EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 11
Issue: 6
17-22
Year: 2024

ISOLATION OF BACTERIAL PATHOGENS FROM BURN WOUNDS

Hasan Fadhil Kudhair*, Abeer Thaher Naji Al-Hasnawi and Ali Jalil Ali Alyassery

College of Medicine, University of Kerbala, Karbala, Iraq.

***Corresponding Author: Hasan Fadhil Kudhair**
College of Medicine, University of Kerbala, Karbala, Iraq.

Article Received on 08/04/2024 **Article Revised on 29/04/2024** **Article Accepted on 18/05/2024**

ABSTRACT
A burn is an injury to the skin or other tissue caused by heat or radiation, electricity, friction, or contact with chemicals. Nosocomial infections are the primary cause of burn wound infections in burn units. In this study, there are 83 burn wound patients and 35 healthy controls. Swab samples from burn wounds were collected, and culturing media and biochemical test were used to identify the bacterial infection. The results showed most of the patients were males, 44 (53.0%), and 39 (47.0%) were females. In the control, 15 (42.9%) were males and 20 (57.1%) were females. The patients' ages ranged from 1 to 60 years; children less than 11 years old represented 37 (44.6%) of them. Most patients had scald burn 44 (53.0%) followed by flame burn 34 (41.0%), and then electrical burn 5 (6.0%). The second degree constituted the most common of cases 55 (66.3%). A total of 83 swab specimens, among them, 28 (33.735%) were found to have Gram-negative bacteria, 7 (8.434%) had Gram-positive bacteria, and 48 (57. 831%) had a negative culture. **In conclusion**, the majority of the burned cases were children, with second-degree burns. Gram-ve bacteria are the most frequently isolated bacteria that cause burn wound infections.

KEYWORD: burns type, severity of burn, Pathogenic bacteria.

INTRODUCTION
Burns refer to injuries to the skin or other body tissue brought on by heat or sudden trauma. Burns are described by the World Health Organization (WHO) as skin damage caused by heat, electricity, chemicals, or radiation.[1] All ages of the population suffer burns more often than any other type of injury in their everyday lives.[2] and constitute an important global community and health issue. Burn.[3] They may seriously jeopardize people's lives and health.[4] It may lead to scores of preventable deaths and disabilities every year.[5] Although burn injuries occur worldwide, they are most common in middle-class and lower-income communities.[6] The World Health Organization, also known as the WHO, reports that every year, burns cause over 250,000 deaths and approximately 18 million disability-adjusted life years to be lost.[7] In general, injuries from flame burns still account for the majority in the USA (41%), according to the American Burn Association's (ABA) National Burn Repository 2019. While burn injuries caused by chemicals (3.5%) and electricity (3.6%) happen much less frequently, burns in children under five years old are typically scald injuries, and as age increases, so do wounds relate to flames.[8] Burn injuries are common in Iraq, especially in rural and low-income areas.[9] Burns can be classified as thermal (caused by flames, hot liquids, and surfaces); chemical; electrical; and other, such as radiation.[10] Burn wounds can severely compromise one of the main defenses against infection. Infection is the main cause of death for patients with burn wounds. These infections can be extremely difficult to treat and cause long-term harm, including delayed recovery and prolonged hospitalizations.[11] Hospital-acquired infections (HAIs) are defined as infections that appear 48 hours following hospital admission.[12] One of the most prevalent and dangerous illnesses brought on by pathogens is burn infection, which is primarily caused by both Gram-positive and gram-negative bacteria .[13] The two types of nosocomial infections are exogenous, which are caused by pathogens from the patient's surroundings or by the same organisms isolated from the patient's body, and endogenous, which are caused by microorganisms in the patient's microflora.[14]

MATERIALS AND METHODS
The study was carried out in the burn unit of Imam Al-Hussein Medical City in Karbala, Iraq, from 1 August to 31 December (2023).

Inclusion criteria: All patients with burn wound infections were diagnosed based on clinical symptoms and other investigations.

Exclusion criteria: patients who have wounds other than a burn.

