Original paper

An Insight Into Bacterial Profile and Antimicrobial Susceptibility of Burns Wound Infections in Kerbala, Iraq

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Abstract

Background: The bacterial profiles and susceptibilities to antimicrobials differ from hospital to hospital, from region to region and from country to country in addition to being shifted from time to time.

Aim of the study: is to have an insight into the bacteriological profile of buns wound infections in Burns Care Unit, Kerbala and to evaluate the antimicrobial susceptibility pattern of the isolated organisms to antibiotics and disinfectants.

Materials and Methods: This study was conducted prospectively at the Burns Care Unit (BCU) in Al-Hussein Medical City, Holy Kerbala Province, Iraq. Wound swabs were obtained from consecutive 57 burns patients treated in BCU for the period from November 2012 to March 2013. Microbial isolates were identified based on standard microbiological techniques. Antimicrobial susceptibility test was done by Kirby Bauer disc diffusion method, whereas efficacy of 5 most commonly used disinfectant was evaluated by agar-diffusion method.

Results and Discussion: A total of 76 isolates were recovered. *Pseudomonas aeruginosa* was found to be the most common isolate (53.94%), followed by *E.cloacae* (25%), E.coli (11.84%), *K.Pneumoniae* (3.94%), *S.aureus* (3.94%), *A. baumannii* (1.31%). Majority of the bacterial isolates were multiple-drug resistant. Generally, Imipenem was the most effective antimicrobial agents. The best disinfectant was Sekusept Forte® whereas the least effective disinfectants were Povidone-Iodine and Chloroxylenol®.

Conclusions: *Pseudomonas* was the predominant cause of burns infections and majority of isolates were multiple-drug resistant. These indicate the need for strict hygienic measurement to protect the burns patients from opportunistic pathogens.

Keywords: Burns, infection, antibiotic susceptibility testing, disinfectants, pseudomonas.

Introduction

Infection represents a major cause of morbidity and mortality in burns patients [(1)]. In most of the cases, burns patients develop burns infections few days after admission to burns care units [(2)]. The high rates of burns infections are attributed to the destruction of skin barriers, immune-depressive nature of burns, the high frequency of contamination in environment of burns care units, in addition to prolonged hospitalization [(3)]. Microbes causing burns infection may

come from either patient's own endogenous (normal) flora, from exogenous sources in the environment, or from healthcare personnel [4]. Exogenous organisms from the hospital environment are generally more resistant to antimicrobial agents than endogenous organisms [5].

High mortality rates following burns infections may be linked to the escalating phenomenon of antimicrobial resistance among bacterial pathogens [6]. The emergence of multiple-resistance to antimicrobials significantly reduces the available therapeutic options for successful treatment of burns infections [6, 7]. The bacterial profiles and susceptibilities to antimicrobials differ from hospital to hospital, from region to region and from country to country. In addition, data on bacterial species and antibiotic susceptibilities shifts from time to time [7]. Therefore, regular monitoring of the bacterial species causing burns infection and their antibiotic susceptibilities is highly recommended as it may help the clinical management in respect of the choice of the antimicrobial for therapy.

In addition, proper disinfection with efficient disinfectant may help in control of burns infections by reducing the incidence of nosocomial infections [8-10]. However, numerous microbial strains were reported to resist disinfectants, and in some cases, may survive in the disinfectants preparations [11, 12].

Due to the paucity of data on bacterial profiles and antibiotic susceptibility patterns in burns care units in Kerbala, Iraq we sought to undertake this study. Kerbala Province witness huge mass-gathering events several times a year. Mass-gathering may entail transmission of multiple drug resistant strains, these may manifest in a nosocomial infections. In this study we sought to study the bacteriological profile of buns wound infections and evaluate the antimicrobial susceptibility pattern of the organisms isolated.

The aim of this study was to have an insight on the most common pathogens causing burns infection and their antimicrobial susceptibilities in the only one burns care units in Kerbala province, Iraq.

Methodology

This study was conducted prospectively at the Burns Care Unit (BCU) in Al-Hussein Medical City, Holy Kerbala Province, Iraq. This Burns unit is the only one delivering health care for burns patients across Kerbala province and, consequently, patients admitted to this unit come from the emergency center belong to Al-Hussein Medical City or referred from other hospitals or health care institutions.

