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Maha salman Ali

Neeran Obied Jasim

ARTICLE

Microbial Species Isolated From Infected Wounds and Burns

Maha S. Ali, Neeran O. Jasim*

College of Science, University of Al-Qadisiyah, Iraq

Abstract

The goal of the current investigation was to separate and characterize the microbes linked to burn injuries. From burn patients admitted to the burn unit of Al-Diwaniyah Teaching Hospital in Diwaniyah City, Iraq, a total of 120 burn wound swabs were collected. The swabs were cultivated on various medium, and the phenotypic and cultural traits were used to diagnosis the colonies. Gram staining and cultural characteristics allowed VITEK® 2 Compact Automated Systems to diagnosis the bacteria. And in the case of fungi, both macro and micro traits were important. *Pseudomonas aeruginosa* was the most prevalent pathogen among the five different bacterial isolates, accounting for 25.2% of the total. Other common pathogens included *Staphylococcus aureus* (23.3%), *Escherichia coli* (15.3%), *Klebsiella pneumonia* (9.8%), and *Enterococcus faecalis* (6.8%). And two isolated fungus species, *Aspergillus niger* [2.4%) and *Candida glabrata* [17.2%].

Keywords: Bacteria, Fungi, Wounds, Burns infected wounds, Co-infections

1. Introduction

The skin acts as a barrier of defense to prevent pathogen invasion. Consequently, a wound arises from the disruption of the normal anatomical structure caused by surgical procedures or by chemical, physical, mechanical, and thermal events, together with a change in the functions of the skin [1]. Skin is more susceptible to pathogen colonization because it is exposed to wounds, scrapes, and interaction with the outside world [2–4].

There are two types of wounds: acute and chronic. Acute wounds are produced by external sources and heal via the normal phases of wound repair, such as cuts, burns, abrasions, and surgical wounds. A wound that is infected impairs both the wound's healing rate and quality of life [5]. In surgical patients, wound infections account for one-third of nosocomial infections and produce 70–80% of mortality [6,7]. Regardless of the type of wound, wound infections are linked to patient morbidity and mortality, particularly in developing countries [8]. It takes a while, sufficient equipment, and trained personnel to diagnose an illness [9,10]. And it typically depends on microbiological analysis, infection biomarker identification, and wound examination [11]. Conversely, chronic wounds—such as leg or artery ulcers—heal more slowly and are brought on by internal variables that may be linked to autoimmune disorders or diseases like diabetes [10]. Many pathogens, including bacteria, viruses, and fungal parasites, can cause skin infections because the deeper tissues of the skin provide an ideal environment for their colonization and growth.

Pseudomonas aeruginosa, *Staphylococcus aureus*, *Klebsiella pneumonia*, *Enterococcus faecalis*, and *Acinetobacter baumannii* are the most frequent bacterial species that cause wound infections. Specifically, during the first week of infection, Gram-positive bacteria—particularly *S. aureus*—seem to be the most common invaders [12,13]. Clinicians may find that the published data provides guidance on how

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* Corresponding author.
E-mail address: neran.jasim@qu.edu.iq (N.O. Jasim).

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to improve wound infection surveillance, prevention, and control.

2. Material and methods

2.1. Collection of specimens

From October 2023 to December 2023, 120 wound swab specimens were taken from burn patients who had been admitted to the Al-Diwaniyah Teaching Hospital. This study investigated both the first and second degrees of burn.

2.2. Specimens preparation

The sample was taken from the various burn areas, particularly the hands, legs, and chest.

2.3. Microbiological analysis of specimens from burn wounds

Plate culture method: all specimens were inoculated using the spread plate method on 5% Blood agar, MacConkey, and Mannitol salt agar in an aseptic environment within a laminar airflow cabinet. The culture plates were then aerobically incubated for the entire night at 37 C. employing a colony counter to isolate microbes based on their total viable count. All bacterial species were isolated and identified using blood agar, whereas gram-negative bacteria (such as E. Coli and Klebsiella spp.) were grown on MacConkey agar. For Pseudomonas and Staphylococcus species, use mannitol salt agar. Next, morphology, color, and shape are examined under a microscope and gram staining is used to determine whether an organism is gram positive or negative. Addition, used Sabouraud's Dextrose Agar for fungi (yeast and molds).

Table 1. Sample distribution.

No. of specimens	%
108	90
12	10
120	100

Table 2. Types of infection.

Type of infection	No. of specimens	%
Bacteria	76	70.4
Fungi	32	29.6
total	108	100

2.4. Identification of strains

Identify the bacteria from isolated samples by using Vitek advice and for yeast using Api test while molds Identified depending of the macro and micro features.

3. Results and discussion

Microorganism prevalence in burn wound samples, out of 120 samples, 108 were found to be hugely populated with bacteria and fungi Table 1.

