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Microbiological Profile of Burn Accidents Among Patients Admitted to Imam Al-Sadiq Teaching Hospital in Babylon, Iraq

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ORIGINAL ARTICLE

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Microbiological Profile of Burn Accidents Among Patients Admitted to Imam Al-Sadiq Teaching Hospital in Babylon, Iraq

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Abstract

Background: Burns constituted the fourth cause of injury particularly in developing countries including Iraq.

Objectives: to identify the bacterial isolates from infected burn injury wounds among patients who were admitted to Al-Sadiq Teaching Hospital – Babylon Province – Iraq.

Methodology: This was a hospital-based cross-sectional study conducted on all acute burn injury cases who were admitted to the biggest teaching hospital in Babylon Province – Iraq during the period from the first of January to the end of June, 2020. Data were collected from patients themselves or their companions and from patients' hospital records, using a pretested questionnaire designed for collection the requested information that included demographic data, burns characteristics and the outcome of wound culture to determine the bacterial isolates of the infected burns wounds.

Results: A sample of 120 cases with burn injuries were investigated. Out of 120 cases with burn injuries, a sample of 58 patients who investigated for microbial infections enrolled in this study. The median age of participants was 16.5 years, ranged (four months – 65 years); children of age 1–9 years old represented 36% of them. The adolescents and children aged ≤18 years accounted 55% of the all. Male to female ratio 1.07:1. More than two third of them resident in rural area. The most common species were Gram Negative Bacteria constituted 83%, mainly Nonspecific Gram-Negative Bacteria, *Pseudomonas spp.* and *Burkholderia cepacia* followed by Gram Positive Bacteria especially *Streptococcus pyogenes* and *Staphylococcus aureus*.

Conclusion: The most common bacterial isolates infecting wounds injuries in this study are gram–ve bacteria mainly *Klebsiella* SPP followed by *Pseudomonas aerogenosa*. A new preventive strategy is requested to address this high priority burn problem.

Keywords: Bacterial isolates, *Klebsiella*, Burns wound, *Pseudomonas*, Babylon

1. Introduction

World Health Organization stated that burns are the most destructive traumas worldwide [1], epidemiological studies can be of great benefit in improvement of burn management [2].

Burn injuries are mainly occurred in developing countries due to low awareness for preventing burns [3]. Infection in burn wounds is still considered as the most important cause of disability and mortality in all ages and in both developed and developing countries [4–7]. Burned patients are at a very high risk for nosocomial infections by multi resistant bacteria, a large proportion of which are gram negative [8]. Seventy-five percent of all deaths are currently related to sepsis from burn wound infections [9]. The spread

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of this organism in health facilities is very dangerous, with infiltrates, via any defect at the basic defense line of the human host, especially in the hospital intensive care units [10]. *P. aeruginosa* pathogenesis is multifactorial, due to the existence of multiple mechanisms of veritable resistance to most antibiotics, resulting in the production of a variable set of cellular structures and extracellular molecules which play a significant role in increasing pathogenicity [11].

Wounds in burns lack the epidermis and lack the efficient circulation that is why they are the best suitable culture media for bacterial growth. After few hours the burn wound surface become infected. Some of these bacteria have certain enzymes to dissolve tissues and some of these bacteria have flagella and very good motility to pass through the dead tissue [12, 13]. Different microorganisms have been identified to be associated with burn wound infection [14].

Studies on burn injury characteristics and the types of isolated bacteria from infected burn wounds are scarce [15, 16]. This study was conducted to identify the bacterial isolates from burn wounds of patients admitted to tertiary care burn unit in Babylon Governorate – Iraq.

2. Materials and methods

2.1. Study design and patients

This was a hospital-based cross-sectional study conducted on all burn cases admitted to Al Sadiq Teaching Hospital – Babylon Province – Iraq. This hospital is the biggest general teaching hospital in the governorate. This hospital serves the population of Babylon province, which located in the south-central region of Iraq and populated about two million inhabitants. The period of study started from the beginning of January 2020 through the end of April 2020. Data were collected from burn injured patients themselves or their companions and from patients' hospital records, using a pretested patients on antimicrobial therapy were excluded from the study.