The number of patients was 83. The second group is the control group, which consists of 35 healthy participants**.** The patients were in the age range of 1 to 60. Wound swabs were collected and transported to the laboratory. MacConkey and blood agar were used for the aerobic culture of swabs. The shape of the colony, Gram staining, and different biochemical tests were used to identify the isolates.

Statistical analysis

Statistical analyses were performed using the SPSS statistical package for social sciences (version 20.0). P value <0.05 was considered statistically significant.

RESULTS

The patients consisted of 44 (53.0%) males and 39 (47.0%) females, whereas in control, 15 (42.9%) were males and 20 (57.1%) were females. Regarding gender, there were no significant differences (*P*=0.420) between the study groups. About the age, the results revealed that burn cases were more frequent in patients < 11 years 37 (44.6%) than other age groups, with no significant result (*P*=0.575). According to the weight of the patients, 78 (94.0%) of them were of normal weight, and 5 (6.0%) of the patients were overweight, while in the control group, all of them were of normal weight, 35 (100%), with no significant differences (*p*=0.320), as shown in table 1.In analyzing the results concerning burn types, it was clear that patients with scalding burns had 44 (53.1%), followed by flame burns at 34 (41.0%), and then electrical burns at 5 (6.0%). About the patients with inhalation injuries, it was found that 80 patients (96.4 %) had non-inhalation injuries, whereas only 3 patients (3.6%) had inhalation injuries. However, 9 (10.8%) patients experienced in-hospital mortality, while 74 (89.2%) patients recovered. For the patients with mechanical ventilation, it was found that 80 patients (96.4%) had non mechanical ventilation, whereas only 3 patients (3.6 %) had mechanical ventilation. Also, total body surface area (TBSA) ranges from (4.00- 75.00%) with a mean (17.05) and a standard deviation (14.02). In addition, the length of hospital stays ranges from (2.00-21.00) days with a mean (9.31) and standard deviation (4.36), as found in table.[2] The degrees of burn severity as illustrated in table (3) show that the second degree constituted the most common of the cases, 55 (66.3%), while the third-degree burn constituted 21 (25.3%), and the second +third degree constituted only 7 (8.4%). A total of 83 swab specimens were assembled from patients with suspected burn wound infections; among them, 28 (33.735%) of specimens were found to have Gram-negative bacteria, 7 (8.434%) with gram-positive bacteria, and 48 (57.831%) with a negative culture., as demonstrated in Table 4.

DISCUSSION

Burn injuries cause permanent physical, psychological, and emotional disabilities in their victims, making them a main cause of both mortality and morbidity.[15]

In this study, there were no significant differences *(P*= 0.420) between study groups regarding gender, as found in table (1). Additionally, the current study found that there were more male patients with burn injuries than female patients. These results were consistent with a study in Al-Hilla City that found that in men, there were 53.4% of burn injuries, compared to 46.6% in women.[9] This result was also, in agreement with other studies, which showed that males have a higher frequency of burn wounds than females.[16-18] On the contrary, in Sulaymaniyah, a study showed that 31% of patients were males and 69% were females and indicated that women's inclination for cooking, the use of dangerous stoves that can catch fire, as well as acts of self-harm or interpersonal violence, are all factors that increase the risk of burns in women.[15] Regarding age, there were no statistically significant variations (*P*=0.575) among the study groups. This study was related to the study accomplished by[19], who demonstrated no significant differences regarding age between the patients with burns and the controls. Additionally, it was observed that the number of patients with burn wounds was higher in ages less than 11 years, this result is in line with the study in Babylon, which found that 35.8% of those who were burned had major burn injuries that were sustained by children between the ages of 1 and 9. This could be explained by the fact that kids are typically more active and spend more time near stoves, fireplaces, hot kitchen appliances, and hot liquids.[20] There were no significant results (*p*=0.320), according to the weight of the patients when compared between the patients and the control group. On the contrary, a study result conducted by[21] discovered that the body mass index showed a positive and significant relationship (P<0.0004), suggesting that the likelihood of burning increased with body mass index. It was determined that patients who were obese had a higher risk of burns than people who were not obese. In table (2), according to the results regarding the different types of burns, it was clear that scalding burns (53.1%) were the most common cause of burns in burn patients, followed by flame burns (41.0%) and electrical burns (6.0%). This could be explained by the reality that hot liquids are essential in homes and are used most of the time in many different life situations. This study's findings were consistent with an Al-Hilla study that found that 43.9% of patients had scald burns, with flame burns coming in second at 34.2% and electrical burns coming in last at 1.4%.[9] Also, this study agreed with other studies (22) and (18), which found that scald burn was the main cause, followed by flame burn. This study was not consistent with the study in Duhok, which found that flame burn had the highest rate (38.18%) and scald burn (15.45%). The differences in these findings may be due to the fact that most flame injuries happen at home during heating and cooking by women in parts of the

