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EXPLORING THE DIVERSITY, PREVALENCE AND ANTIBIOTIC SUSCEPTIBILITY OF PATHOGENIC BACTERIA IN PATIENTS WITH BURN INJURIES IN BASRA PROVINCE, IRAQ

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Background: *Burns represent an important cause of morbidity and mortality, and bacterial infections constitute a significant global public health issue.* ***Objective:*** *This investigate aims to study the distribution of bacterial species in burn patients in Basra Province and to elucidate their antibiotic resistance patterns.* ***Methods:*** *192 samples (56 from blood and 136 from skin) were collected from burn wound patients in Al-Fayhaa Burn Centre in Basra, and were identified by biochemical tests, VITEK was utilized to verify the isolates identification with their resistance patterns.* ***Results:*** *Of the 136 skin specimens collected, 83% exhibited positive growth. Among the 141 bacterial isolates recovered, 77.3% were identified as G -ve bacteria, while 22.7% were designated as G +ve. the most predominant bacteria was P. aeruginosa with rate 58.9%, followed by E. coli at 10.6% and S. aureus at 9.9%. The antibiogram profile for P. aeruginosa indicated a serious resistance to all antibiotics, with the exception of colistin (3.6%). In contrast, all S. aureus isolates showed resistance to cefoxitin, benzylpenicillin, and oxacillin. In blood specimens, positive growth was observed in 28.6%, among the 11 bacterial isolates recovered, 54.5% were identified as G +ve and 45.5% as G -ve bacteria. The dominant G +ve isolate was Staphylococcus haemolyticus, with resistance to most tested antibiotics. Enterobacter cloacae, the highest prevalent G -ve isolate, exhibited resistance to all tested antibiotics except for minocycline (50%) and no resistance to amikacin.* ***Conclusion:*** *P. aeruginosa was the most prevalent causative agent in burn injuries in Basra. All S. aureus were MRSA.*

Keywords: *Antibiotic resistance, Pathogenic bacteria, Skin, Blood, Pseudomonas aeruginosa*

INTRODUCTION

A burn is an injury resulting from exposure to thermal, chemical, electrical, or radiation sources. Burns are a prevalent cause of substantial illness and death, representing a critical global public health issue, with the World Health Organization determining that 11 million individuals worldwide have burn injuries annually [1,2]. Burns impair the integrity of the skin's protective barrier and create a humid atmosphere, which is an optimal situation for microorganisms to develop, in addition, these microbes constitute a serious obstacle to patients' recovery [3,4]. The main contributors of mortality in burn patients are infections caused by microbes, constituting a considerable health issue inside the burn unit [5]. Bloodstream infection is among the most severe infections that can occur in burn patients. Burn patients face a significant risk of bloodstream infections due to numerous surgical operations, the utilization of invasive devices, and prolonged hospitalizations [6,7].

Burn wound initially establishes an uncontaminated environment that becomes colonized roughly 48 hours later by either the remaining microorganisms in the affected area or by microorganisms from the nearby skin that is healthy surrounding the wound. G +ve bacteria are the initial colonizers of the skin wounds, including *Staphylococcus aureus* [8,9].

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With longer hospital stays, infections are more likely to be caused by flora native of G -ve from the upper respiratory system and gastrointestinal tract [10].

Multidrug-resistant (MDR) bacterial infections present an important challenge in the treatment and care of burn patients, leading to extended hospitalizations and increased rate of mortality. In terms of treatment approaches, the diversity of MDR bacteria complicates conventional antimicrobial therapies [11,12]. In recent years, antibiotic resistance has rapidly developed and disseminated globally from one country to the other at a rate faster than previously expected. Superbugs and multidrug-resistant bacteria are prevalent in numerous regions globally. The widespread utilization, overuse, and incorrect application of antimicrobials over the past 80 years contributed to the explosion in resistance to antimicrobial drugs [13]. Ongoing observation of resistance to antibiotics developments among burn patients from Iraq and other developing countries is crucial to improve treatment quality and prevent inappropriate antibiotic dispensing. This study targeted to explore the frequency of different species of bacteria and determine the corresponding profiles of antibiotic susceptibility in patients with burn infections in Basra, Iraq.