According to the guidelines applied in this burns unit, wound swaps were taken twice weekly to monitor microbial colonization and its indicated when there were signs of burns infection. In this study, wound swabs were obtained from consecutive 57 burns patients treated in BCU for the period from November 2012 to March 2013. Demographic data were collected (including age, gender, residency, causes of burn, etc.)

Microbial cultivation and identification was performed by Standard microbiological methods and techniques [13]. The antimicrobial sensitivity tests of the identified isolates were performed through the Kirby-Bauer disk diffusion method [13] in line with the recommendations of the Clinical and Laboratory Standards Institute (CLSI). In addition, we evaluated the antimicrobial activity of five commonly used disinfectants by agar-diffusion method, namely Glutacid-28®, Sekusept Forte®,

Sekulyse®, proviodone, and Chloroxylenol® (ECOLAB GmBH, Germany). The efficacy of these disinfectants was evaluated against 23 randomly selected bacterial isolates recovered from the burns patients. The active substances in Glutacid-28®, Sekulyse®, and Sekulyse® are 2% glutaraldehyde solution, glucoprotamin, and benzalkonium chloride, respectively. Proviodine is a complex of 10% iodine, as the active substance, and polyvinylpyrrolidone as a solubilizing agent. The disinfectants were evaluated at the manufacturing dilution in addition to two-folds serial dilutions (i.e. 1/2, ¼,→ 1/128).

Ethics statement

This study was carried out in agreement with regulation mentioned in the Declaration of Helsinki and was approved by ethical review board of Health Directory in Kerbala Province. Samples were collected as part of "standard of care" for treatment and diagnosis; therefore, the ethical review board did not instruct us to collect informed consent.

Results

The age of the patients ranged from 1 to 66 years where the majority of patients were children (n=36, 63.16%). Female patients were more than males (37, 64.91% versus 20, 35.09%). Flame was the major cause of burns in this study (54.385%), followed by hot liquids (45.614%), however, in the pediatric group, most of the burns cases were caused by liquids injury (21/36), while in the group of the adult burn patients, the flame injury caused most of the cases.

A total of 76 bacterial isolates were obtained from 57 patients with burns wound infections. The most predominant bacterial isolate was *P. aeruginosa* (53.94%) followed by *E. cloacae* (25%), *E. coli* (11.84%), *K. Pneumonia*(3.94%), *S .aureus* (3.94%), *A. baumannii* (1.31%) (Table 1).

Antimicrobial susceptibility testing of the bacterial isolates was carried out against 10 antibiotics. Tables 2 and 3 Show the results of antibiotics susceptibility testing of gram negative and *S. aureus*, respectively.

Table 1. The distribution of microorganisms isolated from burn wounds.

Type of bacteria	Numbers	percentage
P. aeruginosa	**41**	**53.94 %**
E. cloacae	**19**	**25 %**
E. coli	**9**	**11.84 %**
K. Pneumonia	**3**	**3.94 %**
A. baumannii	**1**	**1.31 %**
S .aureus	**3**	**3.94 %**
Total	**76**	**100 %**

The susceptibility of organisms to different antibiotics varied depending on the type of isolates.

Generally, Imipenem was the most effective antimicrobial agents with susceptibility rate of 63.01% and substantial resistance rates were detected against most of the tested antimicrobials. The highest resistance rate among the tested isolates was detected against Azithromycin (76.71%), followed by Cephaloridine (71.23%). The lowest resistance rate was detected against Chloramphenicol (13.70%).

The majority of the *P. aeruginosa* isolates were multidrug resistant. Imipenem, Chloramphenicol and Amikacin were the most active antimicrobial agents against *P. aeruginosa*, whereas Cephaloridine was the least effective antimicrobial. All tested *E.cloacae* isolates were multi-drug resistant.

Table 2. The susceptibilities of gram negative isolates to various antimicrobials agents

