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Research Article

Bacterial contamination of Mobile phones and Hands of Health care workers in Sabha Medical Center Hospital, Fazzan Area in Southwestern of LIBYA.

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Abstract

The target of this study is isolation and identification of bacterial colonization on mobile phones (MPs) and hands for health care workers (HHCWs) and screening to antibiotic sensitivity test in Sabha Medical Center Hospital. In total, one hundred forty random mobile phones and hands swabs from HCWs were screened for bacterial contamination. Positive isolates were identified according to the standard microbiological techniques. All bacterial isolates were testing by available antibiotic disks. Analyzed the data based on T-test and Chi- square. Fifty eighth (58.3%) bacterial contamination were found on mobile phones and hands of HCWs. The contamination rates of 52.5%, 64.1% were isolated from mobile phones and hands respectively. Bacterial isolates were Methicillin-resistatn *Staphylococcus. aureus* 35 %, *Bacillus* spp. 33.5 %, *Staphylococcus. albus* 22.85%, *Escherichia. Coli* 8.57 % (P=0.628). The resistance rates to Chloramphenicol, Ciprofloxacin, Erythromycin and Oxacillin were *Staphylococcus. aureus* 22.4%, 0%, 16.3% , 100%(MRSA), *Bacillus* spp. 23.4 %, 0% , 0%, 65.9%, *Staphylococcus. albus* 0%, 43.75%, 0%, 100% respectively. Non- resistance rate was recorded to *Escherichia. coli* except to Oxacillin (P=0.000). Bacterial contamination on MPs and HHCWs are the similar types that may be transmission between them. The present of them demonstrated alarming about nosocomial infection spread, moreover, antibiotic resistance for bacterial contaminants isolates.

Keywords: Mobile phones, HHCWs, contamination, LIBYA, Hospital.

1.Introduction

The first mobile phone call was made in 1973 which improvement in shape, size and technology from 1983(Motorola) until now (Vasanth, R . 2014). The mobile phone now a common practice rule for communication worldwide, one of the most creative accessories for all a persons and easily way to contact with the other (Brady, R.R., et al. 2007). In Libya, World's First mobile phones were used in the registration for vote for official election (Chao, R. 2014.). The mobile phone used between Health care workers (HCWs) patients and visitors was the risk device for transmutation of microbial infection inside the hospital and the community (Brady, R.R., et al. 2007, Namias, N. , et al. 2000). The mobile phones are provided his surface to colonize of normal flora and bacterial contaminated skin. The nature of the skin is the moisture and has optimum temperature of human body especially our palms (Tagoe, D.N., et al. 2011). Cross-contaminations occur between healthcare workers' hands and patients (Singh, A., Purohit, B. 2012). The mobile phone is serving as a

reservoir for many harmful pathogens of nosocomial infections (Brady, R.R., et al. 2007) and become exogenous sources of infection for the family members (Arora, U., et al. 2009, Gashaw, M., et al. 2014, Nwankwo, E.O., et al. 2014).

Also the mobile phones is the important sources to transmission of microbe between hands , faces, mouths, ears, and his surface to self-users (Singh, A., Purohit, B. 2012). HHCWs are easily cleaning by jelly hand rubs disinfection that present a cross all departments and corridors of hospitals but the mobile phones rarely disinfect it (Brady, R.R., et al. 2007). The mobile devices must be disinfected with 70% isopropyl alcohol wipes or ethyl alcohol wipes (Basol, R., et al. 2014). On the other hand, the mobile phone is the sources for multi-resistant pathogen transmission. This is pathogen challenge treatment by antibiotics and other options of it, which considered dangerous (Angadi, K.M., et al. 2014). The antibiotic resistant bacterial contaminants of mobile phones patients must be reported (Kumar, B.V., et al. 2014). HCWs are working in the risk and important hospital ward exposed to harmful microbe, which mobile phone transfer them to any places (Kokate, S.B., et al. 2012). The dealing with mobile phones and hands cleaning is must be under strictly control management (Elsevier Health Sciences 2011). Generally, the best behavior does not share mobile phones with other people (Kumar, B.V., et al. 2014). However, the mobile phone type and structure is most important causes to difficulty cleaning of it (Orsi, G.B., et al. 2015). Many infection and deaths cases were reported by hand contamination infection in the hospitals (Elsevier Health Sciences 2011). The world wide of hospital-associated infection is responsible on level increased significantly to morbidity and mortality of the patients (Pal, S., et al. 2015).