MATERIALS AND METHODS

Samples collection and detection of isolates

In this cross-sectional study, a total of ١92 samples (136 swabs from skin and 56 blood culture) were collected from burn wound patients from various age ranges and genders in Al-Fayhaa Burn Centre in Basra Province, Iraq, during November 2022–April 2023. All swabs were cultured after collection on blood agar, nutrient agar, mannitol salt agar, eosin methylene blue agar, and MacConkey agar plates (all media were supplied by Oxoid). The plates were incubated in an aerobic environment for 24 hours. The bacteria grown were purified by subculture and then subjected to biochemical tests for identification such as catalase test, oxidase test, indole test, mannitol fermentation test, lactose fermentation test, Kligler's iron agar, eosin-methylen blue agar, citrate utilization test, and hemolysin production test. The obtained isolates were identified following (Prescott, 2002)[14]. The identification has been confirmed by the VITEK® 2 Compact system (bioMérieux) by using ID-N and ID-P cards.

The antibiotic susceptibility test (AST)

The antibiotic susceptibility of the isolates was assessed utilizing the VITEK® 2 system, following the instructions provided by the manufacturer via using AST-P580 cards for G +ve bacteria which covers up to 19 antibiotics including Pencillin, Oxacillin, Cefoxitin, Benzyl-penicillin, Tobramycin, Gentamicin, Erythromycin, Moxifloxacin, Levofloxacin, Linezolid, Teicoplanin, Clindamycin, Tigecycline, Tetracycline, Vancomycin, Fosfomycin, Fusidic Acid, Rifampicin, Nitrofurantoin, Trimethoprim/Sulfamethoxazole, While for G -ve bacteria the AST-N222 cards were used which contained Piperacillin, Ticarcillin, Meropenem, Imipenem, Aztreonam, Cefepime, Ceftazidime, Tobramycin, Gentamicin, Amikacin, Minocycline, Colistin, Ticarcillin/Clavulanic Acid, Ciprofloxacin, Piperacillin/Tazobactam, Trimethoprim/ Sulfamethoxazole. The cards were mechanically injected with a suspension of microbes and placed into the VITEK® 2 device for incubation and detection. All AST findings have been derived from the 29th Edition of the Clinical and Laboratory Standards Institute (CLSI).

Statistical Analysis

The data were analysed using the Statistical Package for Social Sciences version 22 (SPSS, IBM Company, Chicago, IL, USA). In order to compare the bacterial infection rate between males and females, chi-square was used at a level 0.05, *p*-values $\leq$ 0.05 are considered significant.

RESULTS AND DISCUSSION

Samples collection and Identification of clinical isolates

Of 192 clinical specimens were collected from skin (136) and blood (56), for skin isolates, 114 (83.8%) had positive growth. Out of 141 bacterial isolates were obtained, 109 (77.3%) G -ve bacterial isolates were recovered and 32 (22.7%) G +ve. Regarding patient

gender, the current result recorded that the bacterial infection rate in females (54.4%) was higher than in males (45.5%) with no significant differences ($p > 0.05$) as shown in (**Table 1)**, and recorded G -ve as the most prevalence of isolates in males (56%), while in female, G +ve bacteria were reported as the highest prevalence rate (81.2%). The most commonly isolated G -ve were *Pseudomonas aeruginosa* 83 isolates (58.9%), followed by *Escherichia coli* 15 (10.6%), while G +ve were *Staphylococcus aureus* 14 (9.9%) and *Staphylococcus epidermidis* 11 (7.8%). Other bacteria were isolated, although at low frequencies for both G -ve and positive isolates **(Fig. 1)**. The positive growth of blood specimens were 16 (28.6%), among them 11 bacterial isolates [6 (54.5%) G +ve and 5 (45.5%) G -ve] and 5 *Candida* spp were obtained. *Enterobacter cloacae* and *Staphylococcus haemolyticus* were the most prevalent bacterial species in the blood, accounting 25% for each one of the bacterial isolates **(Fig. 2**). The results showed no differences in bacterial infection rate ($p > 0.05$) and the prevalence of bacteria isolated from blood of males and females.

Table 1: The number and percentage of burn patients with infection and distribution of G -ve and G +ve bacteria.