A single wound swab was taken from each patient prior to wound dressing. Swabs were taken from areas that appeared deep, with discharge, and the swabs were immediately transported to the Microbiology Laboratory for culture and sensitivity.

2.2. Ethical consideration

The study was carried out in accordance with the ethical standards that have their origin in the Helsinki Declaration. All subjects involved in this work are informed and the agreement was obtained verbally from each one before the collection of the samples.

Table 1. Demographic description of sample (N = 58).

Variables	Frequency	%
Age groups (Years)		
≥60	2	3.4
50–59	2	3.4
40–49	6	10.4
30–39	3	5.2
20–29	13	22.4
10–19	8	14
1–9	21	36
<1	3	5.2
Gender		
Male	30	52
Female	28	48
Place		
Rural	41	71
Urban	17	29

This study was approved by a local committee on publication ethics at Babil Health Directorate.

3. Results

Out of 120 cases with burn injuries, a sample of 58 patients who investigated for microbial infections enrolled in this study. The median age of participants was 16.5 years, ranged (4 months–65 years); children of age 1–9 years old represented 36% of them. The adolescents and children aged ≤18 years accounted 55% of the all. Male to female ratio 1.07:1. More than two third of them resident in rural area (Table 1).

The median duration of admission to hospital was 9 days. The outcome of accidents was 79% of patients cured and discharged, and 21% dead, (Fig. 1). One third of patients treated with standard intervention wound excision and skin graft and two-third treated conservatively, (Fig. 2).

The median of total body surface area (TBSA) was 19.5% and 59% of patients present with TBSA ≤20%. More than one-half (57%) of burns scalded by a hot

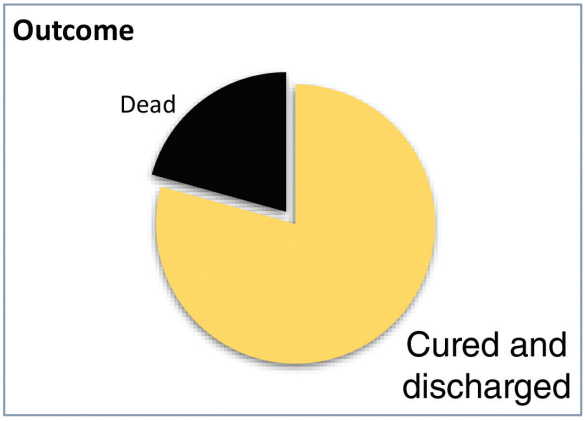

Fig. 1. Outcome of accident (N = 58).

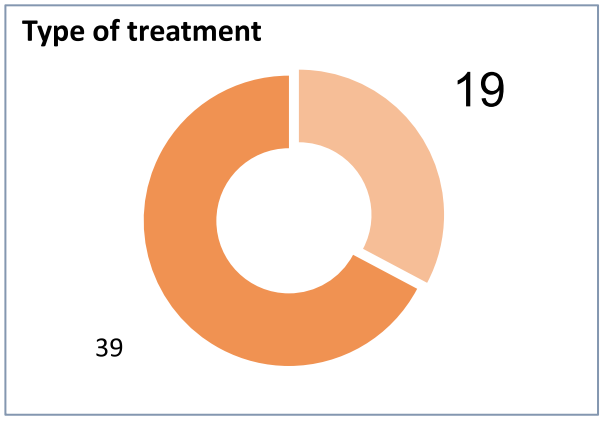

Fig. 2. Distribution of cases based on type of treatment (N = 58). Nineteen patients treated with wound excision and skin graft and 39 patients treated conservatively.

