Egyptian Journal of Medical Microbiology Volume 34 / No.2 / April 2025 311-318 Online ISSN: 2537-0979

ORIGINAL ARTICLE

# Surface Mycobiota of Mobile Phones from some Researchers in Iraq

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***Key words:***
***Mobile phones, Fungal contamination, Hands, Molecular analysis, Iraq***

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## ABSTRACT

***Background:*** *Mobile phones, as basic gadgets have become an important and essential part of our daily private and professional lives, and biologically they may have a potential role in transmitting microbes.* ***Objective:*** *Mobile phones and hands of researchers and students in both the microbiology and mathematics laboratories were investigated for the presence of any associated fungi.* ***Methodology:*** *Three sterile swabs were firmly passed on the screens, lateral sides, and backs of each mobile phone. one swab was taken from each participant's hand. The isolated species were identified using conventional techniques, standard identification keys and its sequence analysis.* ***Results:*** *The mean number of fungal isolates was higher in samples taken from mobile phones and owner's hands in microbiology lab than those in mathematics lab. The most diverse genera were Candida with 6 species, followed by Aspergillus with five species. The most frequent species were A. niger (14.61%), followed by A. flavus (11.69%), Rhodotorula mucilaginosa_(8.77%), Kluyveromyces lactis (5.84%), and C. tropcalis (6.43%).* ***Conclusion:*** *The majority of mobile phones and owners' hands were carriers of various mycobiota. Therefore, it is necessary to pay attention to the cleanliness of hands and mobile phones to reduce the source of disease transmission.*

## INTRODUCTION

Mobile phones have become an integral part of modern society. According to projections, there will be 7.1 billion mobile users in 2021, and that number is expected to increase to 7.49 billion [1]. Man has been creating new tools since the beginning of human civilization; one such portable electronic gadget is the cell phone. These days, they are reasonably priced, simple to use, cozy, and furnished with nearly every modern convenience we might want, like a calculator, internet, social media, games, a camera, and many more. Cell phones have become an essential tool for social and professional life due to recent developments in information sources, social media apps, cellular frontiers in microbiology, and microbial diversity. Cell phones, once a rare and costly piece of technology used mostly by the business elite, have become a ubiquitous low-cost personal item in less than 20 years [2] .

Mobile phones are among the best-selling gadgets, and their user base is growing significantly worldwide. They are now indispensable in social media and public life. It is anticipated that over 80% of people on the planet will own a mobile phone by the end of 2018. However, the increasing risk of microbial contamination on these devices' surfaces and the spread of infectious pathogens as a result of their frequent use raise serious concerns[3].

While previous studies have investigated the presence of *Candida spp*. On a range of environmental surfaces, including hospital equipment's and household items, few have examined their prevalence on mobile phones and hands which are known to be important routes of transmission for infectious agents. Understanding the frequency of *Candida spp*. colonization on these surfaces is therefore essential for developing effective strategies to mitigate the risk of infection and transmission[4] . It have been shown to harbor a variety of potentially pathogenic microorganisms, including bacteria, viruses, and fungi. Among these, *Candida* species (*Candida spp*.) are of a significant concern, given their ability to cause range of infections in humans from superficial skin and mucosal infections to life-threatening systemic diseases[5].

Some studies have found high levels of contamination on mobile phones, despite the lack of research on the potential risks of mobile phones as a vector of microbial infections. Nowadays, cellular phones are used practically everywhere, including in restaurants, the gym, the dining room, the kitchen, and even the rest room. This means that cellular phones are constantly exposed to various bacteria. Since cell phones are technological devices, they are rarely cleaned. All of these elements, together with the heat produced by cell phones, have been identified as the main causes of the dangerously high levels of microorganisms harbored on the device[6].

Because many of these microbes are resistant to desiccation and can survive on phone surfaces for weeks, regular contact with the face, ears, and hands may directly increase the risk of getting sick from bacterially infected cell phones[7]. A well-known side effect of cell phones is the radiations produced by them. Along with this our cell phone might be the important reservoir of harmful microorganisms. The constant handling of the phone by different users makes it a good carrier for microbes especially those associated with skin resulting in a spread of different microorganisms such as *Candida, Aspergillus, Penicillium, Mucor, Alternaria, Cladosporium, Bipolaris,Curvlaria* etc[1]. There are currently few reports in the medical literature on fungi that have been isolated from the surface of mobile phones and the hands of their owners. 24 distinct microfungal species from the genera A*lternaria, Caldosporium, Geotrichum, Penicillium, Phoma, Rhinocladiella, Scopulariopsis, Trichoderma,* and *Trichophyton* were found after 50 mobile phones used by students at Health Services Vocational School were analyzed[1] .