Antimicrobials	*P. aeruginosa* N= 41			*E.cloacae* N=19			*E.coli* N= 9			*K.Pneumonia* N=3			*A. baumannii* N= 1	Total (%)
	R (%)	I (%)	S (%)	R (%)	I (%)	S (%)	R (%)	I (%)	S (%)	R (%)	I (%)	S (%)	R/I/S	
Imipenem	**13 (31.70)**	**6 (14.63)**	**22 (53.65)**	**4 (21.05)**	**1 (5.26)**	**14 (37.68)**	**2 (22.2)**	**0**	**7 (77.7)**	**1 (33.33)**	**0**	**2 (66.67)**	**S**	**R= 20 (27.40) I= 7 (9.50) S= 46 (63.01)**
Amikacin	**19 (46.34)**	**6 (14.63)**	**16 (39.02)**	**8 (42.11)**	**7 (36.84)**	**4 (21.05)**	**2 (22.22)**	**1 (11.1)**	**6 (66.67)**	**2 (66.67)**	**0**	**1 (33.33)**	**R**	**R= 32 (43.84) I= 14 (19.18) S= 27 (37.00)**
Cephaloridine	**27 (65.85)**	**14 (34.14)**	**0**	**15 (78.94)**	**4 (21.05)**	**0**	**8 (88.89)**	**0**	**1 (11.1)**	**1 (33.33)**	**2 (66.67)**	**0**	**R**	**R= 52 (71.23) I= 20 (27.40) S= 1 (1.37)**
Ciprofloxacin	**21 (51.21)**	**15 (12.19)**	**5 (12.19)**	**11 (57.89)**	**6 (31.57)**	**2 (10.52)**	**9 (100)**	**0**	**0**	**1 (33.33)**	**2 (66.67)**	**0**	**R**	**R= 43 (58.90) I= 23 (31.51) S= 7 (9.59)**
Gentamicin	**16 (39.02)**	**15 (12.19)**	**10 (24.39)**	**8 (42.11)**	**6 (31.57)**	**5 (26.31)**	**6 (66.67)**	**2 (22.2)**	**1 (11.1)**	**1 (33.33)**	**1 (33.33)**	**1 (33.33)**	**R**	**R= 32 (43.84) I= 24 (32.88) S= 17 (23.29)**
Chloramphenicol	**0**	**18 (43.90)**	**23 (56.09)**	**7 (36.84)**	**6 (31.57)**	**6 (31.57)**	**1 (11.1)**	**4 (44.4)**	**4 (44.4)**	**1 (33.33)**	**2 (66.67)**	**0**	**R**	**R= 10 (13.70) I= 30 (41.10) S= 33 (42.20)**
Ampicillin	**0**	**31 (75.60)**	**10 (24.39)**	**13 (68.42)**	**0**	**6 (31.57)**	**3 (33.33)**	**0**	**6 (66.67)**	**0**	**0**	**3 (100)**	**R**	**R= 17 (23.29) I= 31 (42.47) S= 25 (34.25)**
Cefotaxime	**22 (53.65)**	**16 (39.02)**	**3 (7.31)**	**17 (89.47)**	**2 (10.52)**	**0**	**3 (33.33)**	**6 (66.6)**	**0**	**1 (33.33)**	**2 (66.67)**	**0**	**R**	**R= 44 (60.27) I= 26 (35.62) S= 3 (4.11)**
Azithromycin	**33 (80.48)**	**3 (7.31)**	**5 (12.19)**	**14 (73.68)**	**5 (26.31)**	**0**	**7 (77.78)**	**1 (11.1)**	**1 (11.1)**	**2 (66.67)**	**1 (33.33)**	**0**	**I**	**R= 56 (76.71) I= 11 (15.07) S= 6 (8.22)**
Vancomycin	**21 (51.21)**	**11 (26.82)**	**9 (21.95)**	**7 (36.84)**	**7 (36.84)**	**5 (26.31)**	**4 (44.4)**	**2 (22.2)**	**3 (33.3)**	**1 (33.33)**	**1 (33.33)**	**1 (33.33)**	**R**	**R= 34 (47.58) I= 21 (28.77) S= 18 (24.66)**

*: number of isolates which were tested, R: resistant, I: Intermediate, S: Susceptible.

High resistance rates of *E.cloacae* isolates were detected against Cefotaxime (89.47%), Cephaloridine (78.94%), Azithromycin (73.68%) and Ampicillin (68.42%). None of the tested antimicrobials could be shown to have high activity against *E.cloacae*. The most effective antimicrobial agent against *E. coli* isolates was Imipenem (77.7%), followed by Amikacin (6.67%) and Ampicillin (66.67%). All tested *E.coli* isolates were resistant to Ciprofloxacin.

Regarding *S. aureus* isolates, the most effective antimicrobial agents were Imipenem, Clindamycin and Chloramphenicol, whereas isolates were resistant to Ampicillin, Azithromycin and Cefotaxime.