Source of samples	The gender	No. of samples	Positive growth n (%)	*p-value **chi-square	No. of bacterial isolates	G -ve n (%)	G +ve n (%)	*p-value **chi-square
Skin swab	Male	61	52 (45.6)	*0.184	67	61 (56)	6 (18.8)	*0.0001
	Female	75	62 (54.4)		74	48 (44)	26 (81.2)	
	Total	136	114	**1.758	141	109	32	**13.73
Blood	Male	29	8 (50)	*1	6	3 (60)	3 (50)	*0.74
	Female	27	8 (50)		5	2 (40)	3 (50)	
	Total	56	16	**0	11	5	6	**0.11

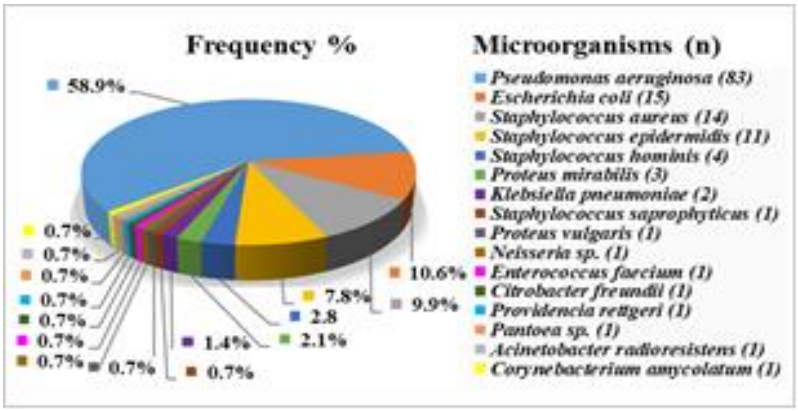


Fig. 1 : The prevalence of microbial organisms obtained from the skin of patients with burns.

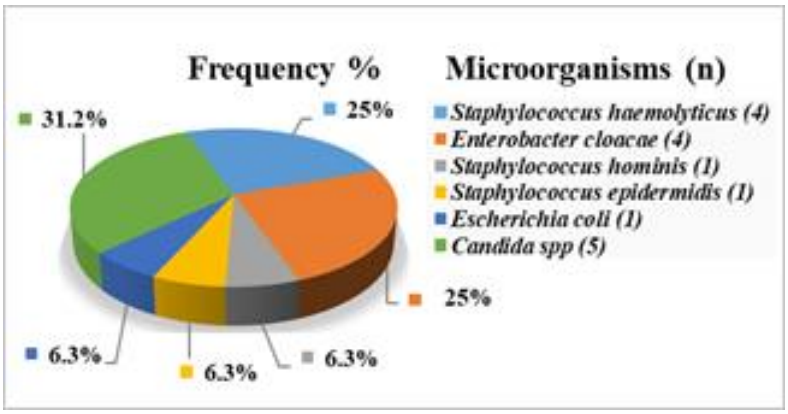


Fig. 2 : The prevalence of microbial organisms obtained from the blood of patients with burns.

The antibiotic susceptibility test

Different group antibiotics against the G -ve and G +ve were tested; antibiotic susceptibility showed various levels of antibiotic resistance. Among the pathogenic bacteria tested, *P. aergenosa* showed that all isolates (100%) were resistant to tobramycin, meropenem, imipenem, ticarcillin, piperacillin, and ciprofloxacin, followed by ticarcillin/clavulanic, amikacin, and gentamicin with 98.8%, while the resistance to piperacillin/tazobactam and aztreonam were 97.6%, at a lower rate to ceftazidime and cefepime (95.2%), in contrast, the vast majority of these bacteria exhibited sensitivity to colistin, with a resistance rate of 3.6% **(Tables 2 and 3)**. On the other hand, *S. aureus* showed all isolates (100%) were resistant to cefoxitin, benzylpenicillin, and oxacillin, and slightly resistant to vancomycin (7.1%), while no resistance to linezolid, tigecycline, and nitrofurantoin was recorded in the current study.