According to a study conducted in Egypt, using cell phones in restrooms and critical care units may increase the risk of pathogen contamination, this contamination can be decreased by routinely disinfecting mobile phones[8] .

This issue has not been sufficiently highlighted in Iraq to our knowledge, three studies have been conducted on the microorganisms associated with mobile phones in the central and northern governorates of Iraq[9-11] .

Therefore, the current study represents the first research on fungal contamination of mobile phones in Basrah, southern Iraq. Due to scarcity of studies conducted on fungi associated with mobile phones in Iraq, the current study aimed to verify the fungal contamination of researchers students and mobile phones used in both Microbiology and Mathematics Laboratories, College of science, University of Basrah.

## METHODOLOGY

This study was conducted at college of science, University of Basra in October 2022 to include researchers (Professors. PhD and MSc. Students) and undergraduate students working in the Microbiology Laboratories/Biology Department and their counterparts in the Mathematics Laboratories/Mathematics Department. All samples were taken from participants under sterile conditions in Mycology Research Laboratory. Data were collected through a special questionnaire that included; sex, hygiene habitats, and mobile phone usage.

One hundred samples were obtained from researchers and students who worked in the Microbiology (n=50) and Mathematics (n=50) Laboratories they have written consents to participate in the research project and a questionnaire, without revealing their names and personal data. For each mobile phone, three sterile cotton swabs moistened with normal saline were collected, one from each of the screen surface, the second from the lateral sides, and the third from the back, whether the cover was present on or not, by passing the swabs firmly over those surfaces. In addition, one swab was taken from each participant's hand. All swabs were inoculated onto SDA supplemented with 50 mg/L chloramphenicol and the plates were incubated at 28 °C. The plates were monitored periodically for any fungal growth[12].

All the isolated yeasts were initially phenotypically identified using conventional microscope methods to detect of budding cells, pseudo hyphae, germ tube formation, chlamydospores production and appearance of the colonies on the CHROM agar Candida medium (Himedia, India). Yeast colonies were subcultured on CHROM agar Candida plates and incubated at 28 °C for (14-48) hours[13,14]. Some yeast isolates that were not identified by conventional methods were subjected to molecular analysis.

**Morphological Identification of fungi and yeast**

Growing fungi and yeast were identified based on the macroscopic colony appearance (color, shape, texture) and microscopic features (shape, size of reproductive structure)[15] .

**DNA analysis**

Following culture on Sabouraud dextrose agar (incubated at 25°C), the DNA was recovered from the fungal isolate using the Gene Aid Kit's molecular identification technique. The entire genomic DNA of the fungal isolate was isolated and purified using the Geneaid Taiwan small kit. The polymerase chain reaction (PCR) technique was used to amplify the internal transcribed spacer (ITS 1-5.8S-ITS2) region rDNA gene from the genomic DNA in accordance with the procedures outlined by Mirhendi *et al.* [16] .

The internal transcribed spacer (ITS1) forward primer F-5-TCC GTA GGT GAA CCT GCC G-3 and the reverse primer (ITS4) R-5-TCC TCC GCT TAT TGA TAT GC-3 were the standard primers used for amplification. Following the sequencing of the amplified ITS (Macrogen, Korea), the National Center for Biotechnology Information (NCBI) blast was used to identify the fungal isolates.

## RESULTS

Thirty fungal species representing 16 genera were isolated from the surfaces of mobile phones and their owner's hands, as shown in (Table 1).

In this study, the isolates were assigned to 21 species in 12 genera of moulds in 105/171 (61.4%) and 9 species in 4 genera of yeasts in 66/171 (38.6%). The most frequent isolates on participant's mobile phones and hands were *Aspergillus niger* in 25/171 (14.61%), followed by *Aspergillus flavus* in 20/171(11.69%), *Rhodotorula mucilaginosa* in 15/171 (8.77%), and *Candida tropicalis* in 11/171(6.43%).

*Candida* showed the widest diversity among all isolated genera and represented by 6 species, followed by *Aspergillus* with 5 species, and *Fusarium* with 4 species (Table 1).

