AlQalam
Alq J Med App Sci
https://journal.utripoli.edu.ly/index.php/Alqalam/index eISSN 2707-7179

Original Article

Antibiogram Profiles and Disinfectant Effectiveness on Bacterial Isolates in the Surgical Intensive Care Unit

Salwa Eltawaty[1*], Ahmed Kabbashi[1], Tawfeek Altawaty[2], Mariam Boukhushaym[3]

[1]*Department of Biomedical Science, Faculty of Pharmacy, Omar Al-Mukhtar University, Albayda, Libya*
[2]*Department of Molecular Diagnostic, Faculty of Biomedical Science, University of Benghazi, Benghazi, Libya*
[3]*Department of Microbiology, Faculty of Pharmacy, University of Derna, Benghazi, Libya*

ARTICLE INFO

Corresponding Email. *Salwa.eltawaty@omu.edu.ly*

Received*: 17-10-2024*
Accepted*: 07-12-2024*
Published*: 17-12-2024*

Keywords*. PCR, ICU Contaminants, Antibiogram Profiles, Disinfectants.*

ABSTRACT

Although studying bacterial contaminants in intensive care units has become a common topic, it is still being studied because of its importance in preserving the lives of patients and healthcare workers, where there is an increasing rate of the emergence of new bacterial strains that acquire resistance to antibacterial drugs. This is the first study targeting the surgical Intensive Care Unit (ICU) at Al-Wahda Hospital, Derna City, Libya. Standard traditional methods and molecular techniques were used to isolate, identify, and study the antibiogram profiles against bacterial isolates found to contaminate inanimate surfaces inside the ICU. The study results proved that the study area was contaminated with nine different bacterial genera belonging to Gram-positive (54%) and Gram-negative (46%) bacteria. The broadest antibiotic in this study was the highest inhibition percentage in this study was from Imipenem 10µg followed by Levofloxacin 5µg which suppressed the growth of 80% and 70% of all tested isolates, respectively. Among the tested disinfectants, hydrogen peroxide (Oxydol 3%) controlled (50%) of the tested bacteria, whereas glutaraldehyde (Prodex 99%) showed no activity. Povidone Hydro alcohol (Iodine 10%) actively controlled (70%) of the tested isolates. Conclusion: This study concludes that the targeted ICU is contaminated with nine different bacterial genera that show varied resistance to the tested antibiotics and disinfectants, threaten patients' and health workers' lives, and recommend the search for alternative effective antibiotics and disinfectants.

Cite this article. *Eltawaty S, Kabbashi A. Altawaty T, Boukhushaym M. Antibiogram Profiles and Disinfectant Effectiveness on Bacterial Isolates in the Surgical Intensive Care Unit. Alq J Med App Sci. 2024;7(4):1549-1557. https://doi.org/10.54361/ajmas.247488*

INTRODUCTION

Healthcare settings include hospitals encompassing countless people circulating each day such as patients, patients, patients' companions, physicians, and nurses. Humans are vehicles for transmitting microorganisms, including bacteria that cause infections, specifically in immunocompromised people. Hospital-acquired infections (Nosocomial infections) Nosocomial are an issue in terms of patient protection, as they might have a disproportionate impact on patient mortality and morbidity [1]. Healthcare settings are considered a potential store of pathogenic bacteria that may lead to difficult treatable hospital-acquired infections (HAI), where most bacterial pathogens are resistant to commonly used antibiotics [2].

Antimicrobial resistance is a global public health concern, particularly among bacteria causing healthcare-associated infections (HAI), which contribute to morbidity, mortality, increased healthcare costs due to treatment failure, and extended hospital stays [3]. Multidrug-resistant (MDR) bacteria have been detected in biofilms on surfaces and furniture sampled after terminal cleaning in intensive care units (ICU) [4, 5]. It has been demonstrated that biofilms enhance the bacterial survival capability on dry surfaces and may confer resistance to physical and chemical agents. Indeed, bacteria within biofilms exhibit up to 1000-fold greater resistance to biocides than those grown in liquid medium.