The investigation showed that most pathogenic bacteria isolates were multidrug-resistant, accounting 90.13%, which were resistant to three or more antibiotics belonging to different antibiotic families. The number and percentage of MDR for G -ve isolates of *P. aeruginosa*, *E. coli*, *E. cloacae*, *P. mirabilis*, *K. pneumonia*, *P. vulgaris*, *P. rettgeri*, and *C. freundii* were 83 (100%), 14 (93.3%), 4 (100%), 3 (100%), 2 (100%), 0 (0%), 1 (100%), and 1 (100%), respectively, while G +ve MDR isolates belonging to *S. aureus* were 12 (85.7%), *S. epidermidis* 8 (66.7%), *S. haemolyticus* 4 (100%), *S. hominis* 3 (75%), *S. saprophytocus* 1 (100%), and *E. faecium* 1 (100%).

Table 2: Percentage of antimicrobial resistance of G -ve bacterial isolates from skin and blood samples of burn patients.

Bacteria isolates (n)		Skin isolates							Blood isolates	
		P. aeruginosa (83)	*E. coli* (15)	*P. mirabilis* (3)	*K. pneumoniae* (2)	*C. freundii* (1)	*P. vulgaris* (1)	*P. rettgeri* (1)	*E. cloacae* (4)	*E. coli* (1)
Antimicrobial agent resisted (%)	TC	100%	100%	100%	100%	100%	0%	100%	100%	100%
	TCC	98.8%	80%	0%	50%	100%	0%	100%	100%	100%
	PRL	100%	100%	0%	100%	100%	0%	100%	100%	100%
	TZP	97.6%	80%	0%	50%	100%	0%	100%	100%	100%
	CAZ	95.2%	86.7%	100%	100%	100%	0%	100%	100%	100%
	CAV	ND*	ND	ND	ND	ND	ND	ND	100%	100%
	CTX	ND	ND	ND	ND	ND	ND	ND	100%	100%
	TZC	ND	ND	ND	ND	ND	ND	ND	100%	100%
	FEP	95.2%	80%	100%	100%	100%	0%	100%	100%	100%
	ATM	97.6%	93.3%	100%	100%	0%	0%	100%	ND	100%
	IMI	100%	66.7%	0%	50%	100%	0%	100%	100%	100%
	MRP	100%	80%	0%	50%	100%	100%	100%	100%	100%
	AK	98.8%	33.3%	0%	50%	0%	0%	0%	0%	100%
	CN	98.8%	60%	0%	50%	0%	0%	0%	100%	100%
	TOB	100%	80%	100%	50%	0%	0%	100%	100%	100%
	CIP	100%	80%	0%	50%	0%	0%	100%	100%	100%
	CS	3.6%	ND	ND	ND	ND	ND	ND	ND	ND
	MN	ND	60%	100%	50%	100%	0%	100%	50%	0%
	SXT	ND	86.7%	0%	50%	0%	100%	100%	100%	100%

CIP Ciprofloxacin, TC Ticarcillin, CAZ Ceftazidime, CAV Ceftazidime/Avibactam, TZP Piperacillin/Tazobactam, TZC Ceftolozane/Tazobactam, CTX Cefotaxime, FEP Cefepime, TOB Tobramycin, CN Gentamicin, ATM Aztreonam, IMI Imipenem, MRP Meropenem, AK Amikacin, PRL Piperacillin, TCC Ticarcillin/Clavulanic Acid, CS Colistin, MN Minocycline, SXT Trimethoprim/Sulfamethoxazole.
*ND Not determined.

Table 3: Percentage of antimicrobial resistance of G +ve bacterial isolates from skin and blood samples of burn patients.

Bacteria isolates (n)		Skin isolates					Blood isolates	
		S. aureus (14)	*S. epidermidis* (11)	*S. hominis* (4)	*S. saprophyticus* (1)	*E. faecium* (1)	*S. haemolyticus* (4)	*S. epidermidis* (1)
Antimicrobial agent resisted (%)	CX	100%	90.9%	75%	0%	ND	0%	0%
	P	ND*	ND	ND	ND	100%	ND	ND
	BNZ	100%	100%	100%	100%	ND	100%	100%
	OX	100%	90.9%	75%	0%	ND	100%	100%
	CN	35.7%	54.5%	0%	0%	ND	75%	0%
	TOB	42.9%	54.5%	25%	0%	ND	75%	0%
	LV	35.7%	18.2%	25%	0%	100%	75%	0%
	MXF	28.6%	18.2%	0%	0%	ND	75%	0%
	E	78.6%	54.5%	100%	100%	100%	75%	100%
	CD	50%	18.2%	25%	0%	ND	75%	0%
	LNZ	0%	0%	0%	0%	0%	0%	0%
	TEC	14.3%	0%	0%	0%	0%	50%	0%
	VA	7.1%	9.9%	0%	0%	0%	50%	0%
	TE	64.3%	9.9%	25%	0%	100%	25%	0%
	TIG	0%	0%	0%	0%	ND	50%	0%
	FOS	ND	ND	ND	ND	100%	ND	ND
	F	0%	0%	0%	0%	0%	0%	0%
	FC	64.3%	81.1%	75%	100%	ND	ND	ND
	RD	28.6%	18.2%	0%	0%	0%	50%	0%
	SXT	42.9%	27.3%	50%	0%	ND	50%	0%