Table 2 Appear predominant bacterial infection than the fungal. Its show 76 specimens for bacterial infection with 70.4% and 32 for fungal infection with 29.6%. This result may be due to the fact that the research sample was limited, as the epidemiological study requires a study for a full year and in different seasons.

The predominant pathogen was *P. aeruginosa*. with 41 (25.2%) isolates followed by *S. aureus* (38, 23.3%), *Candida glabrata* (28, 17.2%), *Escherichia coli* (25, 15.3%), *Klebsiella pneumonia* (16, 9.8%), *E. faecalis* (11, 6.8%)and *Aspergillus niger* (4, 2.4%) (see Fig. 1). Table 3, Fig. 2.

Figures 3 and 4 appear the genera of bacteria and fungi that isolated from specimens and their characteristic in different media and under light microscope this accordant with [14–16].

Fig. 1. Api test for yeast.

Table 3. No. of isolates and percentage.

genus	No. of isolates	%
Pseudomonas aeruginosa	41	25.2
Staphylococcus aureus	38	23.3
Candida glabrata	28	17.2
E.coli	25	15.3
Klebsiella pneumonia	16	9.8
Enterococcus faecalis	11	6.8
Aspergillus niger	4	2.4
Total	136	100%

Many studies accordance with this study, [17]. which found Of all the samples, it was discovered that 28 had 107 CFU/mL of live bacteria in them. Pseudomonas spp. was the most common pathogen, followed by Klebsiella spp. And *S. aureus*. Enterobacter species were found in three of the samples. While [18]. were shown to be growing with *E. coli*. Also [19]. reported in his study that *P. aeruginosa* accounted for 41 specimens (24.91%) of the 158 bacterial isolates. This was followed by 38 specimens (24.05%) of *S. aureus*, 27 (17.09%) of Acinetobacter, 24 (15.19%) of Klebsiella, 13 (8.23%) of *E. coli*, 7 (4.43%) of Proteus, 6 (3.8%) of other coliforms, 1 (0.63%) and 1 (0.63%) of Enterobacter. Additionally [20], has generally shown that more types of fungal species were found in wound swabs than in burn samples. The most common fungal species found was Cryptococcus laurentii, accounting for 40% of the samples, followed by *Stephanoascus ciferri* (23%), and *A. niger* (11%). Other fungal species were found in smaller percentages.

Fungal agent infections resulting from burns are not uncommon in any society or setting since there are numerous risk factors for infection. Because of this, the current investigation looked for a variety of fungal burn etiologies following patient admission.

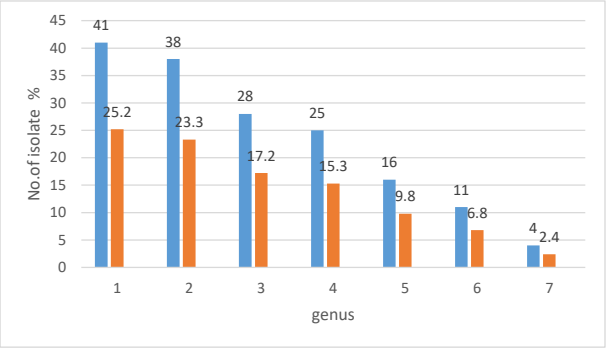

Fig. 2. No. of isolates and percentage.

The findings are consistent with recent research [21–23] and further support the need for strict treatment in hospital burn units. The detailed profile of the bacteria that predominate in burn wounds can be obtained through routine monitoring of burn infections using the primary experiments outlined above. This information is relevant for the management of public health as a whole.

