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Research Article

The Effect of Using Disinfectant Wipes to Eliminate Contamination Bacterial of Shopping Carts Handles in Some Supermarkets and Larges Stores in (Sakaka, Al jouf)

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ABSTRACT

This study examined to identify bacterial contamination of shopping carts handles from different supermarkets and large stores in Sakaka. A total of 30 samples were collected from shopping carts, 15 samples before and 15 samples after wiping the handles with disinfectant wipes, some of bacteria isolated from shopping carts and baskets before using disinfectant wipes are: Gram +ve bacteria are S.aureus , S.hominis , S.pettinkoferi and Micrococcus spp and some of isolated Gram –ve bacteria are Gardenerella vaginalis and pseudomonas. Isolated bacteria after using disinfectant wipes are Corynebacterium matruchotti, S.cohnii and Pasteurella pneumotropica they show high sensitivity to Gentamicin, Chloramphenicol, Moxifloxacin and Rifampin.

Keywords: *Contamination, Shopping carts, Public surface, Sakaka Al-jouf, Disinfectant wipes.*

INTRODUCTION

According to WHO the definition of contamination is the soiling or pollution of inanimate objects or living material with harmful, potentially infectious or other unwanted material, for example organic matter or microorganisms (WHO, 2001).

While the microbial contamination specifically refers to the non- intended or accidental introduction of infectious material like bacteria, yeast, mould, fungi, virus, prions, protozoa or their toxins and by-products (Gabriel, 2008).

People believe that microbes are only present in research labs or in hospitals and clinics and thus they have a misleading feeling of security in other places. Lack of knowledge about where microbe's prowl could be the cause of health problems.

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(Reynolds et al., 2005). Even in wealthy nations, infection is still extremely common: at least a quarter of all illnesses for which patient consult their doctors in the UK are infective disease ,Knowledge of the ways in which microorganism spread and cause disease in communities has produced vital insights that can be used to inform effective control program (David et al., 2007). Public facilities are considered as a vector for transmission of infectious disease, because the frequent use of these surfaces by many members of the communities.

Supermarkets and stores are one of most important public facilities since they are represent places those gather large number of people who are in different hygienic and health condition. In addition, most important objects in supermarkets those are constantly come in contact by customers are shopping carts. In spite of all efforts to emphasize the importance of washing hands and using disinfectant gel or wipes after touching any public surfaces ,but many people in our society don't realize the seriousness of contamination around us , they belief that the continuous washing and disinfecting hands is a (clean freak). The healthy human body naturally capable of preventing many bacteria and other microorganisms from causing a disease, but in some condition human body becomes weak and fails to defend against bacteria and microorganisms then a state of disease occur. Majority of microorganisms have isolated from public surfaces are saprophytic and opportunistic which rarely cause a disease in healthy individual but may do so in those with reduced immunity.

Not all microorganisms are pathogenic and can cause infection and disease, the human body is colonized with numerous microbes (normal flora) many of which serve important function for their hosts, such as certain normal flora aid in digestion of food, produce vitamins (vitamin K), and many flora serve other important benefits (Murray et al., 2015) Studying microbial contamination on our environment is especially important, since any disturbance on environmental microbes may lead to disastrous results ending with out-break that suddenly affects large population.

MATERIALS AND METHODS

Sample area and size:

A total number of 30 samples were collected from shopping carts handles in some supermarkets, pharmacies, large stores in Sakaka city, 15 samples were collected before cleaning the handles of the carts with disinfectant wipes, and the other 15 swabs were after cleaning the handles with disinfectant wipes.

Collection of samples:

The handles of shopping carts were swabbed with a sterile cotton swabs moistened in sterile normal saline to collect the sample before cleaning with disinfectant wipes and labeled. after that the same cart`s handle was cleaned with disinfectant wipe and then was allowed to dry for 10 min, then the sample After cleaning was collected with other swab and labeled, the swab was rotated on all handle` parts during each swabbing before and after manner was conducted for 15 shopping carts each cart with two swabs labeled with the cart`s number also whether before or after cleaning. After that, swabs were collected on transport media (Amie's agar) as study by (Ashgar et al., 2012). To ensure complete viability of bacteria, and then swabs were transferred in ice-filled container immediately to university lab during two hrs. at most.

