

## Association of Pathogenic Bacterial Isolates in Burn Wound Infections

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### **Abstract**

Burn wound infection is a major medical problem in all areas of the world. One hundred fifty burn wound swabs were studied from 100 patients admitted to Al-Karama teaching hospital in Baghdad from 1/ 11/ 2007 to 1/ 4/ 2008. Forty two ( 42%) of patients were males and fifty eight ( 58 %) were females. The age group of patients ranged from one year to 50 years. The high incidence of burn patient was 36 ( 36 % ) at the age group 10-19 years in both sex and the low incidence was 2 ( 2% ) at the age group 50 years in both sex. According to the causes of burn ; 50 (50 % ) were due to flame , 41 (41 % ) were due to scald, 7 (7% ) were due to electrical burns and 2 ( 2 % ) cases were due to chemical burns. Out of 195 (100 %) bacterial isolated, 103 (52.8 % ) were isolated in pure culture while 92 (47.2%) were mixed culture .The most dominant bacteria were *Klebsiella SPP* 36 (18.5%) followed by *Pseudomonas aeruginosa* 19 (9.7%), *Staphylococcus aureus* 15(7.7%), *Candida albicans* 11(5.6%), *Escherichia coli* 8(4.1%), *Proteus mirabilis* 6(3.1%), *Staphylococcus epidermidis* 4(2.1%) , *Enterococcus faecalis* 2(1%) and *Streptococcus pyogenes* 2(1%)

**Keyword:** Pathogenic Bacterial Isolates, Burn Wound Infections.

### **الخلاصة**

تعد اصابات الجروح احد المشاكل الطبية الكبيرة في العالم. تم اخذ ١٥٠ مسحة من ١٠٠ مريض في مستشفى الكرامة في بغداد للفترة من ١/١١/٢٠٠٧ الى ١/٤/٢٠٠٨ توزعت عينة الدراسة بواقع ٤٢ من الذكور و٥٨ من الإناث بمدى عمر من ١-٥٠ سنة اخضعت عينات المسحات الى الزرع البكتيري وكانت النتائج ان البكتيريا الاكثر ظهورا كانت الكلبسيلا بنسبة ١٨,٥ % تليها الزوائف الزنجارية والعنقوديات الذهبية.

### **Introduction**

Human skin surface is a vital to the preservation of body fluid homeostasis, thermoregulation and the host's protection against infection. The skin also has immunological, neurosensory and metabolic D metabolism. Burn injury creates a breach in the surface of the skin and hampers those vital functions which are essential to sustain life [1]. The burn site remains relatively sterile during the first 24 hours [2]. Burn wound infections are serious complications of thermal injury and

the patients are at the risk for acquiring infection because of their destroyed skin barrier and suppressed immune system, compounded by prolonged hospitalization and invasive therapeutical and diagnostic procedures [3].

Bacteria and Fungi are the most common pathogens of burn wounds. These microbes from multi-species biofilms on burns wounds within 48-72 hours of injury [4]. Organisms originate from the patient own skin, gut and respiratory flora as well as from contact with

contaminated health care environments and workers [4]. Gram positive bacteria are some of the first to colonize burns, followed quickly by gram negative bacteria. Fungi infection tends to occur in the later stages after the majority of bacteria have been eliminated by topical antibiotics [5]. This study was carried out to diagnose and identify the causative pathogens that associated with burn infection in Al-Karama teaching hospital of Baghdad

### **Material and Methods**

One hundred –fifty wound swabs were collected from 100 patients admitted to Al-Karama teaching hospital in Baghdad during the period from 1/ 11 / 2007 to 1 / 4 / 2008. The age of the patients ranged from one year to over (50) years old. The specimen swabs were taken from patients in the surgical ward and were cultured directly on blood agar and

MacConkey agar ( Mast Group Ltd. Merseyside, UK) aerobically overnight at 37°C for bacteria and Sabouraud's Dextrose agar aerobically for 24 -48 hours at 25°C for fungi. Anaerobic bacteria were cultured on blood agar media for 72 hours at 37 °C. Gram stain ,biochemical tests were done to identify and diagnose the colony morphology of the causative pathogens[6-8].

**Statistical analysis:** The analysis of the data was performed by using the statistical software package. The difference was considered significant at  $P < 0.05$ .

### **Results**

This study showed that 42( 42 %) were males and 58( 58%) were females. The highest number of patients was 36( 36%) at age group ( 10-19) years. The lowest frequently affected was 2 (2%) and 3( 3%) at age group(>50) and (40-49)years (table 1).

**Table 1** age and sex distribution burn patients.

Age Years	Female NO. (%)	Male NO. (%)	Total NO. (%)
1 -9	12 (12)	10 (10)	22 (22)
10 -19	20 (20)	16 (16)	36 (36)
20 -29	11 (11)	7 (7)	18 (18)
30 -39	10 (10)	6 (6)	16 (16)
40 -49	3 (3)	3 (3)	6 (6)
> 50	2 (2)	0 (0)	2 (2)
Total	58 (58)	42 (42)	100 (100)

Table (2) showed that out of (100) burn patients in this study, 50(50%) were due to flame, 41(41%) were due to scalds, 7(7%) due to electrical burns and 2(2%) cases due

to chemicals burns. Out of 195 (100%) bacterial isolates; 103 (52.8%) were isolated in pure culture while 92(47.2%) were showed mixed cultures.