kitchen, where there is a higher risk for burns by flame.[23] The current study found that only (3.6 %) of patients had an inhalation injury. It is less than the study by[24] that revealed that inhalation injuries affected 6.7% of the patients. This result was also less than a study in Saudi Arabia, which found that (9.9%) of patients had inhalation injuries.[25] The variety may be due to the distribution of the population, burn severity, and causes of burns. However, in table (2) the frequency of the patients In-hospital mortality was (10.8%) compared (89.2) of the patients who healed. Consistent with previous research, a study conducted in western Uganda discovered that while 91.6% of the patients recovered and were released from the hospital, 4.7% of the patients passed away.[26] Additionally, a study conducted in Basra revealed that 21% of patients died and 79% of patients were cured and released after an accident.[17] There may be differences in care, treatment, and adherence to standards as the reason for the disparities in mortality rates. Goodarzi *et al.,* (2014) suggested that septicemia and improper routine bacterial resistance could be the cause of the high burn mortality rate.[27] Large TBSA% burns and inhalation injuries were predictive factors for burn injury-related mortality.[28] Also, of the patients in this study who had received mechanical ventilation, it was discovered that only three (3.6%) of them did so, as shown in Table 2. In contrast to other studies (28 and 29), which revealed that 21% and 20%, respectively, of the patients required mechanical ventilation, it has repeatedly been demonstrated that mechanical ventilation is linked to an increase in the severity of inhalation injuries. However, in this study, total body surface area (TBSA) had a mean value of 17.05. The present study was consistent with a study[18] that found a total body surface area with a mean (15.49%). Also, in this study, length of hospital stay had a mean value (9.31) and a standard deviation of 4.36, as clarified in Table 2. It was in the same line as the study conducted by[26] who found that the hospital stay ranged from 3 to 28 days, with a mean of 9 days and a standard deviation of 5.7. The current study's findings contradict a study done in Turkey, that revealed the average length of hospital stays was 10.29 ± 9.59 (minimum 1–maximum 74) days. Given that length of hospital stay has been demonstrated to be influenced by a number of burn-specific characteristics, including gender, age, depth, and size of the burn, it is possible that the variations in length of stay observed when compared to other studies are due to differences in the characteristics of the study participants.[30] Concerning table 3, the highest percentage of burn degrees was in patients with second degree burns (66.3%), This study supported a study conducted in Cameroon that discovered 48.9% of all burns were of the second degree.[31] Also, a study by[32] demonstrated that most burns (72.6%) were of the second degree, while 27.4% were of the third and mixed degrees. In contrast to a study conducted in Sulaymaniyah, which found that 51% of burn patients had mix II–III degree burns, 38% had second degree burns, and 11% had third degree burns, Longer burn exposure periods raise the likelihood of extended skin-to-burn contact, which intensifies the burn.[15] Gram-negative bacteria were the most frequently encountered bacteria in the present study (33.735%) compared to gram-positive bacteria (8.434%), as demonstrated in table (4). This result is compatible with other studies such as[13], [34] and[34] that found that the gram-negative bacterial isolate was greater than the gram-positive bacteria. The results of the present study differed from the study by[35] who revealed that the presence of gram-positive and gram-negative bacterial isolates were 68.8% and 66.0%, respectively. Another study in turkey found that the most common bacterial isolates were gram-positive bacteria (70.55%) followed by gram-negative bacteria (28.68%).[36] The variability in study populations and sample sizes amongst studies could be the reason for this unevenness. An infection from a burn wound is not ruled out by a negative culture. According to Ganatra and Ganatra (2007), the potential causes of dry surface swabs in burn centers should be examined in conjunction with the reasons for "no growth" in burn wounds. Dry swab data are qualitative in nature. Furthermore, despite being a low-cost method, it is unable to differentiate between deeper wound infections and superficial contamination. Moreover, the subeschar space, where microbial proliferation takes place before invasion of underlying viable tissues, is not sampled by a surface swab culture. Even quantitative swab cultures of the wound surface could contain false positives or false negatives due to erroneous counts.[37]