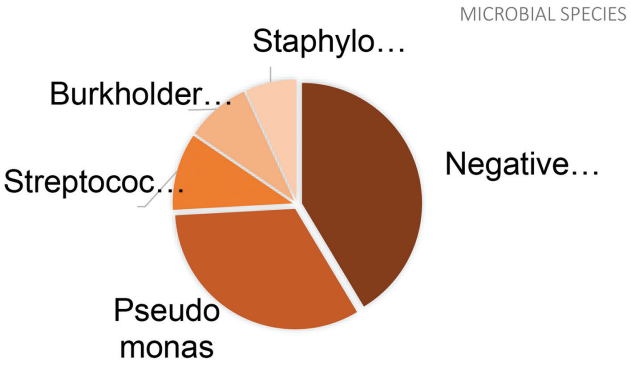

Fig. 3. Distribution of microbial cultures among patients (N = 58).

liquid followed by flame (41%) and electrical (2%). Findings indicated that Nonspecific Gram-Negative Bacteria detected in 41% of the sample, *Pseudomonas spp.* detected in 33% of patients, (Fig. 3).

Table 2, depicts the types of types of bacterial isolates recovered from the burned wounds of 58 patients. The most common species were Gram Negative Bacteria constituted 83%, mainly Nonspecific Gram-Negative Bacteria, *Pseudomonas spp.* and *Burkholderia cepacia* followed by Gram Positive Bacteria especially *Streptococcus pyrogens* and *Staphylococcus aureus*. However, G–ve Bacteria and *Staphylococcus aureus* detected mostly in patients scalded by hot liquid, those with 2nd degree while *Pseudomonas Spp.* and *Streptococcus pyogenes* detected on the whole in patients burned with flame and presented with 3rd. and mixed degree.

4. Discussion

Identification of bacterial flora in the infected burn wounds and methods for management or prevention of burn wound infection is one of the essential first steps in burn wound care that may safe patients' lives [17].

Unfortunately, in the current study, more than half of burned patients have missed or un meticulous records for bacteria isolation or may be not tested for culture and sensitivity or using antibiotics before doing culture and sensitivity tests. Gram–ve bacteria are the most common isolates from burn wounds in the current study, this finding is similar to the finding reported by other study conducted in India by Srinivasan et al. [18].

But, in contrast with the findings of other studies, in one study Out 43 patients, *Pseudomonas spp.* was the most predominant bacteria associated with the burn wounds infection. In contrast to the finding of this study that shows that *Pseudomonas spp.* constituted the second more common isolated pathogenic bacteria as reported by the study carried out by Lakshmi et al. from India, which reported *Pseudomonas spp.* as the most common isolate in burn wounds with a prevalence of 33.6% [19]. The result of this study, however, is also in contrast to the study

Table 2. Distribution of burned patients with microbiological test by types of bactria (N = 58).

Variables	Microorganisms					Sig.*
	Pseudomonas spp.	*Streptococcus pyogenes*	*Staphylococcus aureus*	*Burkholderia cepacia*	Other gram negative bacteria	
Etiology						0.036
Flame (n = 24)	12 (63%)	4 (67%)	–	2 (40%)	6 (25%)	
Hot liquid (n = 33)	7 (37%)	2 (33%)	4 (100%)	3 (60%)	17 (71%)	
Electric (n = 1)	–	–	–	–	1 (4%)	
Burn degree						0.068
2nd. (n = 28)	5 (26%)	2 (33%)	3 (75%)	2 (40%)	16 (67%)	
3rd. and mixed (n = 30)	14 (74%)	4 (67%)	1 (25%)	3 (60%)	8 (33%)	
How burn occurred?						0.185**
Accidental (n = 54)	16 (84%)	6 (100%)	4 (100%)	4 (80%)	24 (100%)	
Suicidal (n = 4)	3 (16%)	–	–	1 (20%)	–	

*Chi-Square test.
**Cramer's V.

conducted by Chaudhary et al. in Nepal [20] and Rao et al. [21]

In India, which reported *S. aureus* as the most prevalent isolates correlated with infected burn wounds with a percentage of 28.71% and 42% respectively. The differences in isolated bacterial isolates in infected burn wounds may be due to a variation in treatment or the misuse and malpractices in wound care in different geographical settings of burn victims [22].