**Table 1: No. and occurrence % of fungal species from all participant mobiles**

| Genera | Species | No of isolates | Occurrence % |
|---|---|---|---|
| *Alternaria* | *A.Alternata* | 4 | 2.35 |
| *Aspergillus* | *A.Flavus* | 20 | 11.69 |
| | *A.fumigatus* | 1 | 0.58 |
| | *A.niger* | 25 | 14.61 |
| | *A terres* | 2 | 1.16 |
| | *A.versicolor* | 5 | 2.93 |
| *Cladosporium* | *C.cladosporioides* | 10 | 5.85 |
| | *C.herbarum* | 4 | 2.35 |
| *Curvularia* | *C.hawaiiensis* | 2 | 1.16 |
| *Eurotium* | *E.herbariorum* | 2 | 1.16 |
| *Fusarium* | *F.oxysporum* | 3 | 1.75 |
| | *F.petroliphitum* | 2 | 1.16 |
| | *F.solani* | 3 | 1.75 |
| | *F.verticillioides* | 1 | 0.58 |
| *Mucor* | *M.hiemalis* | 3 | 1.75 |
| *Nigrospora* | *N.oryzae* | 3 | 1.75 |
| *Penicillium* | *P.chrysogenum* | 6 | 3.50 |
| | *P.spinulosum* | 5 | 2.93 |
| *Rhizopus* | *R.oryzae* | 2 | 1.16 |
| *Rhizomucor* | *R.pusillus* | 1 | 0.58 |
| *Scytalidium* | *S.dimidiatum* | 1 | 0.58 |
| **Yeasts ( n= 66)** | | | |
| *Candida* | *C.albicans* | 6 | 3.50 |
| | *C.dubliniensis* | 6 | 3.50 |
| | *C.glabrata* | 5 | 2.93 |
| | *C.parapsilosis* | 8 | 4.69 |
| | *C.krusei* | 4 | 2.35 |
| | *C.tropicalis* | 11 | 6.43 |
| *Kluyveromyces* | *K.lactis* | 10 | 5.85 |
| *Rhodotorula* | *R.mucilignosa* | 15 | 8.77 |
| *Sacharomyces* | *S.cerevisiae* | 1 | 0.58 |
| Total number of species = 30 | | | |
| Total number of isolates | | 171 | 100 |

The study revealed that the total number of fungal isolates contaminating the participants hand and mobile phones from microbiology laboratories was 140, with an a percentage of 81.87%, while the number of isolates recorded on the participants hands and phones from mathematics laboratories was 31, with a percentage of 18.13% (Table 2). The number of fungal isolates from all participants (n=100) was higher in samples collected from the hand surfaces 57 (33.33%), followed by screen surfaces 52 (30.4%), back surfaces 34 (19.88%), and lateral sides 28 (14.61%).

When comparing the different parameters in each of the two groups of participants, table 2 shows that most fungal isolates were recovered from the surfaces of cell phone screens 44(31.42%), followed by the surfaces of the owners' hands 41(29.28%), the surfaces of the backs of the cell phones 30 (17.85%), and the sides of the cell phones 25(17.85%), in the group of workers in microbiology laboratories. As for the group of workers in mathematics laboratories, the result was as follows: the highest number of isolates recorded were on the surfaces of hands 16(51.6%), followed by the screens 8 (25.8%), backs 4 (12.9%) and lateral 3 (9.67%).

**Table 2: Occurrence % and total number of fungal isolates from the samples collected from hand and mobile phone surfaces of the researchers**

