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PREVALENCE AND ANTIBIOTIC RESISTANCE PROFILES OF BACTERIAL ISOLATED FROM BURN WOUND INFECTIONS

Abdul Salam Abdul Sattar Abdul Azez
Department of Medical Laboratories Techniques , Al-Maarif University College, Al-Anbar Governorate, Iraq
abdulsalam.abdulsattar@uoa.edu.iq

luma N.abdulrazaq
Anbar Health Department, Heet general hospital, Anbar -Iraq.
Luma.abdulrazaq@gmail.com

Mohammed Nazhan Radaan Alqaisi
Anbar Health Department, Heet general hospital, Anbar -Iraq.

Mohammed Sabah Mohammed
Department of Medical Laboratories Techniques , Al-Maarif University College, Al-Anbar Governorate, Iraq

Hadeel Ahmed Kenoosh
Department of Medical Laboratories Techniques , Al-Maarif University College, Al-Anbar Governorate, Iraq.

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Abstract: Burn wound infections remain a sizeable assignment, especially because of the superiority of multidrug-resistant gram-negative organisms. The objective of this take a look at was to assess the superiority of bacterial infections in burn wounds, perceive the most not unusual bacterial species, and determine their antibiotic resistance profiles. A overall of eighty samples had been amassed from burn sufferers. Bacterial cultures were performed, and the isolated bacteria were identified using standard microbiological techniques. Antibiotic susceptibility testing was conducted using the disc diffusion method. In this study, 44 samples (73.3%) tested positive for bacterial growth. Pseudomonas sp. was the most commonly isolated bacteria (56%), followed by Staphylococcus aureus (22%) and others. Antibiotic resistance profiling revealed high resistance rates among the isolated bacteria, with Rifampicin showing the highest resistance rate (80%), followed by Cefotaxime (64%) and Amoxicillin (56%). The high prevalence of multidrug-resistant gram-negative organisms in burn wound infections underscores the urgent need for effective antibiotic management strategies. These findings highlight the importance of continuous surveillance of antibiotic resistance patterns and the development of tailored treatment protocols to mitigate the morbidity and mortality associated with burn wound infections. Additionally, there is a critical need for the development of new antimicrobial agents and infection control measures to combat the growing threat of antibiotic resistance in burn care settings.

Keywords: Pseudomonas aeruginosa ,Multidrug resistance ,Burn wounds infections ,Gram negative bacteria ,Pathogenic bacteria

Introduction

One of the maximum frequent trauma kinds requiring instantaneous clinical intervention is burn injuries1. After a burn injury, the pores and skin's herbal protecting systems are long past, which leads to a brief colonization of the wound surface. The wound mattress is first colonized with the aid of gram-negative organisms which can be derived from skin commensals, then through gram-negative organisms and yeasts2. Worldwide, two of the most usually remoted microbes from burn wounds are Pseudomonas aeruginosa and Staphylococcus species3.

In hospital medicine, bacterial growth following burn injuries is essential because burns impair the skin's and pores' defense systems, which take into account the wound site's rapid colonization4. Gram-negative bacteria originating from the afflicted person's private skin flora first colonize the wound. Afterwards, the area surrounding the wound may also get colonized by yeasts and gram-dreadful microbes. Two of the commonly isolated bacteria from burn injuries worldwide are Pseudomonas aeruginosa and Staphylococcus species5.

A major cause of death and morbidity for burn victims is wound sepsis, which is brought on by bacterial colonization. Similar to how nosocomial bacterial infections worsen the situation, they provide extremely difficult challenges for healthcare organizations and the healthcare sector at large. A number of factors, including as the kind of burn, extended hospital stays, the use of intrusive equipment, and the immunocompromising consequences of burns, increase the risk of infection and complications in burn patients. 6

One of the greatest challenges in treating bacterial infections in burn patients is the resistance of these microorganisms to antimicrobial treatments. Studies conducted globally have identified multidrug-resistant bacteria prevalent in burn units, including Acinetobacter baumannii, the bacterium Staphylococcus aureus, K. pneumoniae, Pseudomonas aeruginosa, and other coliform bacilli 5.