CONCLUSION

The current study reported that the majority of the burned patients were children, with scald burns. In addition, gram-negative bacteria are the most frequently isolated bacteria that cause burn wound infections. A new preventive strategy is requested to address this high priority burn problem.

Ethical Consideration

This study was approved by the Ethics Committee at the University of Kerbala, collage of medicine.

ACKNOWLEDGEMENT

The researchers would like to thank the University of Kerbala, particularly the College of Medicine. The researchers acknowledge and thank the Imam Al-Hussein Medical City for their cooperation, flexibility, and providing all the data needed to finish the project.

RECOMMENDATIONS

1. It is necessary to implement programs for health education relating to prevention of burn injuries by means of broadcast flashes on mass media like television or radio, showing risk situations and teaching self-care methods in workplaces and homes together with epidemiological data about burn accidents. and sentences to call attention to prevent burn accidents.

2. Training for HCWs in nosocomial infections control programs. The continuous education of hospital authorities and HCWs on principles of infection control through training and re-training is advocated.

3. Application of infectious diseases control program which could improve hygiene, particularly hand washing and PPE (gowns, gloves, masks and caps).

4. The isolation care unit especially for the infected patients and the patients with high TBSA% is important in the prevention of nosocomial transmission of infection and decrease the mortality

5. Burn unit must be an independent unit and equipped with all instruments to prevent the cross-infection and the contact of burn unit patients with others.

6. To avoid air contamination, the patientís and dressing rooms should be sterilized by U.V or any other available mean as providing high quality air filters.

Funding: The research was funded by the authors.

Conflict of interest: The authors declare no conflict of interest.

Table (1): The distribution of gender, age, and weight characteristics of the studied groups.

Variables		Group				*P value*
		Patients (N=83)		Control (N=35)		
		Count	%	Count	%	
Gender	Male	44	53.0%	15	42.9%	0.420*
	Female	39	47.0%	20	57.1%	
	Total	83	100%	35	100%	
Age (year)	<11	37	44.6%	12	34.3%	0.575*
	11-20	11	13.3%	6	17.1%	
	21-30	8	9.6%	3	8.6%	
	31-40	13	15.7%	6	17.1%	
	41-50	8	9.6%	7	20.0%	
	51>	6	7.2%	1	2.9%	
	Total	83	100%	35	100	
Weight	Normal weight	78	94.0%	35	100.0%	0.320*
	Overweight	5	6.0%	0	.0%	
	Total	83	100%	35	100%	

***p value* is nosignificant (chi-square test)**

Table (2): Distribution of clinical characteristics in cases group.

Variables		Count	%
Burn types	Scalding	44	53.0%
	Flame	34	41.0%
	Electrical	5	6.0%
	Total	83	100
Inhalation injury	-ve	80	96.4%
	+ve	3	3.6%
	Total	83	100%
In-hospital mortality	-ve	74	89.2%
	+ve	9	10.8%
	Total	83	100%
Mechanical Ventilation	-ve	80	96.4%
	+ve	3	3.6%
	Total	83	100%
		Mean (SD)*	Range
Total body surface area (TBSA)		17.05 (14.02)	4.00-75.00
Length of hospital stay		9.31 (4.36)	2.00-21.00

***SD: Standard deviation**

Table (3): Degrees of burn severity in patients.

Variables		Count	%
Burn severity	Second degree	55	66.3%
	Third degree	21	25.3%
	Second + third degree	7	8.4%
	Total	83	100%

Table (4): Bacterial culture results in cases group.

Variables		Count	%
Bacterial Culture	Gram –ve	28	33.735%
	Gram +ve	7	8.434%
	No growth	48	57.831
	Total	83	100%

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