| Species | Microbiology laboratories | | | | | | Mathematics laboratories | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Moulds (n=105)** | **S** | **B** | **L** | **H** | **Total isolates** | **Occurrence %** | **S** | **B** | **L** | **H** | **Total isolates** | **Occurrence %** |
| *Alternaria alternate* | 2 | 0 | 1 | 1 | 4 | 2.8 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Aspergillus falavus* | 5 | 5 | 2 | 6 | 18 | 12.8 | 1 | 0 | 0 | 1 | 2 | 6.45 |
| *A. fumigatus* | 0 | 1 | 0 | 0 | 1 | 0.70 | 0 | 0 | 0 | 0 | 0 | 0 |
| *A. niger* | 3 | 7 | 6 | 7 | 23 | 16.4 | 1 | 0 | 0 | 1 | 2 | 6.45 |
| *A. terreus* | 0 | 1 | 0 | 0 | 1 | 0.70 | 0 | 0 | 0 | 1 | 1 | 3.22 |
| *A. versicolor* | 1 | 0 | 0 | 3 | 4 | 2.8 | 1 | 0 | 0 | 0 | 1 | 3.22 |
| *Cladosporium cladosporioides* | 3 | 1 | 0 | 1 | 5 | 3.57 | 1 | 1 | 1 | 2 | 5 | 16.1 |
| *C. herbarum* | 1 | 1 | 0 | 1 | 3 | 2.14 | 0 | 0 | 0 | 1 | 1 | 3.22 |
| *Curvularia hawaiiensis* | 0 | 2 | 0 | 0 | 2 | 1.42 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Eurotium herbariorum* | 0 | 0 | 1 | 1 | 2 | 1.42 | 0 | 0 | 0 | 0 | 0 | 0 |
| *F. oxysporum* | 1 | 1 | 0 | 0 | 2 | 1.42 | 1 | 0 | 0 | 0 | 1 | 3.22 |
| *F. petroliphitum* | 0 | 0 | 0 | 1 | 1 | 0.70 | 0 | 0 | 0 | 1 | 1 | 3.22 |
| *F. solani* | 0 | 1 | 0 | 2 | 3 | 2.14 | 0 | 1 | 0 | 0 | 1 | 3.22 |
| *F.verticillioides* | 1 | 0 | 0 | 0 | 1 | 0.70 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Mucor hiemalis* | 1 | 0 | 0 | 1 | 2 | 1.42 | 0 | 0 | 0 | 1 | 1 | 3.22 |
| *Nigrospora oryzae* | 1 | 1 | 0 | 0 | 2 | 1.42 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Penicillium chrysogenum* | 1 | 2 | 1 | 1 | 5 | 3.57 | 0 | 0 | 0 | 1 | 1 | 3.22 |
| *P. spinulosum* | 5 | 0 | 0 | 0 | 5 | 3.57 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Rhizomucor pusillus* | 1 | 0 | 0 | 0 | 1 | 0.70 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Rhizopus oryzae* | 1 | 1 | 0 | 0 | 2 | 1.42 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Scytalidium dmidiatum* | 0 | 0 | 0 | 1 | 1 | 0.70 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Yeasts ( n= 66)** | | | | | | | | | | | | |
| *Candida albicans* | 2 | 0 | 1 | 1 | 4 | 2.8 | 0 | 0 | 1 | 1 | 2 | 6.45 |
| *C. dubliniensis* | 2 | 1 | 0 | 1 | 4 | 2.8 | 0 | 1 | 0 | 1 | 2 | 6.45 |
| *C. glabrata* | 1 | 1 | 1 | 1 | 4 | 2.8 | 1 | 0 | 0 | 0 | 1 | 3.22 |
| *C. krusei* | 0 | 0 | 0 | 4 | 4 | 2.8 | 0 | 0 | 0 | 0 | 0 | 0 |
| *C. parapsilosis* | 4 | 0 | 0 | 3 | 7 | 5 | 0 | 0 | 0 | 1 | 1 | 3.22 |
| *C. tropicalis* | 1 | 1 | 3 | 4 | 9 | 6.42 | 1 | 0 | 0 | 1 | 2 | 6.45 |
| *Kluyveromyces lactis* | 2 | 0 | 8 | 0 | 10 | 7.14 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Rhodotorula Mucilaginosa* | 5 | 3 | 1 | 1 | 10 | 7.14 | 1 | 1 | 1 | 2 | 5 | 16.1 |
| *Sacharomyces cerevisiae* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 3.22 |
| Total number of isolates | 44 | 30 | 25 | 41 | 140 | | 8 | 4 | 3 | 16 | 31 | |
| % | 31.42 | 21.42 | 17.85 | 29.28 | | 81.87 | 25.8 | 12.9 | 9.67 | 51.61 | | 18.13 |

S: screen surface; B : back surface ; L: lateral surface ; H: hand surface

The results of the current study, as shown in table 3, indicate that the duration of mobile phone ownership is directly proportional to the increase in pollution. The pollution rate was 68.18% for individuals who owned mobile phones for two years, while it was 0% for those who owned phones for six months. Similarly, the period of phone replacement is directly proportional to pollution. As the duration increased, the pollution rate also increased, reaching 75%. As for daily phone usage, the pollution rates were almost equal at 52.63 % and 47.36 %, whether the usage was constant or variable. The table also shows that the highest pollution rates were associated with phones kept in wallets or bags, reaching 42.85% .

