

Hospital Door Knobs as a Source of Bacterial Contamination: A Study in Iraqi Hospitals

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Abstract

In this study, 20 swabs were collected from three hospitals in the holy city of Karbala (Al Hussein General Hospital, Al Abbas Private Hospital and Maternity Hospital). Nutrient agar was grown on solid feed medium and incubated at 37 ° C for 24-48 hours for isolation and diagnosis. Bacterial isolates obtained underwent biochemical and bacteriological tests for diagnosis. I prepared different doses of isolated bacteria according to the McFarland model. Then take 0.1 ml of 1/10000 IV dilution and add to Muller Hinton agar medium.

The results of the preliminary diagnosis of the isolated bacteria showed that the positive bacteria of Cram stain were higher than those of Cram negative bacteria. The largest number of *S.aureus* bacteria was in the hospital environment from which swabs were taken and in all locations, especially bathrooms. By calculating the percentage of the total number of samples diagnosed for each hospital separately, the results showed that Hussein General Hospital had the highest contamination rate of 90%, while Al-Ahli Hospital had the lowest contamination rate of 40%. With regard to the effect of antiseptics, the concentration gave 75% Dettol the highest amount of inhibition of bacterial growth compared with other concentrations.

On the other hand, the synergistic effect of both antiseptics (Dettol and chlorine) 75% -25% had an effect on inhibition of bacterial growth and its total elimination in the medium compared to other concentrations.

Keywords: *Door Knobs, Bacteria, Contamination, Antiseptic, Microorganism.*

Introduction

With the application of the principle of prevention better than treatment and with the development and scientific progress and scientific achievements of many inventions and discoveries that are in the interest of humanity we had to know the impact of microorganisms in hospitals and health environments, according to the campaign of infection prevention in hospitals and provided by the United States Hospitals aggravated by routine work and failure to adopt hygiene standards applied to the physical environment of diseases of the same level of importance available in cleaning hands and people led to this large amount of pollution and can be avoided Reducing the rates of contamination in hospitals

to 10% by establishing or adopting modern sterilization mechanisms and designing studies that focus on the basic rates of infection and the type of injury and trying to avoid them and identify the causes. Persons facilitate the transmission of germs throughout the building ⁽¹⁾.

In recent times, many types of antibiotic-resistant bacteria have begun to emerge. The poor health culture of many nurses, they help spread it ⁽²⁾.

Door handles for toilets and taps in toilets are parts contaminated with microorganisms. Microbes carry human skin on two endemic and transient species ⁽³⁾ ⁽⁴⁾ ⁽⁵⁾ ⁽⁶⁾.

Human hands are usually the port of microorganisms as a normal flora of the body, as well as the transmission of microbes through the environment ⁽⁵⁾ ⁽⁶⁾ ⁽⁷⁾.

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Some of the most important species that may be found on the hand as transmitted species from external sources include *Escherichia coli*, *Salmonella spp.*, *Shigella spp.*, *Clostridium*,⁽⁸⁾ at a high rate and have a significant impact on the third of public places.

Repeated use of the same surfaces, including door handles by people living on the hand, will be easily transmitted to other users of all ages and environments.

Substances used to eliminate microorganisms (disinfectants, detergents and disinfectants) are variously concentrated chemical compounds used in the medical field to prevent the spread of diseases causing hospital

infections and are used for personal health and to prevent accidental contamination of nurses and staff⁽⁹⁾.

Materials and Method

Sample Collection

In this research, samples were collected from Al-Husseini, Abbasi and Maternity Hospital in the holy city of Karbala, where swabs were taken from the hospital environment (door handles for bathrooms, emergency and operations) during the period 1/1/2016 to 25/1/2016 as shown in Table (1)

Table (1) shows samples and sources of obtaining them

No.	Hospital	Samples	Source		
1	Elhosany	20	Emergency	Baths	Operations
2	Elwelada	20	Emergency	Baths	Operations
3	Abbasi	20	Lack of emergency in the hospital	Baths	Operations

The number of swabs taken was 20 swabs per hospital. These swabs were transported to the laboratory by Transport media. They were transplanted to Nutrient agar solid medium and incubated at 37 ° C for 24-48 hours for isolation and diagnosis.

Diagnosis of samples

Bacterial isolates obtained from biochemical and bacteriological tests were subjected to diagnosis as well as the action of slices and dyed with Gram stain.

Isolation of bacteria

Wipes were planted on the following media: Nutrient agar, Blood Agar and MacconKy agar.

Mannitol salt agar (especially for the diagnosis of *S. aureus*).

The dishes were incubated aerobically for 24 hours at 37 ° C and the colonies were initially diagnosed by recognizing their morphological and agricultural

characteristics in the general culture media (Nutrient agar) to determine the type and isolation of the isolated bacteria.