Cultivation of samples:

Each samples were cultivated on Blood agar, Nutrient agar and MacConkey agar under complete aseptic conditions by Lawn method. Then the cultures were incubated at 37C◦ for24-48 hrs. under aerobic conditions.

Isolation of bacteria:

Isolation was conducted by comparing morphology of the grown bacterial colonies based on size, color, margins, elevation and spreading. Morphologically different colonies were considered as different colonies. Depending on **Gram stain** to determine gram positive and gram negative bacteria, and to identify the bacterial cells` morphology (cocci, bacilli, comma, spiral) for each different colony.

Gram staining:

Gram stain is most commonly used stain in microbiology laboratory forming basis for separating major groups of bacteria (gram

positive and gram negative) after fixation of specimen to glass slide by heating. Specimen is exposed to crystal violet 2 min and then iodine for 1 min is added to form complex with primary dye, during decolonization with alcohol, complex is retained in gram positive bacteria but lost in gram negative bacteria, counterstain is retained by gram negative bacteria (hence their red color). According to Gram stain, Gram-negative bacilli were cultivated into MacConkey agar and EMB (Eosin methylene blue) agar to differentiate coliforms from non-coliforms according to ability of coliforms bacteria for Lactose fermentation (Murray et al., 2015). And Gram positive cocci that form clusters were isolated into Mannitol Salt Agar, since they were suspected to be *Staphylococcus spp*., and those fermented Mannitol might be *Staphylococcus aureus* and Nutrient agar plates for other different colonies by using (streak-plate technique) to get pure cultures. In addition, molds and irregular oval budding cells that stained with irregular violet color with gram stain were isolated into SAB agar. All cultivated plates were incubated at 37C◦ for 24-48 hrs. Cultivation and isolation of samples were carried out at microbiology laboratory of Al-jouf University.

Statistical analysis plan

Data analysis were performed on the SPSS program for version 22, 2013.

The description of data was done in form of frequencies and percentages for normally distributed quantitative data. One Way ANOVA test used to compare between more than 2 groups by: post Hoc test LSD (Least significant difference) to compare intergroup.

RESULTS

Isolation was conducted by comparing morphology of the grown bacterial isolates, and depending on Gram stain to determine Gram nature, the isolates were isolated into selective and differential media and nutrient agar as previous detailing, the purified isolates were processed by micro Scan walk-away 96 plus and BD phoenix ^{TM} Automated microbiology system. The results revealed Forty-seven from the total bacterial isolates, forty-four bacterial isolates before using disinfectant wipes whilst only three bacterial isolates after cleaning with disinfectant wipes including:

Table 1: The number of isolated bacteria in general before and after using disinfectant wipes

Isolated bacteria before using disinfectant wipes	No.	%	Isolated bacteria after using disinfectant wipes	No.	%
-Dermacoccus nishinomiyaensis	1	2.13%	*-Corynebacterium matruchotii*	1	2.13
Staphylococcus pettenkoferi	3	6.38%	*Staphylococcus cohnii spp. Cohnii*	1	2.13
-Staphylococcus aureus	3	6.38%	*Pasteurella pneumotropica*	1	2.13
-Staphylococcus hominis	3	6.38%			
-Staphylococcus Capitis	1	2.13%			
-Staphylococcus haemolyticus	2	4.26%			
-Staphylococcus epidermidis	2	4.26%			
-Staphylococcus kloosii	1	2.13%			
-Staphylococcus auricularis	2	4.26%			
-Staphylococcus schleiferi	1	2.13%			
-Streptococcus pneumonia	1	2.13%			
Staphylococcus cohnii spp. Cohnii	1	2.13%			
Pasteurella pneumotropica	1	2.13%			
-Bacillus circulans	3	6.38%			
-Bacillus cereus	1	2.13%			
Corynebacterium matruchotii	1	2.13%			
-Bacillus megaterium	1	2.13%			
-Leifsonia aquatica	1	2.13%			
Micrococcus species	4	8.51%			
Gardnerella vaginalis	2	4.26%			
-Leuconostoc mesenteroides app. Cremoris	1	2.13%			
Aerococcus viridans	1	2.13%			
Paenibacillus alvei	1	2.13%			
Pseudomonas fluorescens	1	2.13%			
Alloiococcus otitis	1	2.13%			
Moraxella species	1	2.13%			
Pseudomonas stutzeri	1	2.13%			
Pasteurella pneumotropica	1	2.13%			
Kytococcus sedentarias	1	2.13%			
Total in general	44	93.6		3	6.4%
Total without repeat	26	89.7%		3	10.4%

