ASSESSMENT THE MICROBIAL CONTAMINATION OF MOBILE PHONE AMONG HEALTH CARE WORKERS IN AZADI TEACHING HOSPITAL   KIRKUK / IRAQ

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Article history:		Abstract:
		The goal of this study was to adopt a comprehensive approach to understanding nucleic acids' reality and function in the body of the organism, in addition to their biological and chemical characteristics. For all living things, nucleic acids serve as essential macromolecules or biological polymer components. They are made up of nucleotide-based units or monomers. Phosphate group, nitrogenous base, and ribose sugar make up each of their three constituent elements. Generally speaking, there are just two essential types of nucleic acids. If the sugar is the ribose derivative deoxyribose, the polymer is (DNA) or deoxyribonucleic acid, and if the sugar is ribose, the polymer is (RNA) or ribonucleic acid. In actuality, the basic information-carrying molecules in cells, known as nucleic acids or genetic materials, are chemical substances. Friedrich Miescher, a scientist, was the first to discover and identify nucleic acids, naming them nuclein, while Watson and Crick proposed the double-helix structure of DNA. In this regard and historically speaking.

INTRODUCTION:

Nowadays mobile phones have become an inevitable part of our lives. Their number per capita is often much larger than the population of a country [1]. Mobile phones have become an integral and indispensable part of daily life of everyone. Multiple variations of mobile devices have been launched in the recent past and are being used in routine practice by Health Care Workers (HCW) in their respective institution widely.

Using mobile phones in hospitals can lead to improved quality of health care, especially in terms of faster communication in emergency situations within hospital departments [2]. However, with all the benefits that mobile phones offer, their potential role in microorganism transmission has to be emphasized as well [3]. While working with patients and touching their mobile phones, health care workers (HCW) can easily transmit microorganisms from patients to their mobile phones and vice versa. Combination of constant handling with the heat generated by the mobile phones can create a prime breeding ground for many microorganisms [4].

Global burden of healthcare associated infections (HAI) is on the rise, and contributes significantly to morbidity andmortality of patients.[5] If not cleaned properly mobile phones can serve as reservoir of bacteria and may act as source of nosocomial infection. They have been implicated as important sources of infection in health care settings. As mobile phones act as perfect habitat for microbes to breed, especially in high temperature and humid conditions, HCWs' mobile phones may serve as reservoirs of microorganisms that could be easily transmitted from the mobile phones to the HCWs' hands and therefore facilitate the transmission of bacterial isolates from one patient to another in different hospital wards including critical areas like ICUs.[6]

Research has shown that the mobile phone could constitute a major health hazard. Microbiologists say that the combination of constant handling and the heat generated by the phones creates a prime breeding ground for all sorts of microorganisms that are normally found on our skin. [7] The adult human skin has surface area of approximately 2 m² which is constantly in contact with environment microorganism and become

readily colonized by microbial species of about 10^{12} bacteria [8, 9]. The etiological agents of hospital infections may spread through the hands of healthcare personnel (HP), thermometers, stethoscopes, and even toys in the pediatric intensive care units of hospitals [10].

AIM OF THE STUDY

1-To determine the microbial contamination of mobile phones among health care workers
2-To assess the potential role of mobile phone in the dissemination of diseases

SUBJECTS AND METHODS:
Official agreements

Approval was established from the Research and ethical committees/ Health Office/ Kirkuk governorate. Finally, permission was taken from ethical committees of hospital prior to conducting fieldwork.

Type of study and period

This was a cross-sectional survey conducted during July and August
2021.

Sampling methods techniques

Sample size selection was calculated using a 95% confidence level and a 5% error around the expected prevalence and an alpha error of 5%, the resulting minimum sample size required amounted to 50 mobile phones.

A total of (50) samples were randomly selected from (50) mobile phones of HCWs of different parts of hospital were tested for their bacterial contamination before and after cleaning with 70% alcohol.

Sampling collection procedure

Before taking samples, technician washed both hands thoroughly with soap and water and disinfected with alcohol. Sterile cotton swabs were collected from 50 mobile phones of health care workers at Azady teaching Hospital before and after sterilization by using 70%

alcohol. They were tested at the bacteriology unite in laboratory for their bacterial contamination. Sterile cotton swabs were used to collect samples from the mobile phones of healthcare workers. The swabs were taken from "touch screen" and phones keys. In order to collect samples from mobile phones, swabs were moistened in normal saline and were rotated over the front screen and keys of phone, Swabs were then inoculated in fresh brain–heart infusion broth and incubated overnight at 37 °C. Positive samples were prepared for further culture on different growth media: blood and chocolate agar as enrichment media incubated under CO_2 at 37 °C for 18 hours, MacConkey-agar used to isolate Gram-negative bacteria were incubated aerobically at 37 °C for 18 hours. Exact identification of bacterial isolates had done by the catalse and coagulase test and API Identification System (Biomèrieux): API STAPH for Staphylococcus spp, API 20E for Enterobacteriaceae Gram negative bacteria.

Data collection tool

A self-administered questionnaire was employed to collect information about the sociodemographic characteristics

Data Analysis:

Data were entered and analyzed using SPSS version 17 computer software, summarized in frequencies and percentages, and presented in tables and graphs. Chi-square test and *Fisher's Exact Test*   was calculated, value less than 0.05 was considered as statistically significant

RESULTS

The total number of sample = 50 persons with mean age 33.54 years and median =32years and standard deviation =9.70, range =33, minimum= 21 years and maximum =54 years

Table (1) mobile bacterial contamination before uses alcohol disinfection according to gender:

Mobile contamination	Male	%	Female	%	Total	%	P-Value
Negative	1	8.3	19	50	20	40	0.01
Positive	11	91.7	19	50	30	60	
Total	12	100	38	100	50	100	

Chi-Square = 6.597

Regarding table 1, higher percentage of male (91%) have mobile contamination while less percent for female before using alcohol disinfection and there is significant relationship between gender and bacterial contamination of the mobile before using alcohol. (p= 0.01).