Pseudomonas aerogenosa species is the serious microorganism causing infection in this study which is usually resistant to most of the available well known antibiotics, this finding is similar to the finding reported by other local studies conducted in Baghdad hospitals by Hamed et al. and other local study carried out in Thi-Qar province [23, 24] and supported by other studies that explained one of the most important highly prevalent bacteria isolated from burn wounds which was *P. aeroginosa* [25–28] but, some other studies emphasize the high prevalent of other bacteria in burn wounds infection [29–31].

5. Conclusion

Results of this study suggest that gram-negative organisms are the most common bacterial isolates followed by *Pseudomonas spp*. from burn wounds infections at hospital in Babylon, Iraq.

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Conflict of interest

The authors declare that there is no conflict of interest.

References

1. World Health Organization. Burns [Fact sheet]. 2016. http://www.who.int/mediacentre/factsheets/fs365/en/. Accessed 7 Jul 2017.
2. Bahçe ZS, Öztaş T. Epidemiological analysis of patients with burns in third-line hospitals in Turkey. Int Wound J. 2020;17(5):1439–43.
3. Rybarczyk MM, Schafer JM, Elm CM, Sarvepalli S, Vaswani PA, Balhara KS, *et al.* Prevention of burn injuries in low- and middle-income countries: a systematic review. Burns. 2016;42(6):1183–92.
4. Pasalar M, Mohammadi AA, Rajaeefard AR, Neghab M, Tolidie HRm, Mehrabani D. Epidemiology of burns during pregnancy in southern Iran: effect on maternal and fetal outcomes. World Appl Sci J 2013;28:153–8.
5. Al-Charrakh AH, Al-Awadi SJ, Mohammed AS. Detection of metallo-β-lactamase producing Pseudomonas aeruginosa isolated from public and private hospitals in Baghdad, Iraq. Acta Med Iran. 2016;54:107–13.
6. Kadhim TA, Al Sa'ady AT, Khayoon HA, Hameed DM, Hussain SS, Kareem AS, *et al.* The bacterial contamination in the burn unit of Al-Hussain Teaching Hospital at Al-Samawa city, Iraq. Med J Babylon. 2023;20:357–61.
7. Radhi SH, Al-Charrakh AH. Occurrence of MBLs and carbapenemases among MDR and XDR Acinetobacter baumannii isolated from hospitals in Iraq. Indian J Publ Health Res Dev. 2019;10:668–74.
8. Alharbi AS, Zayed ME. Antibacterial susceptibility of bacteria isolated from burns and wounds of cancer patients. J Saudi Chem Soc. 2014;18:3–11.
9. Rafla K Tredget EE. Infection control in the burn unit. Burns. 2011;37(1):5–15.
10. Farahi RM, Ali AA, Gharavi S. Characterization of gyrA and parC mutations in ciprofloxacin-resistant *Pseudomonas aeruginosa* isolates from Tehran hospitals in Iran. Iran J Microbiol. 2018;10(4):242–9.
11. Bunyan IA, Hadi OM, Al-Mansoori HA. Molecular detection of metallobeta-lactamase producing *Pseudomonas aeruginosa* isolated from different sites of infection. J Pharm Sci. 2018;10(5):1072–8.
12. Essayagh M, Essayagh T, Essayagh S, El Hamzaoui S. Epidemiology of burn wound infection in Rabat, Morocco: three-year review. Med Sante Trop. 2014;24(2):157–64.
13. Sewunet T, Demissie Y, Mihret A, Abebe T. Bacterial profile and antimicrobial susceptibility pattern of isolates among burn patients at Yekatit 12 Hospital Burn Center, Addis Ababa, Ethiopia. Ethiop J Health Sci. 2013;23(3):209–16.