Both endogenous and foreign organisms can opportunistically colonize a burn site thanks to the favorable conditions it creates. The skin's barrier is broken by heat damage, which makes microbes more likely to infiltrate. After an accident, burn wounds are initially sterile, but over time, microbes begin to colonize them. Within the first 48 hours, gram-positive bacteria that withstand the heat stress—like S. aureus—fast colonize the wound surface. The current study's objectives were to identify, isolate, and assess the susceptibility of burn patients' bacterial wound infections to various antibiotics.7

Method

Sample Collection

Eighty burn patients with invasive burn wound infections, ranging in age from one to two sexes, provided 80 burn wound swabs.. The samples were from individuals who were hospitalized to Al-Ramadi Teaching Medical Hospital's burn unit. . The samples were inoculated into plates containing 5% blood agar, MacConkey agar, and chocolate agar. They were then incubated under aerobic conditions for a whole night at 37°C. The samples were also incubated overnight in Brain

Heart Infusion broth before being subcultured on Pseudomonas agar. After performing a Gram stain, the material was inoculated into Pseudomonas agar plates. According to conventional microbiological technique, the organisms were identified by colony morphology, gram staining, and biochemical responses.

Antibiotic Susceptibility test

In accordance with our hospital laboratory's procedure, antimicrobial susceptibility testing was also carried out utilizing the disk diffusion method (Kirby-Bauer, zone diameter). and CLSI guidelines of 2021. For P. aeruginosa , the tested antimicrobial drugs included The antibiotics listed include Cefotaxime (10 µg), Rifampicin (30 µg), Amoxicillin (100 µg), Gentamicin (30 µg), Tobramycin (Top), and Imipenem (10 µg). An isolate was classified as multidrug-resistant (MDR) if it demonstrated resistance to three or more different kinds of antimicrobial medications.

Statical analysis

The main tool used to enter the data collected for this study and generate descriptive statistics like mean and percentage was the Microsoft Excel Worksheet 2016 (Microsoft, USA). For data analysis, GraphPad Prism 8 (GraphPad Software, USA) was utilized.

Results

The burn patients provided a total of eighty-two samples, of which 92% were from female patients and 8% from male patients.Out of the eighty samples that were cultivated, sixteen (26.6%) showed no signs of bacterial development, and forty-four (73.3%) tested positive for bacteria. Overall, five different isolates were discovered, with Pseudomonas sp. being the most prevalent kind of bacteria.25 (56%) (Figure 1),(tabte 1&2). It was followed by Staphylococcus aureus 10 (22%). Fungi 3 (7%), Streptococcus sp.4 (9%), Klebsiella sp. 2 (5%).

Table 1: Distribution of Samples by Gender and Bacterial Culture Results

	Total Samples	Positive Samples	Negative Samples
Female	74 (92%)	40 (90.9%)	4 (100%)
Male	6 (8%)	4 (9.1%)	0
Total	80	44	16

Table 2: Distribution of Bacterial Isolates from Positive Samples

Bacterial Isolates	Number of Isolates	Percentage
Pseudomonas sp.	25	56%
Staphylococcus aureus	10	22%
Fungi	3	7%
Streptococcus sp.	4	9%
Klebsiella sp.	2	5%