The percentage of Gram+ve bacteria was (82.8%) compared to (17.2%) of Gram-ve.

As seen in table (2) figure (1)

Table 2: Types of isolated bacteria according to Gram positive and Gram-negative bacteria

Types of isolated bacteria according to gram	No.	%
Gram positive	24	82.8 %
Gram negative	5	17.2 %
Total	29	100 %

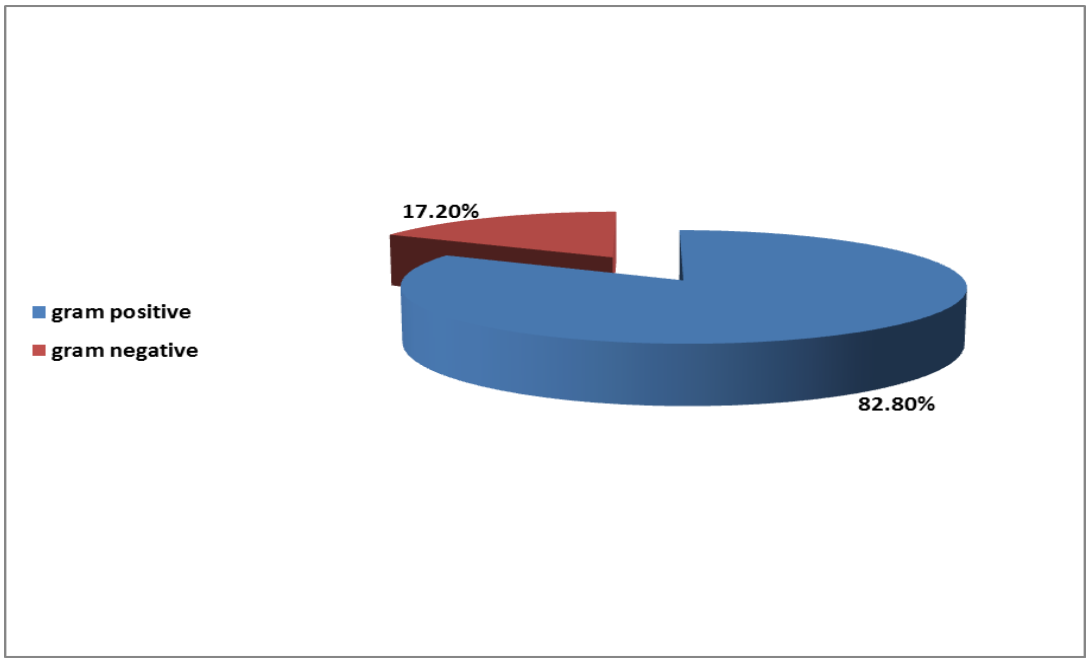

Figure 1: Types of isolated bacteria according to Gram positive and Gram-negative bacteria.

Frequencies between (Gram positive and Gram-negative bacteria) using ANOVA test (P-value= 0.234) which is greater than (0.05), this indicates that there is no significance between two groups at level of (0.05).