1.1. Objectives

The study was aimed to isolation and identification of bacterial colonization on mobile phones and hands for health care workers (HHCWs) in Sabha Medical Center Hospital, on the other hand, determine the antibiotics resistant patterns for bacterial colonization.

2. Materials and Methods

2.1. Samples collection

This cross sectional study was carried out during period the first Jul- 30 August 2014, based on the desire of detecting a prevalence of mobile phones and hands contamination using a 95% confidence level and a 5% error. A total of 240 random samples were taken of mobile phones (120) and Hands (120) of Health care worker (HHCWs) at the Sabha Medical Center Hospital were tested for bacterial contamination. Our study was tacked permission from Sabha Medical Center Hospital administration and the study was approved by our local committee for Medical and Research Ethics. The sample was obtained from the physicians and nurses. The oral informed consent was obtained from enrolled individuals. The samples were collected by using sterile cotton swabs which moistened with sterile normal saline. The swabs were rotated over the surface and back of the mobile and the same for the hands (Brady, R.R, et al. 2006).

2.2. Cultured of samples

All swabs collected were immediately cultured onto different media as MacCkoncy, Nutrient, Blood agar (Oxoid, England) by soaked it on surface of media and incubated aerobically at 37 ^{o} C for 24 hours (Brady, R.R, et al. 2006).

2.3. Identification of the bacterial isolates

The bacterial colonies were identified based on the Gram stain and morphology characterization. The isolates were tested by the biochemical tests according to the standard microbiological for further identification described by Elmanama, A. A. (2007) and Ramakrishnan, S. , Sulochana, K.N. (2012)

2.4. Antibiotic sensitivity test

The bacterial inoculum was prepared and the turbidity adjusted to that of 0.5 McFarland by the technique of Kirby-Bauer disk diffusion method according to the NCCLs recommendation M100-S25 (2015). Briefly, the adjusting suspension was streaked by the swab over the Muller-Hinton agar

surface (Oxoid, England). Commercially available antibiotic disks available (Oxoid, England) were used for antibiotics susceptibility testing included Erythromycin (E, 15µg), Ciprofloxacin (Cip, 5µg), Chloramphenicol (C,30µg), Oxacillin (O,1µg) dispensed onto the surface of the inoculated agar. All the plates were incubated at 35C° for 18 hours.

2.5. Statistical analysis.

The statistical significance of difference between categorical variables was evaluated by T-test and Chi –square in cross tab. Significance was accepted when P ≤ 0.05, by using Minitab program 16.1.

3. Results

3.1. Isolation and identification of the bacterial strains

Among 120 clinical staffs, 100(83.3%) were Nurses, 20(16.6%) were physicians. A total of 140/240 (58.3%) bacterial strains were isolated from hands (120) and mobile phones (120) of HCWs (**Table I**). Of these, 77(64.1%) strains were isolated from hands and 63(52.5%) were isolated from the mobile phones. The bacterial types were *Staphylococcus. aureus* 35 % (49/140), *Bacillus spp.* 33.5 % (47/140), *Staphylococcus. albus* 22.85% (32/140), and *Escherichia. Coli* 8.57 % (12/140). The prevalence of *S. aureus* rate (24.16%) was greater among hands isolated strains. In contrast, the prevalence of *Bacillus spp.* (23.3%) was greater among hands and mobile phones isolated strains. Whereas, the lower rate of *E. Coli* was among hands(5.8%) and mobile phones(4.16%) isolated strains. The distribution of bacterial isolates between hands and mobile phones were showed in the figure (**1**). Non- statistical significant different was between hands and mobile phones isolates (P=0.628).

Table I. HCWs participants and Bacterial contamination collection from hands and mobile phones.

Bacterial contamination	**No. (%)**
Hands	77(64.1)
Mobile phones	63(52.5)
Total contamination	**140 (58.3)**
Study category	**No. (%)**
Physicians participants	20(16.6)
Nurses participants	100(83.3)