The transmission of bacteria may be facilitated by healthcare personnel who engage in physical contact with patients, while being unaware of their potential to transmit pathogenic microorganisms. Contact with contaminated instruments or surfaces [6, 7] can increase the risk of infection in both healthcare workers and patients [8]. Indeed, the isolation of microorganisms from inanimate surfaces in healthcare settings suggests that certain surfaces harbor infectious bacterial isolates [9]. Patients admitted to care units are typically more susceptible to acquired infections due to their compromised health status; therefore, it is imperative to investigate and assess the safety and sterility of these environments concerning pathogenic bacterial contaminants. This is paramount for maintaining the health of patients undergoing treatment in these facilities, safeguarding them from nosocomial infections, and protecting the medical personnel responsible for their care, including physicians and nurses. For intensive care units, the primary objective is to mitigate, inhibit, and monitor infections to provide high-quality management with minimal adverse health outcomes. Consequently, healthcare facilities must implement strategies and systems for epidemiological surveillance in order to control infections. In this context, this study aimed to investigate potential bacterial pathogens that may contaminate inanimate surfaces within the surgical ICU at Al-Wahda Hospital, Derna City, Libya, and to examine their sensitivity profiles towards commonly used antibiotics for treatment and disinfectants primarily employed for sterilization.

METHODS

Chemical, drugs and reagents

The chemicals used in this study were ethanol (Sigma Aldrich, Germany), mannitol salt agar, blood agar, MacConkey agar, Muller Hinton Agar (Hi Media Laboratories Pvt. Ltd., India), catalase, coagulase, citrate, urease, oxidase, and triple-sugar iron reagents (Sigma Aldrich, Germany). Additionally, the standard drugs employed were Amoxicillin (25µg), Augmentin (30µg), Cefuroxime (30µg), Cefepime (30µg), Ceftriaxone (30µg), Ceftriaxone (10µg), Meropenem (10µg), Vancomycin (10µg), Nitrofurantoin (300µg), Azithromycin (15µg), Clarithromycin (15µg), Levofloxacin (5µg), Doxycycline (5µg), Norfloxacin (10µg), and Gentamicin (10µg) (Bioanalyses).

Study area

This study investigated the contamination of inanimate surfaces inside a surgical ICU at Al-Wahda Hospital, Benghazi, Libya**.**

Bacterial isolates used

One hundred (100) samples were collected from different inanimate surfaces inside the ICU of the surgery section of Al-Wahda Hospital, Derna City, Libya.

Antibiotics disc used

Fourteen antibiotic discs with different mechanisms of action were used in this study. The antibiotics were purchased from a local market.

Disinfectants used

Prodex (Glutaraldehyde 99%), Oxydol (Hydrogen peroxide 3%), and Iodine (Povidone Hydro alcohol 10%) were disinfectants constantly used to disinfect the ICU at the targeted hospital. The quantities used in this study were obtained from the same disinfectant gallons used in the target ICU.

Preparation of bacterial isolates

One hundred sterile swabs were collected from the different inanimate surfaces. Each sample was placed on a nutrient agar surface and incubated at 37 °C for 24 hours. For purification, each colony was re-cultured on a nutrient agar slant surface, incubated at 37 °C for 24 h, and maintained at 4 °C.

Identification of bacterial isolates

All grown isolates were stained with Gram stain, differential media (mannitol salt agar, blood agar, and MacConkey agar), and biochemical reactions according to Cheesbrough [10] was used for the identification. One isolate from each identified genus was sent to the Laboratory of Molecular Biology, Faculty of Science, University of Tunis Al-Manar, for confirmation. Forward "AGAGTTTGATCMTGGCTCAG" and reverse TACGGYTACCTTGTTACGAC" primers with an annealing temperature of 50 °C and polymerase chain reaction (PCR) were used, as described by Jenkins, Ling [11].

Antibiotic sensitivity test

The disk agar diffusion method was used to assess the susceptibility of the isolated bacteria to a panel of commonly used antibiotics [12].

Disinfectant activity test

The agar well diffusion method was used in this study, according to the method described by Magaldi, Mata-Essayag [13] to evaluate the effectiveness of the three disinfectants against bacterial isolates previously identified using molecular techniques. Muller Hinton agar was seeded with 100 µl of a suspension of overnight growth of each tested bacterium calibrated with McFarland solution (0.5) before seeded into the agar. Duplicate wells were prepared on each agar plate. One hundred microliters (100) µl of the tested disinfectant (100 µL) were added to each well. The plates were then incubated at 37 °C for 24 h. The inhibition zone for each disinfectant was measured and recorded in millimeters.

Statistical Analysis

All data are presented as the mean ± standard deviation and percentages.

RESULTS

Identified of bacteria

Table 1 demonstrates that out of 100 cultured samples, 63(63%) exhibited growth; the highest contamination rates were observed in drip carriers at 9(14.3%), patient beds at 8(12.7%), and tables adjacent to patient beds at 7(11.11%).