Table 3: Difference between Gram-positive bacteria and Gram-negative bacteria

Source	N	Mean	Std. Deviation	t-value	P-value
Gram positive Bacteria	24	1.6296	.88353	1.215	0.234
Gram Negative Bacteria	5	1.0000	.00000		

Among this study, percentage of pathogenic bacteria was (13.8%) while the non-pathogenic represents (82.8%) and (3.47%) for unspecified species. As seen in table (4) and figure (2).

Table 4: Types of isolated bacteria according to pathogenic bacteria, non - pathogenic bacteria and unspecified species

Types of isolated bacteria	F	%
Pathogenic bacteria	4	13.8 %
Non - pathogenic bacteria	24	82.8 %
Unspecified species of isolated	1	3.4 %
Total	29	100 %

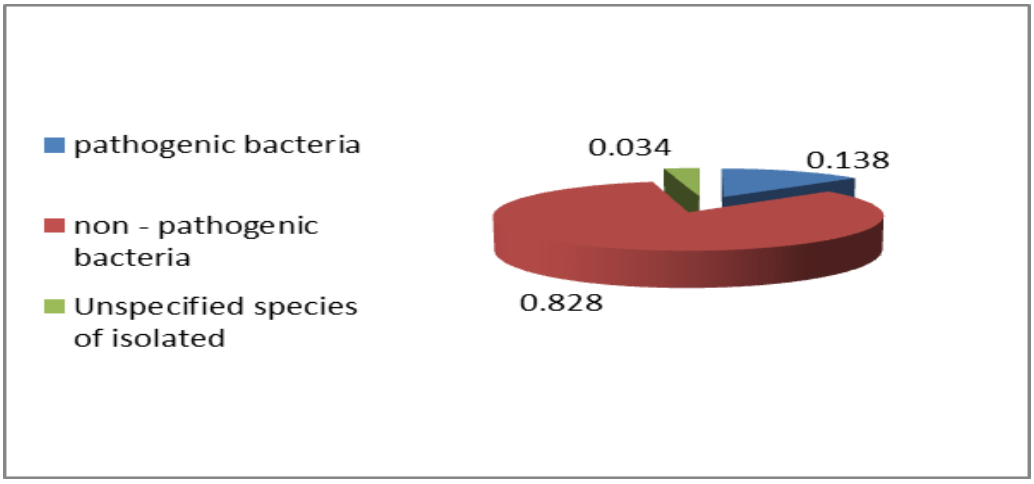

Figure 2: Types of isolated bacteria according to pathogenic bacteria, non – pathogenic bacteria and unspecified species

The number of isolated bacteria from supermarkets were (61.7%), from pharmacies (27.7%) and from large stores (10.6%) as seen in table (5) and figure (3)

Table 5: Types of isolated bacteria according to places with repeat

Places	No.	%
Isolated bacteria for Supermarkets	29	61.7 %
Isolated bacteria for Pharmacies	13	27.7 %
Isolated bacteria for large stores (Malls)	5	10.6 %
Total	47	100 %