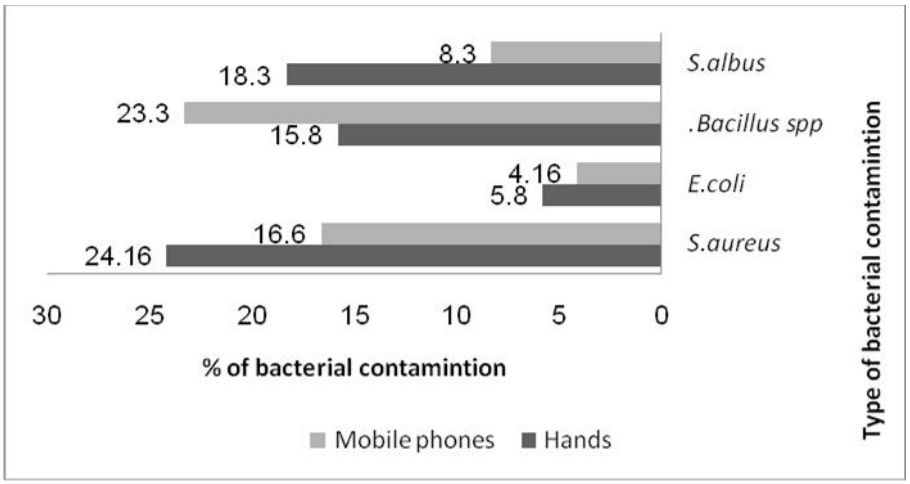

Figure. 1: The distribution of bacterial isolates types for HCWs (T-test= P > 0.05).

3.2. Antibiotic sensitivity test

The 140 bacterial isolates showed variable resistance patterns. The results to antibiotics testing revealed that 11 of the *S. auruse* isolates (22.4%), 11 of *Bacillus spp*. (23.4%) were resistance to Chloramphenicol. Among *S. auruse*, 8 strains (16.3%) and 49 strains (100%) were resistance to Erythromycin and Oxacillin, respectively. All 12 (100%) *E.coli* isolates were resistant to Oxacillin. A similar result was seen among *S. albus* isolates that showed 100% resistant to Oxacillin. Only 65.9% of *Bacillus spp*. strains were resistant to the same antibiotics showed in the figure **(2).** Statistical significant different was between the resistant rates of the antibiotics (P = 0.000).

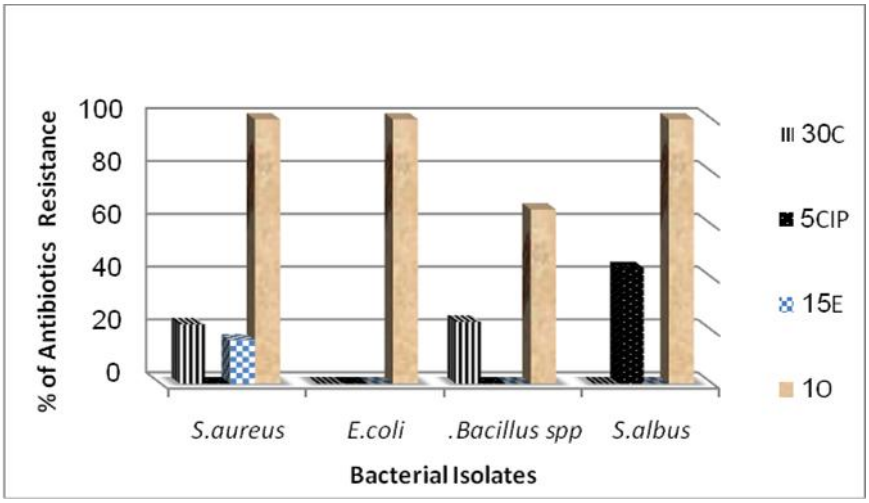

Figure. 2: The resistance of the isolates to antibiotics sensitivity test (Chi –square, P =0.000).

4. Discussion

The mobile phones and HHCWs are the most important sources for nosocomial infection and community (Angadi, K.M., et al. 2014, Kokate, S.B., et al. 2012). The current study showed a high prevalence of bacterial colonization in hands of HCWs. The prevalence rate of bacterial colonization found in the our study is higher than those found in studies conducted in Alexandria University students Hospital, Egypt (25%) Selim, H.S., Abaza, A.F. (2015). In contrast, the prevalence rate of bacterial colonization found in the current study is lower than those found in studies conducted in Saudi Arabia Hospitals (83.9%) Kumar, B.V. et al. (2014), Gondar town Hospitals, Ethiopia (98.3%) Gashaw, M. et al. (2014), the teaching Hospital Umberto I in Rome, Italy (86.0%) Orsi, G.B. et al. (2015). The different between these studies was might be due to the difference in decontamination program implemented. Among different isolates, *S. aureus* were the commonest pathogen detected in the present study (35%) by the higher colonization rate on HHCWs. This is in agreement with previous studies (Tambe, N.N., Pai, C. A. 2012, Raghavendra, M.P., et al. 2014, Selim, H.S., Abaza, A. F. 2015). This is the most common causes of nosocomial infections, normally found on the skin, as well as the respiratory tract of humans and causes various diseases (Chaibenjawong, P., Foster, S. J. 2011). The other fact is *S. aureus* can grow on warm environments as mobile phone surface (Trivedi, H.R., 2011). HHCWs serve as vectors for the nosocomial transmission of microbial pathogenic. The nature of the skin is responsible on this result, because the moisture the skin and has optimum temperature of human body especially our palms that provided the good environment to bacterial colonization (Tagoe, D.N., et al. 2011). However, the hospital acquired infections are considered a big problem that found in developed and developing countries (Ducel, G., et al. 2002).