Table 1. Distribution of contamination:

Site of isolation	Number of isolated	Percentage of isolated
Air conditioner	1	1.59
Bed	8	12.70
Bench	3	4.76
Bench roof	1	1.59
Big Table	3	4.76
Big wardrobe	3	4.76
ECG	4	6.35
Window	2	11.1
Hand Wash bulk	2	3.17
Handle of External door	3	4.76
Oxygen tube	5	7.94
Refrigerator lower hand	1	1.59
Refrigerator upper hand	1	1.59
Roof of the table	3	4.76
Tools vault	1	1.59
Saline	1	1.59
Saline carrier	9	14.29
Table beside bed	7	11.11

Table 2 shows that with Gram stain, 34(54%) belonged to Gram-positive, and 29(46%) belonged to Gram-negative bacteria. Among the Gram-positive bacteria, 21(33.3%) were coagulase-negative *Staphylococcus* species and 20.6% 13(20.6%) were coagulase-positive *Staphylococcus* species. Among the Gram-negative bacteria, 7(11.11 %) were

Pseudomonas aeruginosa, 6(9.52%) were Enterobacter spp. 2(3.17%)*;* Citrobacter spp. 2(3.17%), *Proteus mirabilis* 3(4.76%), *Providencia spp.* 6(9.52%), and *Pantoea agglomerans* 3(4.76%).

Table 2. Numbers and percentages of isolated Gram-positive and Gram-negative bacteria:

Type of isolated bacteria	Gram stain (%)	Number of isolates	Percentage of isolates
Staphylococcus spp. (Coagulase negative)	Gram-positive (53.96)	21	33.33
Staphylococcus aureus (Coagulase positive)		13	20.63
Pseudomonas aeruginosa		7	11.11
Shigella spp.		6	9.52
Enterobacter spp.	Gram-negative (46.03)	2	3.17
Citrobacter spp.		2	3.17
Proteus mirabilis		3	4.76
Providencia spp.		6	9.52
Pantoea agglomerans		3	4.76

Twelve isolates were reidentified with the molecular technique and the results cleared that the Gram-positive bacteria were *Staphylococcus aureus* strain S33R, *Staphylococcus epidermidis* strain NBRC 100911, and *Staphylococcus hominis* strain Huaian_201_1, while the Gram-negative bacteria were *Pseudomonas aeruginosa* strain DSM 50071, *Pseudomonas putida* strain NEAU-ST5-5, *Proteus mirabilis* strain JCM1669, *Citrobacter youngae*, strain GTC1314, *Pantoea agglomerans* strain JCM1236, *Providencia alcalifaciens* DSM30120 strain NCTC 10286, *Providencia huaxiensis* strain WCHPr000369, *Shigella sonnei* strain CECT 4887, and *Enterobacter cloacae* subsp. Dissolvens strain ATCC 23373 (Table 3).

Table 3. Identified bacterial isolates from inanimate surfaces inside the ICU

Description	E value	Per. Ident (%)	Accession
Staphylococcus aureus strain S33 R 16S ribosomal RNA	0.0	93.93	NR_037007.
Staphylococcus epidermidis strain NBRC 100911 16S ribosomal RNA	0.0	98.58	NR_113957.1
Staphylococcus hominis Huaian_201_1 16S ribosomal RNA gene	2e-15	83.70	MN252040. 1
Pseudomonas aeruginosa strain DSM 50071 16S ribosomal RNA gene	0.0	99.87	NR_117678.1
Pseudomonas putida strain BHUJPCS-5 16S ribosomal RNA gene	1e-98	82.71	MN385417.1
Proteus mirabilis strain JCM 1669 16S ribosomal RNA	0.0	94.96	NR_113344.1
Citrobacter youngae strain GTC 1314 16S ribosomal RNA	3e- 166	84.04	NR_041527.1
Pantoea agglomerans strain JCM1236 16S ribosomal RNA	0.0	99.46	NR_111998.1
Shigella sonnei strain CECT 4887 16S ribosomal RNA gene	0.0	99.88	NR_104826.1
Enterobacter cloacae strain ATCC 23373 16S ribosomal RNA	0.0	100	NR_118011.1
Providencia huaxiensis strain WCHPr000369 16S ribosomal RNA,	6e-103	89.80	NR_174258.1
Providencia alcalifaciens DSM 30120 strain NCTC r RNA	0.0	90.05	NR_115879.1