Table (2) mobile bacterial contamination after uses alcohol disinfection according gender:

Mobile contamination	Male	%	Female	%	Total	P-Value

Negative	8	66.7	32	84.2	40	0.18
Positive	4	33.3	6	15.8	10	
Total	12	100	38	100	50	

Chi-Square = 1.7

Table 2 shows that using of alcohol, mobile contamination among male higher than female but there is no significant relationship found (p value = 0.18)

Table (3) mobile bacterial contamination before uses alcohol disinfection and after uses alcohol disinfection according male gender:

Mobile contamination	Before uses alcohol	%	After uses alcohol	%	Total	P-Value
Negative	1	11.1	8	88.89	9	0.003
Positive	11	73.33	4	26.67	15	
Total	12	100	38	100	50	

Chi-Square = 8.7

Table 3. shows higher significant relationship (p= 0.003) before and after using of alcohol disinfection for mobile contamination in male.

Table (4) mobile bacterial contamination before uses alcohol disinfection and after uses alcohol disinfection according female gender:

Mobile contamination	Before uses alcohol	%	After uses alcohol	%	Total	P-Value
Negative	19	37.25	32	62.75	51	0.002
Positive	19	76.00	6	24.00	25	
Total	12	100	38	100	76	

Chi-Square = 10.07

Table 4. shows higher significant relationship (p value = 0.002) before and after using of alcohol disinfection for mobile contamination in female.

Table (5) mobile bacterial species contamination according to the gender:

Bacterial species contamination	Male	%	Female	%	Total	P-Value
Negative	1	8.3	19	50.0	20	0.06*
Staph. Epidermidis	1	8.3	7	18.4	8	0.46*
Staph. Aureus	0	0	1	2.6	1	1.0 **
E Coli	7	58.3	7	18.4	14	0.06 *
Streptococcus Epidermidis + E Coli	2	16.7	1	2.6	3	0.16 **
Staph Epidermidis + E ColiCount	1	8.3	3	7.9	4	1.0 **
Total	12	100%	38	100%	50	0.02 *

* Chi-Square Test   ** Fisher's Exact Test

Table (6) The infection control training according to gender

Infection control training	Male	%	Female	%	Total	P-Value
Yes	2	16.7%	26	68.4%	28	0.002
No	10	83.3%	12	31.6%	22	
Total	12	100%	38	100%	50	

Chi-Square = 9.9

DISCUSSION

This study demonstrated that (60) % of the mobile phones of health care workers were contaminated with bacteria. The high prevalence of bacterial agents isolated from mobile phones was attributed to the poor hygienic and sanitary practices. As compared to the current study lower values were reported from Saudi Arabia (43.6%), Iran (32%), Turkey (61.3%) and Nigeria (62%).[15,16] The difference observed may be attributed to the difference in implementation of infection prevention strategies. Moreover, most of the study participants never cleaned their mobile phones, which will contribute to the increased contamination rate. On the other hand, relatively similar results were reported from other parts of the world including Turkey (94.5% and 90.98%), India (95%)[17]

Our study showed that the rate of bacterial contamination of the personal mobile phones for male was 91.7 % while in personal mobile phones for female was 50%, after disinfection with alcohol still the rate of bacterial contamination of personal mobile phone for male more than female (33.3% compared with 15.8%). It is consistent with a study done in Iraq that show the rate of bacterial contamination of the personal mobile phone for male is higher (85%) compared with personal mobile phones for female (80%).[14]

The study reveals that mobile phones may get contaminated by bacteria (such as Escherichia coli, Staph. Aureus, Staph Epidermidis), which cause hospital infections, and may serve as a vehicle for the spread of nosocomial pathogens. The most common isolates were E Coli for both male and female (58.3 %, 18.4% respectively). A study done among students of the Islamic University-Gaza (IUG) and healthcare workers (HCWs) at Al-Shifa Hospital showed that Staphylococcus aureus was the most predominant isolate (with 27%) mostly in HCWs.[15]

Other study in Iraq demonstrate that the microorganisms isolated and the frequency of occurrence was Staphylococcus aureus (45%), Staphylococcus epidermidis (27.5%), Bacillus spp. (52.5%) and Esherichia coli (12.5%).[14]

CONCLUSION
1. Mobile phones were found to be highly contaminated with bacterial agents.
2. Their usage in hospital settings serves as a potential vehicle for the spread of nosocomial pathogens.

RECOMMENDATIONS
1. As restriction of using mobile phone while working hours is not the practical solution of the problem, we recommend simple measures like hand washing, using hand free mobile phone while working hours.
2. Developing active preventive strategies like decontamination of mobile phones with alcohol containing disinfectant might reduce cross-infection.
3. Regulations regarding the use of mobile phones need to be developed like restriction of mobile phone use in clinically sensitive areas, such as operating environment and ICU as a start point, is recommended. to reduce the dissemination of pathogenic bacteria from hands to phones and, potentially, to patients.
4. Screening of HCWs' mobile phones inside the hospital should be done while doing environmental screening especially within hospital critical areas.
5. Well controlled infection control plan and regular training of HCWs to reduce the rate of hospital acquired infection.
6. Mobiles phones should not be taken to toilets, bathrooms or put on dirty surfaces.
7. More advanced educational program about the correct and healthy use of mobile phones especially in hospitals and other medical institutions

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