The results of the evaluation of antimicrobial efficacy of disinfectants against 23 randomly selected bacterial isolates are summarized in Table 4. A 22 out of 23 tested isolates (95.65%) were susceptible to the manufacturers' dilution of Glutacid-28® and there was a decrease in the susceptibility along with increasing the dilution. Sekusept Forte® expressed high antimicrobial efficacy where all the isolates (100%) were susceptible manufacturers' dilution in addition to dilutions1/2, 1/4, 1/8, 1/16, 1/32 and 1/64. All of the tested isolates were susceptible to the manufacturers' dilution of the Sekulyse®, as well as to dilution of 1/2.

Table 3. The susceptibility of *S. aureus* to antimicrobials agents

Antimicrobials	*S. aureus* isolates N= 3		
	Resistant	Intermediate	Sensitive
Imipenem	0	0	3
Amikacin	2	0	1
Cephaloridine	1	0	2
Ciprofloxacin	1	0	2
Gentamicin	2	0	1
Chloramphenicol	0	0	3
Ampicillin	3	0	0
Cefotaxime	3	0	0
Azithromycin	3	0	0
Vancomycin	0	1	2
Clindamycin	0	0	3
Tetracyclin	0	1	2
Oxacillin	1	0	2

However, there was a gradual decrease in the susceptibility of the isolates along with increasing dilution. Only 16 isolates were susceptible to the manufacturers' dilution of povidone-iodine. In addition, the antimicrobial efficacy was significantly reduced with dilutions. Chloroxylenol® exhibited low antimicrobial activity as only 12 out of the 23 isolates were susceptible to the manufacturers' dilution. In addition, there was a significant decrease in the antimicrobial activity with increased dilution of this disinfectant.

According to the above results, the best disinfectant was Sekusept Forte® whereas the least effective disinfectants were Povidone-Iodine and Chloroxylenol®.

Table 4. Frequency of the susceptible isolates to different dilutions of 5 commonly used disinfectants.

Disinfectant	**Dilutions of Disinfectant**							
Dilution Sekusept forte	**Manufacturer's dilution**	**1/2**	**1/4**	**1/8**	**1/16**	**1/32**	**1/64**	**1/128**
Sekusept Forte® (susceptible strains, %)	23/23, 100%	23/23, 100%	23/23, 100%	23/23, 100%	23/23, 100%	23/23, 100	23/23, 100%	9/23, 39.13%
Glutacid-28® (susceptible strains, %)	22/23, 95.65%	15/23, 65.21%	9/23, 39.13%	4/23, 17.39%	3/23, 13.04%	3/23, 13.04%	0/23, 0.00%	0/23, 0.00%
Sekulyse® (susceptible strains, %)	23/23, 100%	23/23, 100%	22/23, 95.65%	21/23, 91.30%	21/23, 91.30%	15/23, 65.21%	6/23, 26.08%	4/23, 17.39%
Povidone-Iodine (susceptible strains, %)	16/23, 69.56%	13/23, 56.52%	5/23, 21.73%	1/23, 4.34%	0/23, 0.00%	0/23, 0.00%	0/23, 0.00%	0/23, 0.00%
Chloroxylenol® (susceptible strains, %)	12/23, 52.17%	12/23, 52.17%	6/23, 26.08%	5/23, 21.73%	2/23, 8.69%	2/23, 8.69%	0/23, 0.00%	0/23, 0.00%

Discussion

The present study was carried out to determine the microbial causes of burns wound infections and to evaluate the antimicrobial susceptibilities of the organisms isolated. In addition, to study the antimicrobial efficacy of 5 commonly used disinfectants. The study was conducted over one year of time (December 2012 to December 2013), during which a total of 76 bacterial isolates were recovered from 57 burns patients admitted to Burns Unit at Al-Hussein Medical City, Holy Karbala.

Pseudomonas aeruginosa was found to be the most common isolated microorganism in this study. Similar to our study, *P. aeruginosa* was the most predominant organism in the burn patients in other studies; such as in Turkey (57%) [14] and in Korea (45.7%) [15]. Furthermore, our results were comparable with those found in a study in USA [16] in which *P. aeruginosa* was the highest isolated bacteria followed by *Enterobacter* species. Several factors may contribute to the high prevalence of *P. aeruginosa* in burns wounds as reported in our study; the remarkably high prevalence of *P. aeruginosa* in the burn wards may be due to the fact that the organism thrives in a moist environment [15] and *P. aeruginosa* is known for its ability to resist killing by a variety of antimicrobials. In addition, the minimal nutritional requirements of *Pseudomonas*, as evidenced by its ability to grow in distilled water and its tolerance to a wide variety of physical conditions, contribute to its ecological success and ultimately to its role as an effective opportunistic pathogen [17].