Confirmation tests:

After that, confirmatory tests were carried out:

Confirmation examination on the center of Mannitol Salt Agar for the diagnosis of *S.aureus*

The isolates were planted on the mannitol glue. The dishes were incubated for 24 hours at 37 ° C to study the agronomic characteristics of the form, color and size of the colonies and their ability to ferment lactose sugar.

Blood Agar confirmation for *Streptococcus Spp.*

The isolates were planted on the medium of B.A. Then the dishes were incubated for 24 hours at 37 ° C to study the agricultural characteristics of the shape, color and size of the colonies and the types of decomposition they produce (α , β , γ).

Test of the effectiveness of the enzyme cytochrome oxidase (Oxidase test)

The filter paper was moistened with drops of reagent and several colonies were transferred from the center of the glue feeding with wooden sticks and mixed well with the reagent and after (20 - 30) seconds after the colonization of the colonies violet positive result ⁽¹¹⁾.

Catalase test

Transfer part of the bacterial suspension to the surface of a clean glass slide and add a drop of reagent (5% hydrogen peroxide solution) .The emergence of bubbles indicates that the result is positive. This detection is used to investigate the ability of the bacterium to produce the catalase enzyme that decomposes H2O2 into oxygen and water ⁽¹²⁾.

CO - Agulase test

Two drops of plasma were placed on the surface of a glass slide and then a rich colony of bacterial suspension was added. After 10-15 seconds, the coagulation or agglomeration was an indication of the positive result and the bacterium was *S.aureus*.

Diagnostic tests were carried out which included the examination of all specimens in Gram stain where the dominance of *Staphylococcus Spp* was recorded. On other bacterial species. Confirmation tests were also conducted for all samples that included both growth on the center of Mannitol Salt Agar. Blood lysis, Oxidase, Catalase.

Exposure to disinfectants:

After isolation and diagnosis of bacteria for swabs taken from hospitals and then their development on the liquid nutrient broth (nutrient).

Different dilutions of the isolated bacteria were prepared according to the McFarland model. Then 0.1 ml of the fourth dilution was taken 1/10000 and added to the center of Mullar hitun agar ⁽¹³⁾.

Some disinfectants used in the hospitals were swabs, which included (Dettol and chlorine), which was in the concentration of chlorine (5% sodium hypochlorite) and dettol at a concentration of (10% xyleneol) prepared four different dilutions for each disinfectant separately (100%, 75%, 50% , 25%). Where distilled water was adopted for dilution. Where the sample was taken without dilution 100%, 75% by adding 25 ml distilled water and 75 ml of disinfectant, 50% was 50 ml of disinfectant and 50 ml distilled water and 25% was 25 ml disinfectant with 75 ml of distilled water and so on for the second disinfectant. The same number of mitigations but both antiseptics attended together to study their synergistic effect together to inhibit bacterial growth.

Each dilution was taken 0.1 ml and added to the implantcenter (muller hiton agar) by two repeaters for each dilution after being pollinated with bacteria that were isolated and diagnosed from the door handles on the one hand and on the other hand the same amount of disinfectants were taken together and in the same way the circles were held in a temperature of 37 for 24 hours.

Results and Discussion

The results of the initial diagnosis of bacteria isolated from (door handles) for all hospitals adopted in the study showed that the bacteria positive to the pigment of karam were more compared to the bacteria negative for the pigment of the pigment and as shown in table 2 that shows the results of diagnostic tests and biochemical For isolated bacterium No. 5, this is consistent with the search results ⁽¹⁰⁾. and table (2).

Table 2: types of bacteria isolated from door handles in all hospitals (Al-Hussein General, Abbas Al Ahli and elwelada)

	Gram Stain	Manitol Salt agar	MacconKey agar	Blood agar	Catelase test	Oxidase test	Coagulase test
Staphylococcus. Spp.	+	+	-	β+	+	-	+
Proteus	-	-	+ Forming swarming	+ Forming swarming	-	-	-

Cont... Table 2: types of bacteria isolated from door handles in all hospitals (Al-Hussein General, Abbas Al Ahli and elwelada)

Bacillus spp.	+	-	-	+	+	-	-
seudomonas aeruginosa	-	-	+	β+	+	+	-
E.coli	-	-	+	-	+	-	-
Clostridium spp.	+	-	+	-	-	-	-
Klebsiella	-	-	+	+	-	-	-
Streptococcus spp.	+	-	-	+	-	-	-

The results of the research showed the spread of *s.aureus* bacterium in the hospital environment from which the surveys were taken and in all locations, especially the baths, and this result was agreed with its findings (binding2) + Planet Saadi) and as described in table (3) and Figure 1.