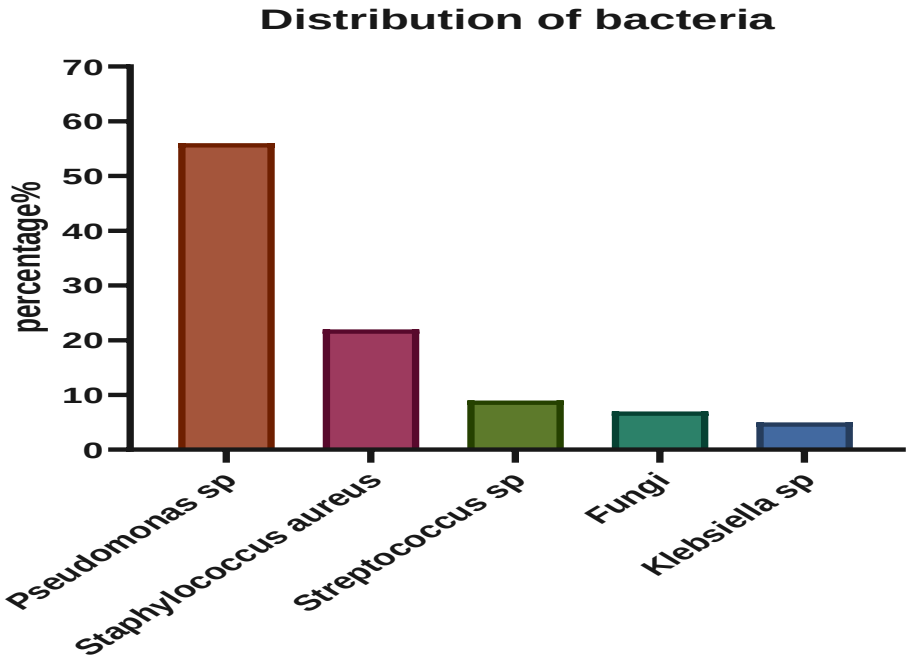

Figure 1: spread of the separated microorganisms. The graphic displays the percentage distribution of the bacterial isolates that were taken out of the sample.. Pseudomonas sp.25 was the most prevalent species, constituting 56% of the total isolates, followed by Staphylococcus aureus 10 at 22%. Fungi 3 accounted for 7%, while Streptococcus sp.4 and Klebsiella sp. 2 comprised 9% and 5% respectively.

Antibiotic resistance results showed as flowing:

P. aeruginosa exhibits a high resistance rate toward Cefotaxime (64%), suggesting potential bacterial resistance development. also Shows resistance to Rifampicin (80%), implying potential effectiveness against P.aeruginosa in many cases. P.aeruginosa displays moderate resistance to Amoxicillin (56%), indicating limited efficacy despite considerable resistance. Gentamicin and Tobramycin Both show similar resistance rates (around 48%), suggesting limited effectiveness against P.aeruginosa. Imipenem: Exhibits the lowest resistance rate (32%), implying potential efficacy despite existing resistance.figure 2.

Table 3: Antibiotic Resistance Rates of Bacterial Isolates

Antibiotics	Resistance Rate %
Cefotaxime (CTX)	64%
Rifampicin (R)	80%
Amoxicillin (Am)	56%
Gentamicin (CN)	48%
Tobramycin (Top)	48%
Imipenem (IPM)	32%

Table 1: illustrates the resistance levels of various antibiotics against P. aeruginosa. The columns indicate the resistance rates expressed as percentages. These rates reflect the proportion of bacterial isolates that exhibited resistance to each antibiotic. Higher resistance rates imply reduced efficacy of the antibiotic against the tested bacterial strains.