14. Patil P, Joshi S, Bharadwaj R. Aerobic bacterial infections in a burns unit of Sassoon General Hospital, Pune. Int J Healthcare Biomed Res. 2015;3(3):106–12.
15. Lami FH, Al Naser RK. Epidemiological characteristics of burn injuries in Iraq: a burn hospital-based study. Burns. 2019;45(2):479–83.
16. Allawi BSA, Baiee HA, Baiee AH. Burn injury characteristics and outcomes among hospitalized patients in tertiary burn unit. Med Legal Update. 2020;20(2):764–9.
17. Emami SA, Karimi H, Alijanpour A. Epidemiology of burn wound infection and its antibacterial resistance, burn registry program. Merit Res J Med Med Sci. 2015;3(4):135–9.
18. Srinivasan S. Vartak AM, Patil A, Saldanha J. Bacteriology of the burn wound at the Bai Jerbal Hospital for children, Mumbai, India. Indian J Plast Surg. 2009;42(2):213–8.
19. Lakshmi N, Ramalakshni K, Perala KB, Jayalaxmi M. Bacteriological profile and antibiogram of burn wound infections in a tertiary care hospital. J Dent Med Sci. 2015;14(10):1–4.
20. Chaudhary P, Shakya C, Pokhrel SR, Shrestha B. Prospective study on bacterial isolates with their antibiotic susceptibility pattern from pus (wound) sample in Kathmandu Model Hospital. Int J Med Sci. 2015;1(1):15–22.
21. Rao SR, Lakshmi LJ, Pavani S, Kawle V, Prakash SJ. Bacteriological profile, antibiogram of burn wound isolates and detection of MRSA and ESBL production at tertiary care hospital, Hyderabad. World J Pharm Pharm Sci. 2014;3(10):1691–8.
22. Ananthakrishanan A, Kanungo R, Kumar K, Badrinath S. Detection of extended spectrum beta lactamase producers among surgical wound infections and burns patients in JIPMER. Indian J Med Microbiol. 2002;18:160–5.
23. Farhood AH, Chelab RL. Isolation and Identification of Bacteria from burn injuries by 16S rRNA Gene. J Coll Educ. 2017;7(1):126–39.
24. Hamed SL, Rasool Khetam H, Hussein N, Taha BM. Prevalence of bacteria isolated from patients with burn infection at a burn hospital in Baghdad and study of their antimicrobial susceptibility patterns. AL-Kindy Col Med J. 2016;12(1):64–7.
25. Turner KH, Everett J, Trivedi U, Rumbaugh KP, Whiteley M. Requirements for *Pseudomonas aeruginosa* acute burn and chronic surgical wound infection. PLoS One. 2014;10(7): e1004518.
26. Azzopardi EA, Azzopardi E, Camilleri L, Villapalos J, Boyce DE, Dziewulski P, *et al.* Gram negative wound infection in

hospitalized adult burn patients-systematic review and meta-analysis. PLoS One. 2014;9(4):e95042.
27. Dou Y, Zhang Q. Analysis of drug resistance of *Pseudomonas aeruginosa* and use of antibiotics in burn wards during 6 year. Zhonghua Shao Shang Za Zhi. 2014;30(1):9–14.
28. Al-Ansary M, Al-Charrakh A. Flagellin b shifting the immune response against *P. aeruginosa* respiratory infections from chronic to cure state. Lat Am J Pharm. 2023;42:55–60.
29. Belba MK, Petrela EY, Belba AG. Epidemiology of infections in a burn unit, Albania. Burns. 2013;39(7):1456–67.
30. Lee HG, Jang J, Choi JE, Chung DC, Han JW, Woo H, *et al.* Blood stream infections in patients in the burn intensive care unit. Infect Chemother. 2013;45(2):194–201.
31. Baiee HA. Antimicrobial Prescriptions by Practicing Physicians in Southern District, Babylon Governorate and Its Correlates. Hilla Univ Coll J Med Sci. 1(1):47–66.