Table 3: shows the total number of bacterium and types of microbiology isolated from the door handles for all sites taking wipes in hospitals

Hospital	Positive samples	Staphylococcus. Spp	Streptococcus spp.	Bacillus spp.	seudomonas aeruginosa	Clostridium spp.	Proteus	Klebsiella	E.coli
Elhosany	38	12	8	3	6	1	1	2	5
elwelada	27	10	5	2	4	0	0	2	4
Elabassi	15	7	4	1	2	0	0	0	4
Total	80	29	17	6	12	1	1	4	10

Figure 1 shows the total number of bacterium and types of microbiology isolated from the door handles for all hospital swabs.

By calculating the percentage of the total number of samples diagnosed for each hospital, the results showed that Hussein Hospital had the highest infection rate, while in Abbas Hospital the lowest contamination rate as in Table 4.

Table 4: Percentages of Total Positive Results for Total Samples

	Samples	Positive Samples	%
Elwelada	20	14	70%
Elhosany	20	18	90%
Abbasi	20	8	40%
total	60	40	67%

After isolating and diagnosing the bacteria from samples taken from the door handles, the bacteria were activated by developing them in the nutrient-liquid broth and conducting a series of dilution specimens based on the McFarland model and took 0.1 of the fourth dilution (1/10000 and was added to the center mullar hitun agar)) and after Study the efficiency of some common and approved disinfectants for use by hospitals that have been taken wipes, which included both chlorine with a concentration (5% sodium hypochlorate) and ditol with a concentration (10% coselinol) and the preparation of four different concentrations for each disinfectant individually (100%, 75%, 50%, 25%) as shown in table 5 below.

Table 5: shows the results of the effect of various concentrations of disinfectants on inhibiting the growth of bacteria

Disinfectants	25%	50%	75%	100%
Cloren	H	I	I	H
Dettol	H	I	W	I
Synergistic (chloranddetol)	I	I	V.W	H

H: Heavy I: Intermediate W: Weak V.W.: Very Weak

The concentration gave 75% Dettol the highest amount to inhibit the growth of bacteria compared to other concentrations.

On the other hand, the results showed that the synergistic effect of disinfectants combined (ditto-chlorine 75%-25%) The highest inhibition rate of the bacterium in the middle compared to other concentrations and the basic sample without the addition of disinfectants.

We note through the results of the isolation and diagnosis of bacteria from the swabs of door handles to hospitals that the number of bacteria positive for the dye of the dignity more than the negative bacteria of the pigment of gram and this means that the negative bacteria of the dye of the gram can be transmitted through the handles of the doors but by a small percentage where the spread

The common ity of positive bacterium is the dominant, and this is consistent with what he has come up with⁽¹²⁾. As for disinfectants and sterilizers performed on a series of disinfectants which are (100%, 75%, 50%, 25%), it was found that the dilution rate of 75% Dettol gave a high rate of inhibition of bacteria for disinfectants each individually, and on the other hand the results showed that the synergistic effect of disinfectants together Dettol Chlorine with a dilution of 75% was enough to eliminate the bacteria in the middle compared to the other disinfectants, whether for disinfectants on the cheek or both disinfectants (binding 2). Exposure to biocides, disinfectants and sterilizers results in reducing the sensitivity of insulation to antibiotics and deadly biomaterials by means of natural or acquired resistance mechanisms in addition to the possession of adaptable microbiology when exposing to biomaterials. The killer by acquiring plasmids or jumping genes that make these micro-organisms resistant and that the same strategies that gain bacteria to resist biocides give them resistance to antibiotics⁽¹⁰⁾.

Conclusions

1- In this study we reviewed the effects and microbiology that can be transmitted between infected people and when they use door handles in hospitals as well as medical staff when conducting tests or operations or neglecting the necessary preventive and health measures at the present time and few Attention to the beginning of prevention, especially in the health and medical services. The results discussed confirmed that the increased use of door handles on a continuous basis leads to increased amounts of microbes and that the majority were from the bacterium positive for the pigment of Karam.

2- Bathrooms are considered one of the most important sources of contamination with microbes as a result of human secretions of skin, saliva, administration, fecal matter and others.

3- Cleaning hands after using bathrooms in a routine way especially by people who do not have health awareness and do not use detergents in the right way before leaving and using door handles for bathrooms makes it a rich medium and ideal for various pathogenic microbiology especially Hospitals and public places

4- From our findings, it is found that local hospitals had high levels of contamination of the handles and the presence of bacteria at high rates requires greater

attention to hygiene and sterilization.

5- Disinfectants on the surfaces are very necessary to prevent injuries and the transmission of microbes, especially on the surfaces that are constantly touched by the hands in order to reduce and determine their presence and prevent their transmission from one person to another.

Ethical Clearance: The Research Ethical Committee at scientific research by ethical approval of both environmental and health and higher education and scientific research ministries in Iraq

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