TIG Tigecycline, TE Tetracycline, CX Cefoxitin, P Pencillin, BNZ Benzylpenicillin, OX Oxacillin, E Erythromycin, CD Clindamycin, LNZ Linezolid, TEC Teicoplanin, VA Vancomycin, TOB Tobramycin, CN Gentamicin, F Nitrofurantoin, FOS Fosfomycin, SXT Trimethoprim/Sulfamethoxazole, FC Fusidic Acid, RD Rifampicin, MXF Moxifloxacin, LV Levofloxacin.
*ND Not determined.

Discussion

As burn infections in Basra Province, Iraq, represent a significant challenge in hospitals, caused by several microorganisms that affect many patients who are hospitalized for extended durations, this study was conducted to evaluate the prevalence and resistance of different types of bacteria isolated from burn wounds of patients at Al-Fayhaa Burn Centre in Basra, as well as their susceptibility to antibiotics profiles. In our present investigation, the bacterial infections rate of skin samples was 83.8%, a study reported that the prevalence of bacteria was 79.12% [15], which was close to the results of our current study. This may be due to burned skin loses protective function, create a warm and moist environment, and the tissue can become necrotic, making it easier for bacteria to enter and colonize the wound.

According to patient gender, the results showed a high rate of bacterial infection in female compering with male (54.4% vs. 45.5%), these differences were not significant (p-value > 0.05). Females are more susceptible to infection than males in skin samples as mentioned by El Hamzaoui *et al*. (2020)[16] study in Morocco, which reported 51.16% and 48.84% infection rate in females and males, respectively. While another study in China reported that the infection rate in males is higher than in females with 69% and 31%, respectively [17]. Many bacterial infections have shown sex differences in incidence, course of disease, and response to treatment. This may be due to a several factors, including behavioral and personal habits, immune responses linked

to sex chromosomes, or sex steroid hormone concentrations [18].

The most predominant isolates from skin were G -ve bacteria, particularly *P. aeruginosa*, accounting for 58.9% of total isolates. Many studies in other cities of Iraq reported the most commonly isolated species in burn patients, revealing a high prevalence of G -ve bacteria, especially *P. aeruginosa*. The study conducted by Abdullah *et al*. (2024)[19] indicated that the frequency of *P. aeruginosa* was 62.13%, while Hasan and Abass's (2019)[20] study in Kirkuk Province reported that the G -ve isolated from the skin of burn patients were more prevalent, and the prevalence of *P. aeruginosa* reached 42.5%. The same results were reported in Al-Najaf Province by Aljanaby and Aljanaby (2018)[21], indicated that *P. aeruginosa* was more prevalent among the G -ve, which were also more prevalent than the G +ve. The high incidence of *P. aeruginosa* on the skin may derive from its ability to adapt in the hospital environment through biofilm formation, which provides considerable advantages to survival and effectively prevents removal by the host's immune system or antimicrobial treatment [22,23].

For G +ve isolates, the most prevalent bacteria recorded was *S. aureus* with 9.9% of total skin isolates, which were 100% methicillin-resistant strains (MRSA) according to cefoxitin and oxacillin screen. Numerous previous investigations showed that MRSA greatly increased morbidity and fatality rates. The prevalence of MRSA in the current investigation exceeded that documented in Saudi Arabia [24] and China[25]. The result was similar to many studies showing that *S. aureus* is the most prevalent G +ve bacteria isolated from burn wounds. AL-Ameen and Ghareeb (2022)[26] in Sulaimanyah Province, Iraq reported that *S. aureus* was the most prevalent in the G +ve bacteria. Haghighifar and Kamali Dolatabadi (2020)[27] mentioned the percentage of *S. aureus* was 10.2% of the total number of isolates in Isfahan City, Iran. Staphylococcus aureus is an important contributor to both hospital-acquired and community-acquired infections worldwide, attributable to its potential to develop multiple factors related to virulence, such as a protein A, capsule, and several types of enterotoxins and exotoxins[28,29]. Moreover, the bacterium *S. aureus* is a skin normal flora that can penetrate the body via disrupted skin, burns, wounds, intravenous catheters, and surgical incisions, leading to purulent infections.