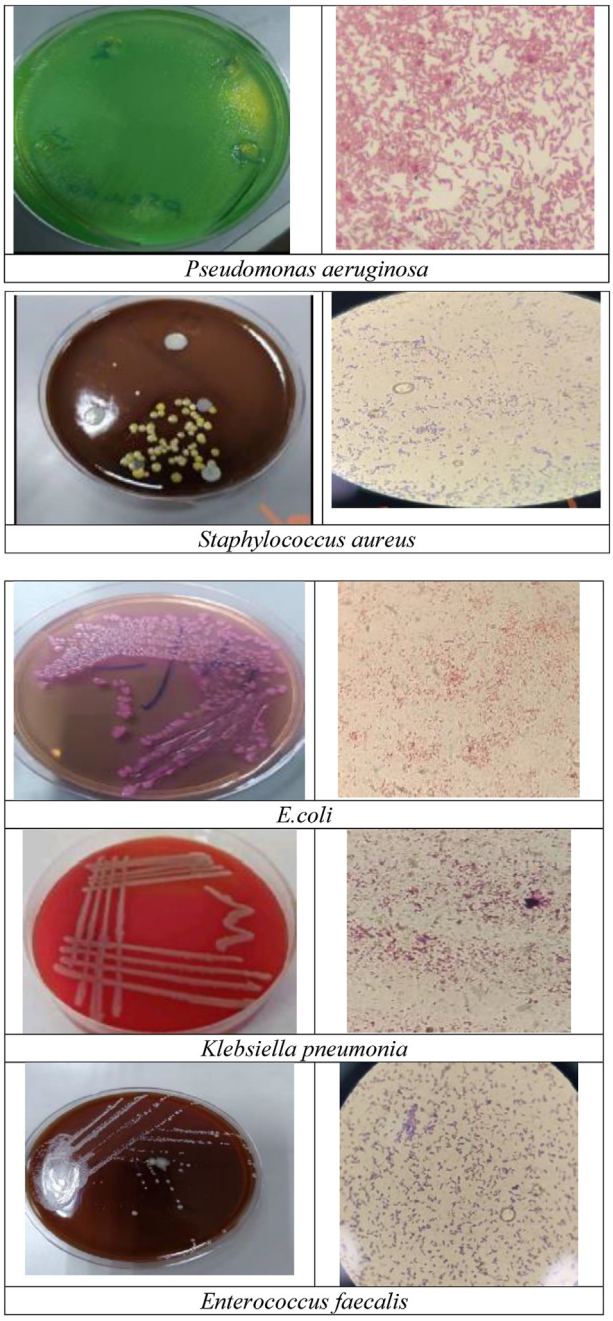

Fig. 3. Genera of bacteria isolated from clinical specimens.

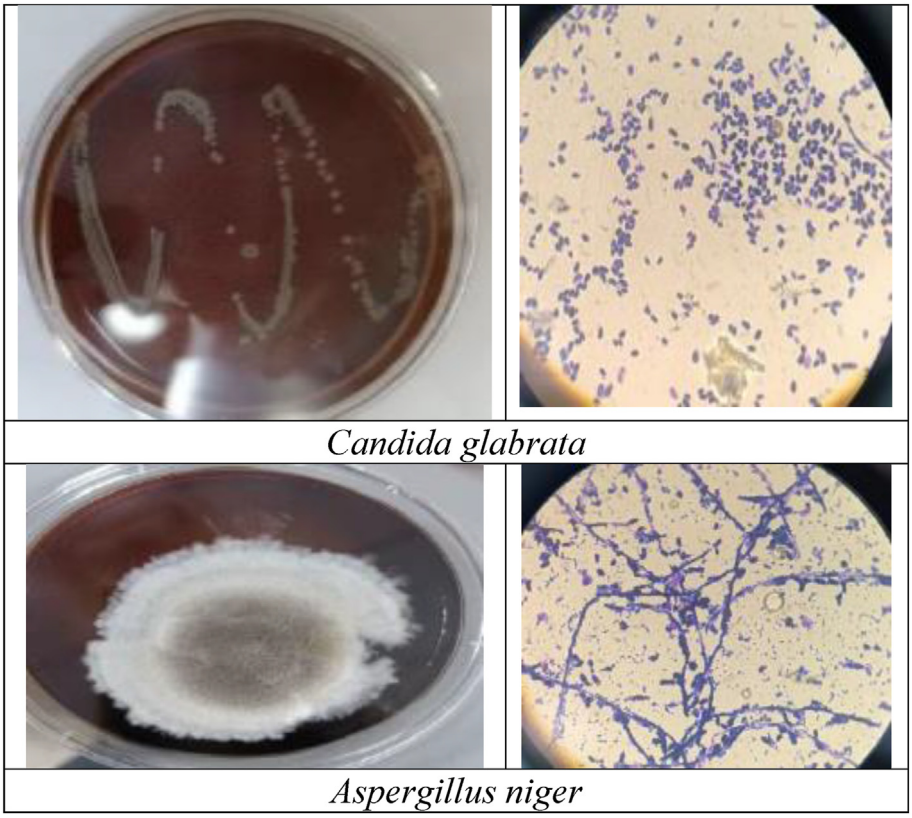

Fig. 4. Genera of fungi isolated from clinical specimens.

4. Conclusion

Our research showed a significant increase in the number of microorganisms in the burn wound samples that we examined. These findings are consistent with recent studies and further support the need for strict treatment in hospital burn units. Regular burn infection monitoring using the main experiments outlined here would be useful in providing a comprehensive profile of the bacteria that predominate in burn wounds and would therefore be relevant to the management of public health as a whole.