**Table 3: The self –administered questionnaire about participants mobile phones and fungal contamination**

| **Data** | **The occurrence of fungal isolates on participants mobile phones (n=100)** | |
|---|---|---|
| | **No.** | **%** |
| **Duration possession** | | |
| 0-6 months | 0 | 0.00 |
| 6-12 months | 4 | 18.18 |
| 12-24 months | 3 | 13.63 |
| >24 months | 15 | 68.18 |
| **Frequency of replacement** | | |
| <1year | 3 | 15 |
| 1-2 year | 2 | 10 |
| >2year | 15 | 75 |
| Frequency of daily usage | | |
| Constantly | 9 | 47.36 |
| Periodically | 10 | 52.63 |
| **Mobile phone holding place at college** | | |
| Bag | 11 | 39.28 |
| Pocket | 12 | 42.85 |
| Other | 5 | 17.85 |
| **Mobile phone holding place at home** | | |
| Table | 3 | 27.27 |
| Pocket | 2 | 18.18 |
| Random | 5 | 45.45 |
| Other | 1 | 9.09 |

Table 4 shows that 80% of individuals clean their phones, with the use of tissue paper being the most common cleaning method at 13%. Meanwhile, 47% of individuals use other cleaning methods.

**Table 4: Percentage of mobile cleaning**

| **Mobile phone cleaning** | **No.** | **%** |
|---|---|---|
| Yes | 80 | 80 |
| No | 20 | 20 |
| Way of cleaning (n=80) | | |
| Alcohol | 20 | 25 |
| Paper tissue | 13 | 16.25 |
| Others | 47 | 58.75 |

Table 5 shows that the highest percentage of people cleaning their phones once a day was 66%, while the lowest percentage was 13% for those who clean their phones more than once a day.

**Table 5 : percentage frequency cleaning per day**

| **Frequency of cleaning** | **No** | **Percentage** |
|---|---|---|
| Once | 66 | 66% |
| Twice | 21 | 21% |
| More | 13 | 13% |

Out of a total of 100 participants mobile phones, 55 showed positive fungal contamination with percentage of 55%, compared to 45 mobile phones that revealed negative results, at a percentage of 45% (Table 6). Eighty percent of the mobile phones of workers in microbiology laboratories were contaminated with fungi, while only 30% of the cell phones of workers in mathematics laboratories carried fungal propagules.

**Table 6: Percentage of fungal contamination on participants mobile phones in microbiology and mathematics laboratories**

| **Fungal contamination** | **Microbiology participants (n=50)** | | **Mathematics lab. participants (n=50)** | | **Total %** | |
|---|---|---|---|---|---|---|
| | **NO.** | **%** | **NO.** | **%** | **NO.** | **%** |
| Positive | 40 | 80 | 15 | 30 | 55 | 55 |
| Negative | 10 | 20 | 35 | 70 | 45 | 45 |
| Total number ; % | 50 | 100 | 50 | 100 | 100 | 100 |

Table 7 shows that the phone contamination rate for females is 40%, which is lower than the phone contamination rate for males at 60%.

**Table 7: Percentage of fungal contamination on mobile phones and hands according to the gender**

| Fungal contamination | Female (n=50) | | Male (n=50) | | Total % | |
|---|---|---|---|---|---|---|
| | NO. | % | NO. | % | NO. | % |
| Positive | 35 | 88 | 15 | 25 | 50 | 50 |
| Negative | 5 | 12 | 45 | 75 | 50 | 50 |
| Total number; % | 40 | 100 | 60 | 100 | 100 | 100 |

Table 8 shows that the highest percentage of mobile phone contamination, according to its type, was Android 30,40% in both the microbiology and mathematics categories respectively

**Table 8: Percentage of fungal contamination according type mobile phones**

| Type of mobile | Microbiology (n=50) | Mathematics (n=50) |
|---|---|---|
| I phone new | 10 | 0 |
| I phone old | 10 | 10 |
| Android | 30 | 40 |

**Molecular identification**

Some yeasts isolates were suspected of being identified by conventional methods and therefore genetic testing was performed. Accordingly, based on the analysis of the sequence of ITS region, it appears that these strains were perfect homology to the following species; *Candida albicans, C. glabrata, C. parapsilosis,* and *C. tropicalis* (Figure 1).