The sensitivity of the isolated bacterial strains to the included antibiotic disc references exhibited variations in susceptibility percentages, as shown in table 4. All isolates (100%) of coagulase-positive Staphylococcus species demonstrated sensitivity to Levofloxacin (5µg) and Doxycycline (5µg) and displayed variable resistance ranging from (0% to 82%) to other antibiotics, Amoxicillin (25µg), Augmentin (30µg), Cefuroxime (30µg), Cefepime (30µg), Ceftriaxone (30µg), Imipenem (10µg), Meropenem (10µg), Vancomycin (30µg), Nitrofurantoin (300µg), Azithromycin (15µg), Clarithromycin (15µg), Norfloxacin (10µg), and Gentamicin (10µg) as shown in Table (4). The same Table (4), indicates that Shigella species and Enterobacter cloacae were completely (100%) sensitive to Ceftriaxone (30µg) and Imipenem (10µg) and resistant to all other antibiotics, with resistance percentages ranging from 0% to 66%. Additionally, Table (4) reveals that (76.1%) of coagulase-negative Staphylococcus species, 72.7% of coagulase-positive Staphylococcus species, and (50%) of MRSA isolates were sensitive to Vancomycin (30µg) (Table 4). All Pseudomonas isolates exhibited variable resistance to nearly all tested antibiotics and were completely (100%) inhibited by Imipenem (10µg), Azithromycin (15µg), and Gentamicin (10µg).

Table 4. Sensitivity of the isolated bacterial strains to the included antibiotic disc references

Types of antibiotic discs	Concentrations used (µg)	Staphylococcus spp. (cog-iv) (21)	Staphylococcus spp. (cog+iv) (11)	MRSA (2)	Pseudomonas spp. (7)	Shigella spp. (6)	E. cloacae (2)	Citrobacter spp. (2)	Proteus mirbilis (3)	Providencia spp. (6)	Pantoea spp. (2)
Amoxicillin	25	61.9	63.6	0	0	0	100	50	0	50	0
Augmentin	30	66.7	100	0	0	50	100	100	0	0	50
Cefuroxime	30	66.7	63.3	50	0	50	50	100	0	50	50
Cefepime	30	57.1	72.7	0	14.3	33.33	50	50	0	0	100
Ceftriaxone	30	57.1	54.5	50	14.3	100	100	50	100	0	100
Imipenem	10	85.7	100	100	100	100	100	100	100	16.6	100
Meropenem	10	71.4	82	100	85.7	100	50	50	100	0	100
Vancomycin	30	76.1	72.7	50	ND	ND	ND	ND	ND	ND	ND
Nitrofurantoin	300	76.1	82	100	14.3	0	50	50	0	100	0
Azithromycin	15	38.0	54.5	0	100	66.66	100	100	66.66	50	100
Clarithromycin	15	61.9	63.3	0	85.7	0	50	100	0	50	50
Levofloxacin	5	76.1	100	100	100	100	50	100	100	16.6	100
Doxycycline	5	76.1	100	100	85.7	16.6	50	100	0	50	50
Norfloxacin	10	61.9	72.7	100	85.7	100	50	100	100	0	100
Gentamicin	10	85.7	91	0	100	100	100	100	100	50	100

Key: Cog-iv = Coagulase-negative; Cog+iv = Coagulase-positive; MRSA = Methicillin-resistant Staphylococcus aureus; E. cloacae = Enterobacter cloacae; and ND = Not done.

Inhibitory effects of the disinfectants:

Table 5 shows that the tested hydrogen peroxide (3%) inhibited the growth of only 5 isolates, the highest zone (mm) was 40.0±0.50 against *Providencia alcalifaciens* DSM30120 NCTC 10286, *Providencia huaxiensis* WCHPr00036 (Figure 1A), followed by 37.5±0.70, 16.5±0.70, and 14.4±0.07 against *Citrobacter youngae* GTC1314 (Figure 1B), *Pseudomonas aeruginosa* DSM 50071 (Figure 1C), and *Pseudomonas putida* NEAU-ST5-5, respectively. Furthermore, this study showed the highest zone (mm) of 40.0±0.50) from Prodex (99%) against *Providencia huaxiensis* WCHPr00036 (Photo 1D) followed by a weak zone of 08.0±1.41 against *Citrobacter youngae* GTC1314, in time other tested bacteria not inhibited by this disinfectant (Table 5) However, the tested Iodine (10%) showed growth inhibitory capability against the tested isolates except for *Pantoea agglomerans* JCM1236 which was not inhibited. The zones of inhibition ranged from 28.0±1.4, the highest against *Staphylococcus epidermidis* NBRC 100911, and 07.0±1.41, the lowest against *Pseudomonas aeruginosa* DSM 50071. *Shigella sonnei* CECT 4887, and *Enterobacter cloacae* subsp. dissolvens ATCC 23373 isolates were not tested (Table 5).