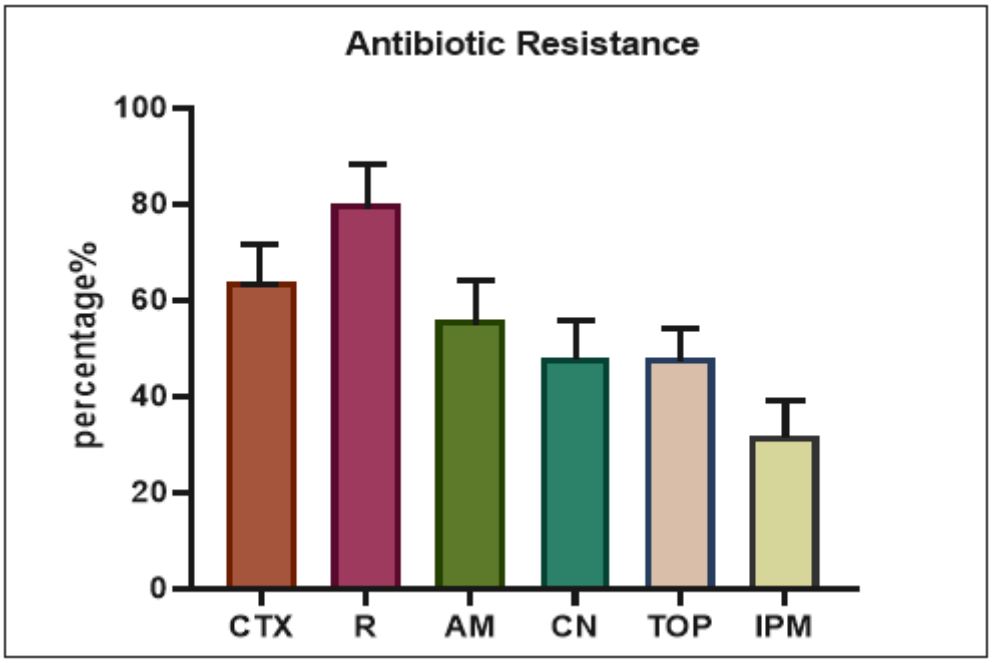

Figure 2: Illustrates the resistance levels of various antibiotics against P. aeruginosa .The antibiotics listed include Cefotaxime (CTX), Rifampicin (R), Amoxicillin (Am), Gentamicin (CN), Tobramycin (Top), and Imipenem (IPM).

Discussion

The frequency of burn injuries and the existence of resistant bacteria among patients at Al-Ramadi Teaching Hospital in Anbar Province are reported for the first time in this study. According to our research, there were 32 cases (92%), of burn injuries among females and just 18 cases (8%) among males. This is consistent with a research by Rao et al. (8), which was carried out in India and discovered that burn injuries were more common in women (56.9%) than in men (43.1%). The higher incidence of burns in women may be related to their increased activity in the kitchen.

Of the gram-negative bacteria recovered from burn sites, Pseudomonas aeruginosa (P.aeruginosa) accounted for 56%, with Staphylococcus aureus coming in second with 22%. The majority of the isolates in this investigation were gram-negative bacteria. Streptococcus sp. (9%), Klebsiella sp. 2 (5%), and fungi (7%). These findings corroborate those of Hotri et al., who found that P. aeruginosa was the most often isolated bacterium from burn injuries, with St. aureus and Alwan et al. coming a close second.9 revealed that S. aureus (24.4%) and P. aeruginosa (48.9%) were the two most frequent isolates. Apart from mcps, f., our study revealed that Pseudomonas aeruginosa (P. aeruginosa) accounted for 54.40% of all isolates, while Staphylococcus aureus (S. aureus) came in second with 22.00%11.

Based on the antimicrobial susceptibility pattern of the different gram-negative isolates from the burn patients, Pseudomonas sp. was shown to be resistant to Cefotaxime, Rifampicin, Amoxicillin, Gentamicin, Tobramycin, and Imipenem. Additionally, the analysis revealed that Pseudomonas sp. exhibited resistance to both cefotaxime and tetracycline. Our findings are consistent with those of 12 who reported having a cefotaxime resistance (34.9%), and with 13. demonstrating that P. aeruginosa is a multi-drug resistant pathogen in burns and wounds, this has led to an increase in the pathogen's susceptibility to commonly used antibiotics; the overuse of antibiotics that are available and used as prophylactic or therapeutic measures; and the introduction of broad spectrum antibiotics like imipenem that can be beneficial in treating patients with burn or wound infections)14. Different study populations, varied antibiotic regimens, heavy use of the antimicrobial drugs under study in those settings, persistent presence of resistant strains in hospitals, cross-contamination from laboratory environments during culturing, or inadequate hygiene in the hospital environments under study15 could all be contributing factors to this disparity.

Conclusion

The study's findings indicate that gram-negative, multidrug-resistant bacteria make up a large portion of isolates from burn injuries. Therefore, a cautious approach to antibiotic selection is essential for effectively managing these infections, aiming to mitigate the morbidity and mortality linked with multidrug-resistant bacteria.

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