**Table 2** Distribution of burn patients according to the causes of burn and culture results.

Cause of burn	Positive culture		Negative culture		Total	
	NO .	%	NO .	%	NO.	%
Electrical	4	57.1	3	42.9	7	7
Chemical	2	100	0	0	2	2
Scald	33	80.5	8	19.5	41	41
Flame	44	88	6	12	50	50
Total	83	83	17	17	100	100

The most dominant bacteria were *Klebsiella spp* 36(18.5%) followed by *Pseudomonas aeruginosa* 19(9.7%), *Staphylococcus aureus* 15(7.7%), *Candida albicans* 11(5.6%),

*Escherichia coli* 8(4.1%), *Proteus mirabilis* 6(3.1%), *Enterococcus faecalis* 2(1%) ,and *Streptococcus pyogens* 2(1%) .

**Table 3** Distribution of 195 bacterial isolates recovered from 100 burn's patients.

NO	Isolated microorganisms	Pure culture		Mixed culture		Total	
		NO.	%	NO.	%	NO.	%
1	<i>Klebsiella spp</i>	36	18.5	25	12.8	61	31.3
2	<i>Pseudomonas aeruginosa</i>	19	9.7	16	8.2	35	17.9
3	<i>Staphylococcus aureus</i>	15	7.7	18	9.2	33	16.9
4	<i>Candida albicans</i>	11	5.6	6	3.1	17	8.7
5	<i>Escherichia coli</i>	8	4.1	10	5.1	18	9.2
6	<i>Proteus mirabilis</i>	6	3.1	6	3.1	12	6.2
7	<i>Staphylococcus epidermidis</i>	4	2.1	3	1.5	7	3.6
8	<i>Enterococcus faecalis</i>	2	1.0	4	2.1	6	3.1
9	<i>Streptococcus pyogens</i>	2	1.0	4	2.1	6	3.1

## Discussion

Burns become infected because the environment at the site of the wound is ideal for the multiplication of infecting organisms freely (9), therefore the burn wound is considered one of the major health problems in the world (10). In this study burn infection in males was 42(42%) while in females was 58(58%) this results was in agreement with the finding study by ( 11) who found that females were commonest than males in burn infection, this may be due to that females were exposed more to burn than males. Other study was in agreement also with this study; Rajupt et al.,2008(10) showed that burn infection in females (60%) was more than males (40%) in India. In this study; it was found that the highest distribution of burn wound infection found within the age group 10-19 years 36(36%). This result was in agreement with the findings reported by Shakibaie et al.,2008(12) that the age group 10-19 years was more susceptible to burn wound infection than other age groups. In the other hand Al-Akaylen,1999 study showed that the age group < 10 years had the highest distribution of burn wound infection in burn patients(13). Flame burns were the most common type in burn infection in this study 50(50%), followed by scalds burns 41(41%)( there was significant difference between them  $p < 0.05$  ), electrical 7(7%) and chemical 2(2%). This result was in agreement with Bariar et al.,1997(11) who found that the commonest cause of burn was thermal (flame and scald) (91.2%) followed by electrical burn (5.9%) and chemical burn (2.5%). In addition Ghffar et al.,2002(14) in India found that flame burns were the common types in burn infection patients because of using kerosene stove and lamp by the people of low

socioeconomic status. *Klebsiella spp* (18.5%) was the most comely isolated bacteria among burn patients with burn wound infection in this study followed by *P.aeruginosa* (9.3%)( there was significant difference between them  $p < 0.05$  ) ,*Staphylococcus aureus* (7.7%) .This result was in agreement with Kehinde et al.,2004(15) who found that *Klebsiella species* was the pathogen commonly isolated followed by *Pseudomonas aeruginosa* and *Staphylococcus aureus*. In this study the following pathogenic bacteria were the least prevalence isolated ; *E.coli* 8(4.1%) ,*P.mirabilis* 6(3.1%),*Staphylococcus epidermidis* 4(2.1%), *Streptococcus faecalis* 2(1%) and *Streptococcus pyogens* 2(1%). This result was in agreement with the study by AL-Akyleh 1999 (13) and Sharma et al.,2006 (6 ) who found that *E. coli* was the least prevalence isolated bacteria. This study was in agreement with Alghalibis,et al., 2011 (17 ) who found that the following bacteria were the least prevalence isolated bactetria: *P. mirabilis* ,*Streptococcus epidermidis*,*Streptococcus faecalis* and *Streptococcus pyogens*. *Candida albicans* was the only isolated fungi from wound infection in this study (5.6%) .This result was in agreement with Elsayed et al., 2003(18). Gang et al.,2000(19) and Wildemauee et al., 2004(20) mentioned that burn units have become major reservoir for pathogenic bacteria which causes nosocomial infection. Because of the environment at the site of the wound , immune-suppressive status and there is a plentiful supply of moisture, nutrients are ideal for the multiplication and growth of the infecting organisms (9).

### Conclusion

In conclusion, the most common causative agents of the burn wound infection in this study were *Klebsiella spp*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Candida albicans*.

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