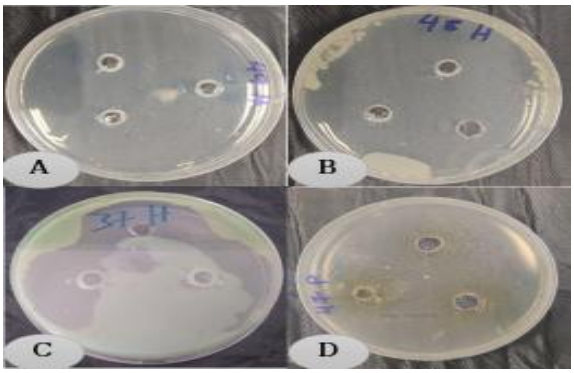

Figure 1. Effect of hydrogen peroxide (3%) against (A) P. alcalifaciens strain DSM 30120 (B) C. youngae strain GTC 1314 (C) Ps. aeruginosa strain DSM 50071 and (D) Prodex (99%) against P. huaxiensis strain WCHPr000369.

Table 5. Effect of disinfectants on isolated bacteria

Bacteria Isolated	Strain used	Oxydol (3%)	Prodex (99%)	Iodine (10%)
		Mean of diameters inhibition zones (mm) ± SD		
Staphylococcus aureus	S33 R	0.00±0.00	0.00±0.00	13.2±0.35
Staphylococcus epidermidis	NBRC 100911	0.00±0.00	0.00±0.00	28.0±1.41
Staphylococcus hominis	Huaian_201_1	0.00±0.00	0.00±0.00	15.2±0.35
Pseudomonas aeruginosa	DSM 50071	16.5±0.70	0.00±0.00	07.0±1.41
Pseudomonas putida	NEAU-ST5-5	14.4±0.07	0.00±0.00	10.0±1.41
Proteus mirabilis	JCM 1669	0.00±0.00	0.00±0.00	15.0±0.00
Citrobacter youngae	GTC 1314	37.5±0.70	8.0±1.41	12.0±0.00
Pantoea agglomerans	JCM1236	0.00±0.00	0.00±0.00	0.00±0.00
Providencia alcalifaciens	DSM 30120	40.0±0.50	0.00±0.00	19.7±0.35
Providencia huaxiensis	WCHPr000369	40.0±0.50	40.0±0.50	21.5±0.70
Shigella sonnei	CECT 4887	ND	ND	ND
***Enterobacter cloacae* subsp. Dissolvens**	ATCC 23373	ND	ND	ND

SD: Standard deviation; ND: Not done.

DISCUSSION

This study aimed to examine the contamination of inanimate surfaces inside the surgical intensive care unit at Al Wahda Hospital in Derna, Libya to determine the degree of safety of patients who visit this unit. This study proved that all surfaces from which samples were taken were contaminated and that the patients' beds and tables next to their beds, as well as the drip holder, were the most contaminated. This is considered a bad result, as the contamination is very close to the patient and to the workers, physicians, and nurses, and is considered a direct cause of their illness and infection, especially with the diversity of the types of bacteria isolated with different pathogenic factors. This study showed that the targeted intensive care unit was contaminated with Gram-positive and Gram-negative bacteria. Although the percentage of Gram-positive bacteria was higher than that of Gram-positive bacteria, the difference in prevalence between them was not large, which shows the danger of the spread of both bacteria.

Although the prevalence of Gram-positive bacteria was higher than that of Gram-negative bacteria, the difference in prevalence was not substantial, indicating the potential risk of dissemination for both bacterial types. This investigation revealed that all Gram-positive bacteria isolated were from the genus Staphylococcus, with some strains testing positive for coagulase and others testing negative, with the latter being the most prevalent (33%). This study also demonstrated that coagulase-positive bacteria constituted 20.6%, of which 84.6% were methicillin-resistant *Staphylococcus aureus* (MRSA) and 15.4% were methicillin-sensitive Staphylococcus species. Numerous studies have reported the presence of Staphylococcus species contaminating inanimate surfaces in hospital intensive care units (ICUs) [14, 15]. Staphylococcus spp. are associated with a range of life-threatening diseases. In particular, *S. aureus* bacteremia leads to significant morbidity in humans, with a mortality rate of 25%. Staphylococcus species, specifically methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant *Staphylococcus aureus* (VRSA), are pathogenic bacteria of global concern. The ability to rapidly identify these pathogens and to guide personalized treatment regimens may contribute to reduced mortality rates [16].