On the other hand, the present investigation recorded 28.6% infections rate in blood samples, and demonstrated that *E. cloacae* and *S. haemolyticus* were the predominant bacteria in the blood, comprising 25% for each one. Their abundance in the blood may be attributed to several factors, such as their high rate of survival in hospital environments, particularly on medical devices, due to their ability to form biofilms and transfer antibiotic resistance genes. These variables significantly contribute to extended hospital stays, elevated healthcare expenses, and increased death rates [30,31]. No differences were observed between females and males, the lack of difference may be due to the similarity of the number of samples taken from males and females (29 and 27, respectively).

The antibiogram profile of *P. aeruginosa* showed a high-level resistance for all antibiotics except for colistin (3.6%). Several previous studies have indicated that *P. aeruginosa* was considered a nosocomial infection in burn patients [32]. Therefore, the similarity in high resistance in most isolates may be due to the prevalence of the same highly resistant strain in burn patients. Or it may be resistance caused by spontaneous mutations or the acquisition of resistance genes associated with resistance via horizontal gene transfer [33]. Many studies have supported our study regarding the high-level resistance of *P. aeruginosa* to most antibiotics. Mirsalehian *et al*. (2017) [34] study in Iran recorded 100% resistance to the antibiotics imipenem, meropenem, ciprofloxacin, aztreonam, cefepime, amikacin, and gentamicin. Furthermore, study in Morocco conducted by El Hamzaoui *et al*. (2020)[16] reported 100% resistance of *P. aeruginosa* to ticarcillin, while in Iraq, ticarcillin/clavulanic, amikacin, and gentamicin in this finding higher than several study such as Al-Azzawi and Abdullah (2018)[35] in Baghdad, Hasan and Abass (2019)[20] in Kirkuk Province, and Jameel *et al*. (2024)[36] in Babylon Province. In contrast, *P. aeruginosa* showed a less resistance against colistin at 3.6%, this finding higher than study recorded colistin resistance rate 0% in Basra Province (Tharia *et al*., 2024)[37] and 2.78% in Wasit

Province (Hussein and Shamkhi 2018)[38] and less than AL-Ameen and Ghareeb (2022)[26] study in Sulaymaniyah that recorded 21.7% resistance rate.

Regarding MRSA resistance, the current study reported that, all MRSA isolates were resistance to cefoxitin, benzylpenicillin, and oxacillin, this high rate of oxacillin resistance, is an approximation to the study by Askarpour *et al*. (2020)[39] where 97.3% of isolates were oxacillin-resistance, and higher than Jasim *et al*. (2022)[40] study that reported 70% resistance rate for each of benzylpenicillin and oxacillin. Fortunately, all MRSA isolates were sensitive to nitrofurantoin, tigecycline, and linezolid, this rate of sensitivity to nitrofurantoin and linezolid were recorded by Ke *et al*. (2023)[25] Chen *et al*. (2018)[41], and Li *et al*. (2021)[42] .

Our findings indicated a greater frequency of multidrug-resistant infections caused by bacteria in patients with burns in comparison to studies conducted in different countries, including India [43], Egypt[44], and Morocco[16]. Geographical climate differences, antibiotic misuse, or hygiene protocols may be the cause of this variation.

The high prevalence of bacteria with multidrug-resistant in burned patients can occur from prolonged hospital stays, which increase their exposure to hospital-acquired infections. Due to the risk of infection, burn patients are frequently treated with antibiotics. Over time, this can lead to the development of resistance as bacteria adapt and evolve mechanisms to survive these drugs. Medical equipment, healthcare workers, and even other patients can be sources of cross-contamination. Improper sterilization or bad hand hygiene can lead to the transfer of MDR bacteria from one patient to another.