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References

[1] Maillard JY, Kampf G, Cooper R. Antimicrobial stewardship of antiseptics that are pertinent to wounds: the need for a united approach. JAC Antimicrob Resist 2021;3:dlab027.
[2] Simões D, Miguel SP, Ribeiro MP, Coutinho P, Mendonça AG, Correia IJ. Recent advances on antimicrobial wound dressing: a review. Eur J Pharm Biopharm 2018;127:130–41.
[3] Van Koppen CJ, Hartmann RW. Advances in the treatment of chronic wounds: a patent review. Expert Opin Ther Pat 2015;8:931–7 [CrossRef].
[4] Negut I, Grumezescu V, Grumezescu AM. Treatment strategies for infected wounds. Molecules 2018;9:2392.
[5] Pallavali RR, Degati VL, Lomada D, Reddy MC, Durbaka VRP. Isolation and in vitro evaluation of bacteriophages against MDR-bacterial isolates from septic wound infections. PLoS One 2017;12:e0179245.
[6] Anguzu JR, Olila D. Drug sensitivity patterns of bacterial isolates from septic post-operative wounds in a regional referralhospital in Uganda. Afr Health Sci 2007;7:148–54.
[7] Mehta RL, Kellum JA, Shah SV, Molitoris BA, Ronco C, Warnock DG, et al. Acute kidney injury network. AcuteKidney injury network: report of an initiative to improve outcomes in acute kidney injury. Crit Care 2007;11:R31.
[8] Agnihotri N, Gupta V, Joshi RM. Aerobic bacterial isolates from burn wound infections and their antibiograms–a five-year study. Burns 2004;30:241–3.
[9] Puca V, Traini T, Guarnieri S, Carradori S, Sisto F, Macchione N, et al. The antibiofilm effect of a medical device containing TIAB on microorganisms associated with surgical site infection. Molecules 2019;24:2280.
[10] Taati Moghadam M, Khoshbayan A, Chegini Z, Farahani I, Shariati A. Bacteriophages, a new therapeutic solution for inhibiting multidrug-resistant bacteria CausingWound infection: lesson from animal models and clinical trials. Drug Des Dev Ther 2020;14:1867.
[11] Khan HA, Baig KF, Mehboob R. Nosocomial infections: epidemiology, prevention, control and surveillance. Asian Pac J Trop Biomed 2017;7:478–82.
[12] Glik J, Kawecki M, Gaździk T, Nowak M. The impact of the types of microorganisms isolated from blood and wounds on theresults of treatment in burn patients with sepsis. Pol Przegl Chir 2012;84:6–16.
[13] Huszczynski SM, Lam JS, Khursigara CM. The role of Pseudomonas aeruginosa lipopolysaccharide in bacterial pathogenesis and physiology. Pathogens 2019;9:6.

[14] von Arx JA, Guarro J, Figueras MJ. Mycosphere the Ascomycete Genus Chaetomium. Beihefte zur Nova Hedwigia 1986;84:1–162.
[15] Raper KB, Fennel DI. The genus Aspergillus. Baltimore: Williams & Wilkins; 1965. p. 686.
[16] Murray PR. Basic medical microbiology E-book. Elsevier Health Sciences; 2017.
[17] Alam SMS, Kalam MA, Munna MS, Munshi SK, Noor R. Isolation of pathogenic microorganisms from burn patients admitted in Dhaka Medical College and Hospital and demonstration of their drug-resistance traits. Asian Pacific J Trop Disease 2014;4(5):402–7.
[18] Askarian M, Hosseini RS, Kheirandish P, Assadian O. Incidence and outcome of nosocomial infections in female burn patients in Shiraz, Iran. Am J Infect Control 2004;32(1):23–6.
[19] Chaudhary NA, Munawar MD, Khan MT, Rehan K, Sadiq A, Bhatti HW, et al. Epidemiology, bacteriological profile, and antibiotic sensitivity pattern of burn wounds in the burn unit of a tertiary care hospital. Cureus 2019;11(6).
[20] Yassin NA, Oumeri NMQ. Identification of Fungi in burn wounds using conventional and Vitek system in Duhok City, Iraq. Sci J Univ Zakho 2020;8(2):62–5.
[21] Saaiq M, Ahmad S, Zaib MS. Burn wound infections and antibiotic susceptibility patterns at Pakistan Institute of Medical Sciences, Islamabad, Pakistan. World J Plast Surg 2015;4:9–15.
[22] Sharma L, Srivastava H, Pipal DK, Dhawan R, Purohit PM, Bhargava A. Bacteriological profile of burn patients and antimicrobial susceptibility pattern of burn wound isolates. Int Surg J 2017;4:1019–23.
[23] Datta S, Ghosh T, Sarkar D, Tudu NK, Chatterjee TK, Jana A. Bacteriological profile of burn wounds and their antibiotic susceptibility pattern in a tertiary care hospital. august-2016.html Int J Sci Stud. 2016;4:141–5.