However, regarding other bacterial isolates, different results were obtained in Turkey [14]; they reported higher prevalence of other species, *A. baumannii* (21%), and *S. aureus* (14%) in comparison to our study. Other studies showed that most commonly isolated organisms from burn patients were *Pseudomonas* species followed by *S. aureus* and *Klebsiella* species [18-21].

The present study found that *E.cloacae* has the highest percent of Enterobacteriaceae that were isolated from patient's samples followed by *E. coli*. This is in agreement with the results of a study in China [22]. However, in a study conducted in Egypt, *K. pneumoniae* was found to be the highest isolated bacteria, followed by *E. coli* and then by *Enterobacter* species [23].

In spite of that *Acinetobacter* species considered as an important cause of nosocomial infection in burn units in several studies[24, 25], in our study this microorganism was not very important because it was isolated from one patient only.

The reasons for high prevalence of Gram negative bacteria in this study may be attributed to resistant of these bacteria to many types of antibiotics or due to the virulence factors, both increase its ability to colonizes of the wounds of burn patients [26]. Gram negative bacteria are more frequently involved in burn wound infection than Gram positive bacteria. This is in complete conformity with the results of other workers who reported that Gram negative aerobic bacilli were the most frequent organisms isolated from sepsis [27, 28].

Appropriate disinfection and sterilization of medical devices and environmental surfaces is one of the key interventions used to control health care-associated infections [10]. Multiple nosocomial outbreaks have resulted from inadequate disinfection. The inadequate disinfection of medical devices or environmental surfaces may result from a lack of intrinsic antimicrobial activity of the disinfectant, an incorrect choice of a disinfectant, and inadequate duration of disinfection, a lack of contact between the disinfectant and the microbes, or the use of contaminated disinfectants. Contaminated disinfectants have been the occasional vehicles of hospital infections for more than 50 years [29]. With this background the present study was undertaken to evaluate the antimicrobial activity of five commonly used disinfectants by agar diffusion method, namely Glutacid-28®, Sekusept Forte®, Sekulyse®, 10% Iodine®, Chloroxylenol®. Glutacid-28® contains 2% glutaraldehyde solution. Glutaraldehyde is a saturated dialdehyde with a powerful antimicrobial agent [9] and the most widely used high-level disinfectant. Glutaraldehyde is active in the presence of organic matter [30]; its low surface tension permits its penetration through blood and/or exudates to reach surfaces and facilitates rinsing [31]. Gélinas and Goulet [32] evaluated the effect of organic matter on disinfectant activity and found that while glutaraldehyde kept its disinfecting activity after contact with high concentrations of organic matter.

In this study, 22 out of 23 tested isolates (95.65%) were susceptible to the manufacturers' dilution of Glutacid-28 and there was a decreasing in the susceptibility along with with increasing the dilution and no inhibition could be detected to the dilution 1/64 and more. These results clearly indicate that manufacturer's dilution was the best concentration of Glutacid-28® and should be used to achieve maximum effectiveness. In addition, care should be taken to not dilute this disinfectant during its usage as dilution may lead to significant decrease in the efficacy of this disinfectant.

Only single *Pseudomonas aeruginosa* isolate (Pa1) was found to resist the manufacturers' dilution of Glutacid-28® and at 1/8 dilution, all tested *Pseudomonas aeruginosa* isolates were found to be resistances. Owing to the presence of an isolate that resistant to the manufacturers dilution, prior testing of disinfectants to local bacterial isolates is recommended. Indeed, the presences of resistant *Pseudomonas aeruginosa* strains that resist 2% glutaraldehyde solution, the

active ingredient of Glutacid-28®, were previously reported [33].

Sekusept Forte® contains glucoprotamin as the active substance. Glucoprotamin was discovered in the early 1990's [34]. and its repeatedly reported to be very effective against clinical bacterial isolates[35, 36]. In this study, Sekusept Forte® expressed high antimicrobial efficacy. All the isolates (100%) were susceptible manufacturers' dilution in addition to dilutions of 1/2, 1/4, 1/8, 1/16, 1/32 and 1/64. However, 9/23 (39.13%) of the tested isolates were susceptible to the dilution 1/128. These results indicate that this disinfectant is highly effective at low concentrations (as reflected by being very effective at high dilutions) and diluting this disinfectant has little effect on its antimicrobial efficacy. Therefore, Sekusept Forte® could be used effectively in different dilutions ranging from manufacturer's dilution up to 1/64 without significant reduction in the antimicrobial activity. Our results are consistent with previous studies that reported high antimicrobial activity of this disinfectant even at low concentrations [35, 36]. Actually, Sekusept Forte® is newly introduced for use as disinfectant for instruments in Iraqi hospital; therefore, it seems no resistant strains have developed yet.