Conclusion

Patients with burn injuries in Basra predominantly exhibited infections caused by *P. aeruginosa*, subsequently followed by *E. coli* and *S. aureus*, with these pathogens demonstrating resistance to the vast majority of the antibiotics evaluated. All *S. aureus* were MRSA. Among the prevalent antibiotics employed for the treatment of burn wound infections, vancomycin, tigecycline, linezolid, and nitrofurantoin were identified as the most effective against MRSA, while colistin was considered to be most efficient towards *P. aeruginosa*. Observation and management strategies for nosocomial infections should be established to decrease morbidity rates in patients suffering from burn infections and to develop improved therapeutic alternatives for this patient population.

Ethical approval

The current investigation conducted in accordance with the standards of ethics established by the Helsinki Declaration and received approval from the Research Committee of the Training and Development Division of Basra Health Department, Basra, Iraq according to document number 1136 on November 6, 2022. Patient participation was voluntary according to the Committee's guidelines.

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استكشاف تنوع وانتشار والحساسية الدوائية تجاه المضادات الحيوية للبكتيريا المرضية لدى مرضى جروح الحروق في محافظة البصرة، العراق

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الخلفية: تُعدّ الحروق سبباً رئيسياً للمرض والوفاة، كما تمثل العدوى البكتيرية مشكلة صحية عامة عالمية بالغة الأهمية.

الهدف: يهدف هذا البحث إلى دراسة توزيع الأنواع البكتيرية لدى مرضى الحروق في محافظة البصرة، والكشف عن أنماط مقاومتها تجاه المضادات الحيوية.

طرق العمل: جُمعت ١٩٢ عينة (٥٦ عينة دم و١٣٦ عينة من الجلد) من مرضى الحروق في مركز الفيحاء للحروق في البصرة، وتمّ تشخيص العزلات البكتيرية من خلال الاختبارات الكيموحيوية، استُعمل نظام VITEK لتأكيد تشخيص العزلات مع تحديد أنماط مقاومتها للمضادات الحيوية.

النتائج: من بين ١٣٦ عينة جلد جُمعت، أظهرت ٨٣% منها نمواً إيجابياً. من ١٤١ عزلة بكتيرية أُكتشفت، وُجد أن ٧٧,٣% منها هي بكتيريا سالبة لصبغة جرام، بينما سُجلت ٢٢,٧% على أنها بكتيريا موجبة لصبغة جرام. كانت البكتيريا الأكثر انتشاراً هي *Pseudomonas aeruginosa* بنسبة ٥٨,٩%، تلتها بكتيريا *Escherichia coli* بنسبة ١٠,٦%، ثم بكتيريا *Staphylococcus aureus* بنسبة ٩,٩%. أظهر ملف المضادات الحيوية لبكتيريا *P. aeruginosa* مقاومة شديدة لجميع المضادات الحيوية، باستثناء مضاد Colistin (٣,٦%). في المقابل، أظهرت جميع عزلات البكتيريا *S. aureus* مقاومة تجاه المضادات Cefoxitin و Benzylpenicillin و Oxacillin. بالنسبة لعينات الدم، لوحظ نمو إيجابي في ٢٨,٦% منها، ومن بين ١١ عزلة بكتيرية تم الحصول عليها، سجلت ٥٤,٥% منها على أنها بكتيريا موجبة لصبغة جرام و٤٥,٥% بكتيريا سالبة لصبغة جرام. كانت البكتيريا *Staphylococcus haemolyticus* هي السائدة من بين العزلات البكتيرية الموجبة للصبغة، وأظهرت مقاومة لمعظم المضادات الحيوية المختبرة. في حين أظهرت بكتيريا*Enterobacter cloacae* الأعلى انتشاراً بين البكتيريا السالبة للصبغة، وأبدت مقاومة لجميع المضادات الحيوية المختبرة باستثناء مضاد Minocycline (٥٠%)، ولم تُظهر أي مقاومة لمضاد Amikacin.

الاستنتاج: كانت البكتيريا *P. aeruginosa* هي العامل الأكثر شيوعاً المسبب للعدوى البكتيرية لدى مرضى الحروق في البصرة. جميع عزلات البكتيريا *S. aureus* كانت MRSA.