This study also demonstrated the presence of the most nosocomial infection-responsible bacterium, *Pseudomonas aeruginosa*. Several studies have isolated *Pseudomonas aeruginosa* and other Pseudomonas species from hospital ICUs [17-19]. This bacterium is responsible for bloodstream infections, which are critical infections associated with increased mortality rates [20]. Despite advances in healthcare and the introduction of an extensive type of antimicrobial retailer, *Pseudomonas aeruginosa* remains a common motive for nosocomial infections and is one of the most critical microorganisms that cause clinical problems because of its high resistance to antimicrobial drugs. Mortality due to *Pseudomonas aeruginosa* bacteremia has remained high over the past few years. Most studies have reported mortality rates ranging from 33 to 61% among all patients with *Pseudomonas aeruginosa* bacteremia [21, 22]. Furthermore, previous studies agree that many members of Enterobacteriaceae (Shigella, Enterobacter, Proteus, and Citrobacter species) were found to contaminate hospital ICUs [23-25], Providencia [26], and Pantoea [27]. The presence of all these bacterial pathogens contaminating the inanimate surfaces in the targeted ICU is a bad situation that threatens the lives of healthcare workers' and patients,' specifically with the varied resistance shown by the isolated bacteria against the tested antibiotics, where no one of the tested antibiotics can suppress the growth of all isolated bacteria. This led to the hypothesis that resistance was disseminated within the target ICU. Of the fourteen used antibiotic references, this study

showed that the most widely used antibiotics were Imipenem 10µg, Levofloxacin 5µg, Gentamicin 10µg, and Norfloxacin 10µg which were controlled at 80%, 70%, 60%, and 50%, respectively. The narrowest antibiotics were Amoxicillin 25µg, Cefuroxime 30µg, Cefepime 30µg, and Clarithromycin 15µg which each 100% controlled only one bacterial genus.

The widespread dissemination of bacterial contaminants within the targeted Intensive Care Unit (ICU) prompted this study to investigate the efficacy of disinfectants commonly employed for daily disinfection purposes: Oxydol (Hydrogen peroxide 3%), Prodex (Glutaraldehyde 99%), also known as Cidex for surface disinfection, and iodine (Povidone Hydro alcohol 10%) for tool disinfection. The findings of this study suggest that Prodex disinfectants should be eliminated from the daily cleaning regimen, as they failed to inhibit the growth of all tested isolates. Hydrogen peroxide inhibited 50% of all tested isolates, which is considered an unsatisfactory result, necessitating the exploration of alternative disinfectants to address this situation. Iodine actively, moderately, and weakly inhibited the growth of 70%, 20%, and 10% of all tested bacteria, respectively.

CONCLUSION

This study concluded that the investigated surgical ICU at Al-Wahda Hospital, Derna City, Libya, was contaminated with nine distinct bacterial genera of varying pathogenicity, which exhibited diverse resistance patterns towards commonly utilized antibiotics and daily disinfectants. This study recommends directing attention towards the identification of alternative antibiotics and disinfecting agents that may effectively address this situation, thereby potentially reducing mortality rates among patients and healthcare workers.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