The active substance in Sekulyse® is the benzalkonium chloride. Benzalkonium chloride is a typical quaternary ammonium salt commonly used as disinfectant and antiseptic (Yang, Zhang *et al.* 2006). In this study, all of the tested isolates were susceptible to the manufacturers' dilution of the Sekulyse®, as well as to dilution ½. However, there was a gradual decrease in the susceptibility of the isolates to the increasing dilution. The antimicrobial efficacy was significantly reduced in dilutions 1/64 and 1/128 where the susceptibilities were 6 out of 23 and 4 out of 23, respectively. These results may indicate that Sekulyse® is a very potent disinfectant at the manufacturers' dilution and maintain good antimicrobial activity with lower dilutions; however, it may lose its antimicrobial efficacy when highly diluted.

Although benzalkonium chloride was shown to be effective in this study, it has been reported to have variable effectiveness. Indeed, more outbreaks have been ascribed to contaminated benzalkonium chloride than any other antiseptic [37]. The most common species associated with outbreaks due to contaminated benzalkonium chloride were aerobic, gram-negative bacilli, including *Burkholderia cepacia*, *S. marcescens*, and *Enterobacter spp*. Most but not all outbreaks were linked to the storage of benzalkonium chloride with cotton or gauze or the improper dilution of the benzalkonium chloride solution. The use of benzalkonium chloride to disinfect endoscopes has also led to urinary tract and pulmonary infections [38], and the use of contaminated spray bottles for environmental disinfection led to *S. marcescens* infections complicating cardiopulmonary surgery [39]. Contaminated benzalkonium chloride used to disinfect the septa of multidose corticosteroid bottles has led to injection site abscesses with *Pseudomonas aeruginosa* [40].

Iodine is one of the oldest (300 to 400 years) and most effective germicidal agents. According to the literatures, iodine is a broad-spectrum bactericide and a good fungicide with some viricidal action and it kills spores and is effective against protozoa (e.g. amebas) [41]. Aqueous or alcoholic (tincture) solutions of iodine are associated with irritation and excessive staining and are generally unstable. These problems were overcome by the development of iodophors ("iodine carriers" or "iodine-releasing agents"); the most widely used are povidone-iodine and

poloxamer-iodine in both antiseptics and disinfectants. Iodophors are complexes of iodine and a solubilizing agent or carrier, which acts as a reservoir of the active "free" iodine. The most common iodophor disinfectant is povidone-iodine (proviodine), in 7.5-10% solutions which is a complex of iodine and polyvinylpyrrolidone, a solubilizing agent [41].

In the current study, only 16 isolates were susceptible to the manufacturers' dilution of povidone-iodine. In addition, the antimicrobial efficacy was significantly reduced with dilutions. Moreover, not antimicrobial activity could be detected in dilutions below 1/8. These results possibly indicate that Iodine is most inferior disinfectant in terms of antimicrobial activity. Our results are in agreement with many studies that reported inferior effectiveness of iodine-containing disinfectants and antiseptics [37]. The prolonged survival of *B. cepacia* in commercially manufactured providone-iodine has been documented [42], and intrinsic contamination of a povidone-iodine solution led to both infections and pseudoinfections [37]. Several studies by Anderson et al have reported the resistance of *Pseudomonas spp*. to povidone-iodine [11, 12]. In the studies by Anderson et al., Pseudomonas biofilms were found on the interior surfaces of polyvinyl chloride pipes used during the manufacture of providone-iodine antiseptics.

Conclusion

Pseudomonas aeruginosa was found to be the most common isolate Gram negative bacteria are more predominant as causative agent for burn wound**.** Imipenem was the most effective antimicrobial agents against the tested isolates. The best disinfectant was Sekusept Forte® whereas the least effective disinfectants were Povidone-Iodine and Chloroxylenol®.

Acknowledgment

We thank all medical and paramedical staff of the burn unit at al Hussein teaching Hospital in Kerbala, especially Dr. Mohammed Mustafa Wais, Plastic surgeon. This study was a part of M.Sc degree for NH Ghanimi.

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