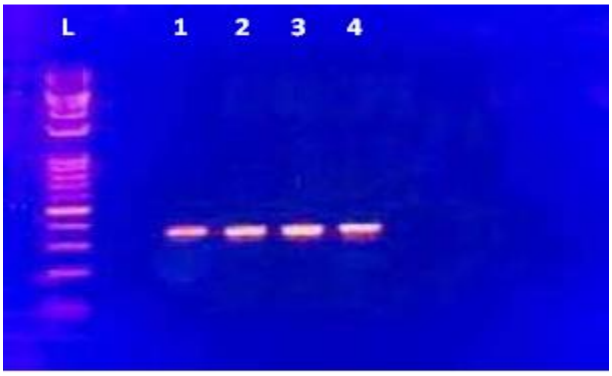


**Fig. 1:** Agarose gel electrophoresis 2 % of PCR product for internal transcribed spacer ITS 1 – ITS 2 regions (including 5.85 S r DNA gene). Lane L:100bp) DNA ladder, Lane 1: *Candida albicans* (495 bp), Lane 2: *Candida glabrata* (610 bp), Lane 3: *Candida tropicalis* (492 bp), Lane 4*: Candida parapsilosis* (481 bp) for ascomycetous yeasts isolates.

## DISCUSSION

Eighty present of the samples in the current study were colonized by various fungi in the staff group, and 20% in the non-staff group. These organisms may have entered the phone through the skin, as is the case with candida spp. This is because soil and air are home to the majority of the isolated fungi[17]. In our study the highest occurrence percentage in mobile phones contamination was *Aspergillus niger* (14.61%) while less occurrence percentage (0.58) were respectively *Aspergillus fumigatus, Fusarium petroliphilum, Scytilidium dimidiatum, Saccharomyces cerevisiae* and *Rhizomucor* sp. May be because the *Aspergillus niger* has *Aspergillus niger* is more prevalent in warmer climates, both in field situations and mobile surface. The black spores apparently provide protection from sunlight and UV irradiation providing a competitive advantage in such habitats. Also the occurrence of fungi in microbiology phones more than mathematics may be reasons.

Biology students are more likely to be in environments where fungi naturally occur (e.g., soil, plants, water), which could increase the likelihood of contamination. They might also handle tools or specimens without sanitizing their hands regularly, transferring microbes to their phones and biology students often handle organic materials, cultures, and biological samples, including in environments like labs and fieldwork, where they may encounter microorganisms such as fungi. This exposure increases the chances of fungi being transferred to their phones.

In a study at Saudi Arabia 86.7% of staff samples were contaminated with at least one fungus, 37.70% of staff samples were colonized by *Aspergillus niger* and 29.51% of them by *Aspergillus flavus* which were the most common. While 80% of non-staff samples were contaminated with 21.74% by *Cladosporium* which was the second most common isolates after *Candida spp*[18]. *Aspergillus niger* is known to produce mycotoxin, specifically ochratoxin although it is less likely to cause human disease, when many spores are inhaled, it can cause Aspergillosis[19]. *Aspergillus flavus*, on the other hand is more pathogenic than *A. niger* since it produces aflatoxin which causes pulmonary infection and cancer when it became invasive especially in immunocompromised patients[20]. So the 16.39% of staff mobile phones were colonized by *Candida* species while 56.52% of non-staff mobile phones were colonized by *Candida* species. We found that *Candida glabrata* , *Candida tropicalis, Candida krusi, Candida albican* were the dominant species in the samples collected from mobile phones and the hands of their owner where *Candida glabrata* was the most common species (50%) isolated from these samples, which any cause endocarditis[21] .

Additionally requested to fill out a survey that questioned about their occupation, use of cell phones, and cleaning habits. Only 80% of members cleaned their mobile phone, 20% of them cleaned their phones using alcohol while 13% using paper tissues,47% cleaned their mobile phones less frequently than the others and found that only 66% of members regularly cleaned their phones once time while 21% twice. Iiusanya *et al.*[22] showed that 83.33% of the samples were contaminated as the rate of bacterial and fungal contamination was 100%.

## CONCLUSION

According to the current findings, mobile phones have the potential to act as a vector for the spread of harmful organisms that humans have acquired from the community. There are a lot of fungi on hands and cell phones, most of which can make people sick. The public should be aware of the dangers of contaminated hands and mobile phones through appropriate hand washing practices after handling them and cleaning them with specialized cleaning supplies as part of a comprehensive prevention campaign aimed at lowering morbidity and mortality.

**Conflict of interests**

All authors declare that they have no Conflicts of interest linked to this study.

**Ethics approval**

All subjects gave their informed consent for inclusion before they participated in the study. and the protocol was approved by the Ethics Committee in Basrah university.

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