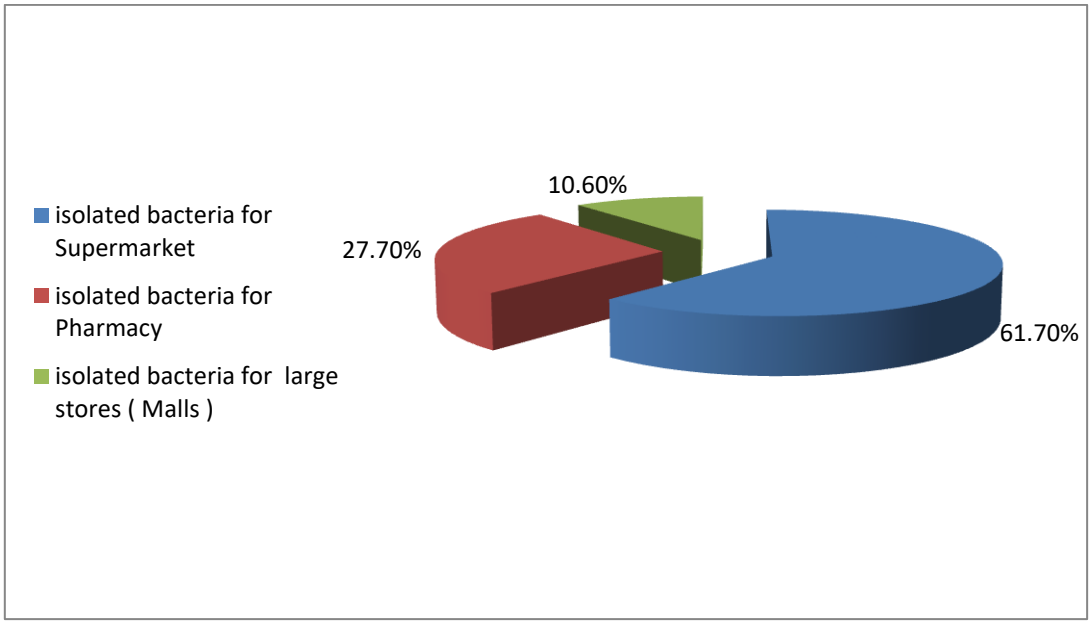

Figure 3: Types of isolated bacteria according to places with repeat

The antibiotic sensitivity test for all isolates show highly sensitive to Ciprofoxacin, Levofloxacin and Maxifoxacin then, Vancomycin, Refampin, Chloroamphinicol, Gentamicin, Synercid, Linezolid and Trimeth/Sulfa, followed by Clindamycin, cephalothin and Fosfomycin (100%), (91%) and (82%) respectively. Whereas other bacterial isolates were more resistant to Imipenem, Cifoxitin, Oxacillin and Amoxicillin – Clavulanate (50%) As seen in Table (6).

Table 6: Antibiotic sensitivity patterns for the isolated bacteria according to Micro Scan system

Antibiotic	*S.aureus*[1]	*S.aureus*[2]	*S.aureus*[3]	*S.schleiferi*	*S.epidermidis*	*S.haemolyticus*[1]	*S.haemolyticus*[2]	*S.hominis*[2]	*S.hominis*[3]	*S.auricuaris*[1]	*S.auricuaris*[2]
Amox/K Clav	S	S	S	R	S	S	S	S	S	S	S
Ampicillin	BLAC	BLAC	BLAC	R	BLAC	BLAC	BLAC	BLAC	BLAC	BLAC	BLAC
Azithromycin	I	--	--	--	--	--	--	--	--	--	--
Cephalothin	--	S	S	R	S	S	S	S	S	S	S
Chloramphenicol	--	S	S	S	S	S	S	S	S	S	S
Ciprofloxacin	S	S	S	S	S	S	S	S	S	S	S
Clarithromycin	--	S	R	S	R	R	S	R	S	S	S
Clindamycin	R	S	S	R	S	S	S	S	S	S	S
Daptomycin	--	S	S	S	S	S	S	S	S	S	S
Erythromycin	R	S	R	S	R	R	S	R	S	S	S
Fosfomycin	S	S	S	R	S	S	S	S	S	S	R
Fusidic Acid	I	S	S	S	S	I	I	S	S	S	S
Gentamicin	R	S	S	S	S	S	S	S	S	S	S
Imipenem	S	--	--	--	--	--	--	--	--	--	--
Levofloxacin	S	S	S	S	S	S	S	S	S	S	S
Linezolid	I	S	S	S	S	S	S	S	S	S	S
Moxifloxacin	S	S	S	S	S	S	S	S	S	S	S
Mupirocin	R	--	--	--	--	--	--	--	--	--	--
Netilmicin	--	S	S	S	S	S	S	S	S	S	S
Nitrofurantoin	--	--	--	--	--	--	--	--	--	--	--
Norfloxacin	--	--	--	--	--	--	--	--	--	--	--
Oxacillin	S	S	S	R	S	S	S	S	S	S	S
Penicillin	BLAC	BLAC	BLAC	R	BLAC	BLAC	BLAC	BLAC	BLAC	BLAC	BLAC
Rifampin	S	S	S	R	S	S	S	S	S	S	S
Synercid	R	S	S	S	S	S	S	S	S	S	S
Teicoplanin	S	S	S	S	I	S	S	S	S	S	S
Tetracycline	R	S	S	R	S	S	S	S	S	R	S
Trimeth/Sulfa	S	S	S	S	S	R	S	S	S	S	S
Vancomycin	I	S	S	S	S	S	S	S	S	S	S
Resistance marker	BLAC	BLAC	BLAC	BLAC	BLAC	BLAC	BLAC	BLAC	BLAC	BLAC	BLAC
Sensitive	10	22	20	15	19	18	21	20	22	21	21
%	33.3%	73.3%	66.7%	50%	63.3%	60%	70%	66.7%	73.3%	70 %	70%
Intermediate	4	0	0	0	1	1	1	0	0	0	0
%	13.3%	0%	0%	0%	3.3%	3.3%	3.3%	0%	0%	0%	0%
Resistant F	6	0	2	9	2	3	0	2	0	1	1
%	20%	0%	6.7%	30%	6.7%	10%	0%	6.7%	0%	3.3%	3.3%
NOT tested	7	5	5	6	5	5	5	5	5	5	5
%	13.4%	16.7%	16.7%	20%	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%
MRS F	0	0	0	0	0	0	0	0	0	0	0
%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
BLA F	3	3	3	0	3	3	3	3	3	3	3
%	10.0%	10%	10%	0.0%	10%	10%	10%	10%	10%	10%	10%