Similarity in the types of isolated pathogens was observable between our findings and others (Auhim, H.S. 2013, Selim, H.S., Abaza, A.F. 2015). In additions, the other common isolates in current study were *S. albus*, *Bacillus* spp. and *E. coli*. Non- Statistically significant different was between bacterial types (P>0.05).

On the other hand, the bacterial types isolated form the MPs and HHCWs were the similar. This is indicated to transmission of microbe between hands and mobile phones (Singh, A., Purohit, B. 2012.). In a similar study by Saxena et al. 2011, 42% of MPs carried by HCWs were found to carry one or more organisms. In addition, the other study carried out by Roy, S.S. et al. 2013, *Enterobacteraece g*roup particularly *Klebsiella* spp., *Proteus spp*. and *E. coli* were the main isolates frequently associated with the mobile phones of meat handlers (84%) followed by animal handlers (80%), fish handlers (60%), laboratory attendants (48%), veterinary surgeons (20%) and students (12%) mobile phones. This is in agreement by current study that observed colonization of *E. Coli* strains on health care workers mobile phones'. The isolation of *E. coli* from mobile phones is indicated on faecal contamination and poor hygiene (Girma, G. 2015).

S. albus was another type of isolated bacteria that the most commonly found species on phone surfaces and it is the normal human skin flora. This is organism can be transmitted onto other plastic surfaces, like that inserted inside the body and made biofilms (Otto, M. 2009). No seasonal variation for contamination rate to *S. albus* on MPs surfaces as well as the contamination rate of *S. albus* on it is more stable (Abdollahi, A., Mahfouzi, S. 2010.). The *Bacillus spp.* was the higher colonization rate after *S.aureus* in the present study (Auhim, H.S. 2013). This is organism have the ability to spores and resistance the change in environment condition as well as chemical disinfectants (Girma, G. 2015). The current study has demonstrated high rates of antibiotic resistances to one drug (Ciprofloxacin) by *S. albus*. In addition, the Ciprofloxacin antibiotic was completely sensitive by *Bacillus spp*. and *S.aureus*. The lower rates of antibiotic resistances were shown by *S.aureus* against Erythromycin. The prevalence of Methicillin resistant rate was greater among *S. aureus* (MRSA), *S. albus* and *E. coli* strains. This rate is higher than that reported abroad (Selim, H.S., Abaza, A.F. 2015, Sedighi, I. et al. 2015). Nearly antibiotic resistances rate was appearance against Chloramphenicol by *S. aureus* and *Bacillus spp*. Statistical significant different was between the resistant rates of the antibiotics (P = 0.000). The extensive usage of antibiotics particularly non-prescription empirical usage, may correlate with grater prevalence of resistance clone (Shahlol, A. M., et al. 2015a). In the last study, we were detection of ESBLs spread among *Enterobacteraece* strains inside Sabha Medical Center Hospital (Shahlol, A.M. 2015b). This is another problem that must be Hospital administration take care about it and implemented strictly protocol to minimization of resistant clone outbreak. The resistance mechanisms of beta-lactam antibiotics as extended –spectrum beta-lactam and methicillin resistances were must be treatment by the other options of drugs (Ducel, G., et al. 2002, Gashaw, M., et al. 2014, Kumar, B.V., et al. 2014).

Our study indicates that bacterial contamination on MPs and HHCWs are the similar types that may be transmission between them. The present of them demonstrated alarming about nosocomial infection spread, moreover, antibiotic resistance for bacterial contaminants isolates. Furthermore, we are recommended that all HCWs in Hospitals aware about guidelines of using mobile phones, regular disinfection of their mobile phones and hand hygiene under strictly conditions. The important points was in our study that MRSA detected by higher resistant rate (100%). This is features distinguish current study from other studies. In addition, this is alarm and warning for our healthcare administration to implement of hand hygiene and mobile phones cleaning protocols and Decontamination Surveillance Programs that must be planning by Hospital administration.

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