REFERENCES

1. Monteiro A, Cardoso J, Guerra N, Ribeiro E, Viegas C, Cabo Verde S, et al. Exposure and health effects of bacteria in healthcare units: An overview. Applied Sciences. 2022;12(4):1958.
2. Bitew K, Gidebo DD, Ali MM. Bacterial contamination rates and drug susceptibility patterns of bacteria recovered from medical equipment, inanimate surfaces, and indoor air of a neonatal intensive care unit and pediatric ward at Hawassa University Comprehensive Specialized Hospital, Ethiopia. IJID regions. 2021;1:27-33.
3. Davane M, Suryawanshi N, Pichare A, Nagoba BS. Pseudomonas aeruginosa from hospital environment. Journal of Microbiology and Infectious Diseases. 2014;4.(01)
4. Vickery K, Deva A, Jacombs A, Allan J, Valente P, Gosbell IB. Presence of biofilm containing viable multiresistant organisms despite terminal cleaning on clinical surfaces in an intensive care unit. Journal of Hospital Infection. 2012;80(1):52-5.
5. Russotto V, Cortegiani A, Raineri SM, Giarratano A. Bacterial contamination of inanimate surfaces and equipment in the intensive care unit. Journal of intensive care. 2015;3:1-8.
6. Huslage K, Rutala WA, Sickbert-Bennett E, Weber DJ. A quantitative approach to defining "high-touch" surfaces in hospitals. Infection Control & Hospital Epidemiology. 2.3-850:(8)31;010
7. Weber DJ, Rutala WA, Miller MB, Huslage K, Sickbert-Bennett E. Role of hospital surfaces in the transmission of emerging health care-associated pathogens: norovirus, Clostridium difficile, and Acinetobacter species. American journal of infection control. 2010;38(5):S25-S33.
8. Luksamijarulkul P, Aiempradit N, Vatanasomboon P. Microbial contamination on used surgical masks among hospital personnel and microbial air quality in their working wards: a hospital in Bangkok. Oman medical journal. 2014;29(5):346.
9. Shaughnessy MK, Micielli RL, DePestel DD, Arndt J, Strachan CL, Welch KB, et al. Evaluation of hospital room assignment and acquisition of Clostridium difficile infection. Infection Control & Hospital Epidemiology. 2011;32(3):201-6.
10. Cheesbrough M. District laboratory practice in tropical countries, part 2: Cambridge university press; 2006.
11. Jenkins C, Ling CL, Ciesielczuk HL, Lockwood J, Hopkins S, McHugh TD, et al. Detection and identification of bacteria in clinical samples by 16S rRNA gene sequencing: comparison of two different approaches in clinical practice. Journal of medical microbiology. 2012;61(4):483-8.
12. Eltawaty S. Antimicrobial activity of leaves and bark of Libyan Capparis spinosa subsp orientalis (Duh.) Jafri. Arabian Journal of Medicinal and Aromatic Plants. 2018;4(2):42-56.
13. Magaldi S, Mata-Essayag S, De Capriles CH, Pérez C, Colella M, Olaizola C, et al. Well diffusion for antifungal susceptibility testing. International journal of infectious diseases.45-39:(1)8;2004 .

14. Cocca G, Piva S, Magno SD, Scarpellini R, Giacometti F, Serraino A, et al. Prevalence and patterns of antimicrobial resistance among Escherichia coli and Staphylococcus spp. in a veterinary university hospital. Veterinary Sciences . .308:(12)8;2021
15. Ziakas PD, Anagnostou T, Mylonakis E. The prevalence and significance of methicillin-resistant Staphylococcus aureus colonization at admission in the general ICU setting: a meta-analysis of published studies. Critical care medicine. 20.44-433:(2)42;14
16. Wozniak JM, Mills RH, Olson J, Caldera J, Sepich-Poore GD, Carrillo-Terrazas M, et al. Mortality risk profiling of Staphylococcus aureus bacteremia by multi-omic serum analysis reveals early predictive and pathogenic signatures. Cell . .27-1311:(5)182;2020e14.
17. Toufen Junior C, Hovnanian ALD, Franca SA, Carvalho CRR. Prevalence rates of infection in intensive care units of a tertiary teaching hospital. Revista do Hospital das Clínicas. 2003;58:254-9.
18. Kerr KG, Snelling AM. Pseudomonas aeruginosa: a formidable and ever-present adversary. Journal of Hospital Infection. 2009;73(4):338-44.
19. Hu Y, Qing Y, Chen J, Liu C, Lu J, Wang Q, et al. Prevalence, risk factors, and molecular epidemiology of intestinal carbapenem-resistant Pseudomonas aeruginosa. Microbiology spectrum. 2021;9(3):e01344-21.
20. Vitkauskienė A, Skrodenienė E, Dambrauskienė A, Macas A, Sakalauskas R. Pseudomonas aeruginosa bacteremia: resistance to antibiotics, risk factors, and patient mortality. Medicina. 2010.490:(7)46;
21. Lodise Jr TP, Patel N, Kwa A, Graves J, Furuno JP, Graffunder E, et al. Predictors of 30-day mortality among patients with Pseudomonas aeruginosa bloodstream infections: impact of delayed appropriate antibiotic selection. Antimicrobial agents and chemotherapy. 2007;51(10):3510-5.
22. Chatzinikolaou I, Abi-Said D, Bodey GP, Rolston KV, Tarrand JJ, Samonis G. Recent experience with Pseudomonas aeruginosa bacteremia in patients with cancer: retrospective analysis of 245 episodes. Archives of internal medicine. 2000;160(4):501-9.
23. Teng S-O, Lee W-S, Ou T-Y, Hsieh Y-C, Lee W-C, Lin Y-C. Bacterial contamination of patients' medical charts in a surgical ward and the intensive care unit: impact on nosocomial infections. Journal of microbiology ,immunology, and infection = Wei mian yu gan ran za zhi. 2009;42(1):86-91.
24. De Geyter D, Blommaert L, Verbraeken N, Sevenois M, Huyghens L, Martini H, et al. The sink as a potential source of transmission of carbapenemase-producing Enterobacteriaceae in the intensive care unit. Antimicrobial Resistance & Infection Control. 2017;6:1-6.
25. Dhayhi N, Kameli N, Salawi M, Shajri A, Basode VK, Algaissi A, et al. Bacterial Contamination of Mobile Phones Used by Healthcare Workers in Critical Care Units: A Cross-Sectional Study from Saudi Arabia. Microorganisms. 2023;11(8):1986.
26. Hadavand F, Naseri SR, Mardani M, Tabarsi P, Keyvanfar A, Gachkar L, et al. An Outbreak of Pan-drug Resistant Providencia Species in an Intensive Care Unit: A Case-Series. Archives of Clinical Infectious Diseases. 2024;19.(3)
27. Nasser NE, Abbas AT, Hamed SL. Bacterial contamination in intensive care unit at Al-Imam Al-Hussein Hospital in Thi-qar province in Iraq. Global journal of health science. 2012;5(1):143.