DISCUSSION

The results of this study demonstrated that the majority of swabbed handle shopping carts were contaminated with bacteria, most of which are common skin flora coagulase-negative Staphylococci. In the present study ,the rate of shopping carts contamination was 93.6% convergent result was 95.5% recorded by (AL-Ghmdi, 2011) Who investigate the bacterial contamination of computer keyboards and shopping carts handles, but these percentages is higher than other study conducted by (Ibrahim, 2015) which was 81%, moreover (Gerba & Maxwell, 2012) who reported 72%.

These findings support the results obtained by the current study and call attention to the high levels of contamination of various public surfaces. Isolation of bacteria from shopping carts before using disinfectant wipes were 93.6% whereas the percentage was reduce after using the wipes to 6.4%. That is mean using disinfectant wipes reduce the Number of pathogenic bacteria from shopping carts. The current study explores Gram-positive bacteria isolated from SCs handle with (82.8%), our results disagree with other studies done by Ibrahim, 2015, and it was lower than our study 66%. On the other hand, the percentage of isolated Staphylococcus coagulase negative was51% while other was 45.5%. As others have highlighted the isolation of different species Bacillus (Reynolds et al., 2005; Ghamdi et al., 2011; 2014 & Ibrahim, 2015), this study identified some most microorganisms on the shopping carts. Overall, spore forming aerobic *Bacillus spp.* was predominant isolates.

The antibiotic result of this study revealed that S. pettenkoferi exhibit resistance (30.5%) to Imipenem, Cefoxitin, Cefuroxime, Ampicillin, penicillin, Amox/K Clav and Oxacillin, S. hominis (34.8%) to Imipenem, Cefoxitin, Cefuroxime, Ampicillin, Erythromycin, penicillin, Amox/K Clav and Oxacillin.

CONCLUSION

This study revealed that the handles of shopping carts in Sakaka city, Saudi Arabia are highly contaminated, mostly with non-pathogenic bacteria, but also bacteria that may be potentially harmful and as well as a multi-drug resistant also were isolated, so they can act as vectors of infectious diseases.

In addition, the study confirmed the effectiveness of disinfectant wipes in greatly minimizing contamination of shopping carts handles and this could be taken as a step forward to minimize contamination and to reduce chances of infection transmission.

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