https://journal.utripoli.edu.ly/index.php/Alqalam/index eISSN 2707-7179

ملفات المضادات الحيوية وفعالية المطهرات على العزلات البكتيرية في وحدة العناية المركزة الجراحية

سلوى التواتي[1]، أحمد كباشي[1]، توفيق التواتي[2]، مريم بوخشيم[3]

[1]قسم العلوم الطبية الحيوية، كلية الصيدلة، جامعة عمر المختار، البيضاء، ليبيا
[2]قسم التشخيص الجزيئي، كلية العلوم الطبية الحيوية، جامعة بنغازي، بنغازي، ليبيا
[3]قسم الاحياء الدقيقة، كلية الصيدلة، جامعة درنة، درنة، ليبيا

المستخلص

على الرغم من أن فحص الملوثات البكتيرية في وحدات العناية المركزة أصبح موضوعًا شائعًا، إلا أنه لا يزال قيد الدراسة نظرًا لأهميته في الحفاظ على حياة المرضى والعاملين في مجال الرعاية الصحية، حيث يوجد معدل متزايد لظهور سلالات بكتيرية جديدة تكتسب مقاومة للأدوية المضادة للبكتيريا. هذه هي الدراسة الأولى التي تستهدف وحدة العناية المركزة الجراحية في مستشفى الوحدة، مدينة درنة، ليبيا. تم استخدام الطرق التقليدية القياسية والتقنيات الجزيئية لعزل وتحديد ودراسة ملفات المضادات الحيوية ضد العزلات البكتيرية التي وجد أنها تلوث الأسطح غير الحية داخل وحدة العناية المركزة. أثبتت نتائج الدراسة أن منطقة الدراسة ملوثة بتسعة أجناس بكتيرية مختلفة تنتمي إلى البكتيريا إيجابية الجرام (54٪) وسلبية الجرام (46٪). كان المضاد الحيوي ذو الفعالية الأوسع نطاقًا في هذه الدراسة هو إيميبينيم 10 ميكروجرام يليه ليفوفلوكساسين 5 ميكروجرام والذي قمع نمو 80٪ و 70٪ من جميع العزلات المختبرة على التوالي. ومن بين المطهرات التي تم اختبارها، سيطر بيروكسيد الهيدروجين (أوكسيدول 3%) على (50%) من البكتيريا المختبرة، في حين لم يظهر الغلوتارالدهيد (برودكس 99%) أي نشاط. وسيطر كحول البوفيدون المائي (اليود 10%) بنشاط على (70%) من العزلات المختبرة. الاستنتاج: خلصت هذه الدراسة إلى أن وحدة العناية المركزة المستهدفة ملوثة بتسعة أجناس بكتيرية مختلفة تظهر مقاومة متفاوتة للمضادات الحيوية والمطهرات المختبرة، وتهدد حياة المرضى والعاملين الصحيين، وتوصي بالبحث عن مضادات حيوية ومطهرات بديلة فعالة.

الكلمات المفتاحية: تفاعل البوليميراز المتسلسل، ملوثات وحدة العناية المركزة، ملفات تعريف المضادات الحيوية، المطهرات .