BACTERIAL BURN INFECTIONS IN BABYLON PROVINCE

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ABSTRACT:

Bacterial agents associated with burn were determined in 50 burned patients were submitted to Al- Hilla education hospital in Babylon province. 50 burned swabs were collected during the period from October 2009 – March 2010. These burn swabs revealed 60 bacterial isolates, from which 43(71.66%) were gram – negative bacteria, distributed of 18(30%) *P. aeruginosa*, 12(20%) *E.coli*, 8(13.3%) *Proteus mirabilis* and 5(8.3%) *K.oxytoca*. On the other hand, 17(28.33%) gram – positive bacteria. Out of 50 burned swabs, 40(80%) revealed a single pathogens and 10(20%) showed a mixed pathogens. Antimicrobial susceptibility of bacterial burn isolates revealed that, *P.aeruginosa* were resistant to routine tested antibiotics, like Ampicillin, Chloromphicol and Streptomycin in (88.8%), (72.2%) and (44.4%) respectively. While most *P.aeruginosa* were sensitive to Meropenem, Imipenem, Oflaxacin and Azithromycin as (100%), (100%), (60%) and (60%) respectively. On the other hand, another gram – negative associated burn isolates were *K.oxytoca*, results of antimicrobial susceptibility revealed that, isolates were resistance to Ampicillin, Streptomycin, and Chloromphicol in (100%). While they were sensitive to Meropenem, Imipenem, Oflaxacin and Azithromycin as (100%), (100%), (60%) and (60%) respectively.

INTRODUCTION.

Burn patients die for three main reasons: burn shock during the first few hours after injury, respiratory failure in the following days, and septic complications and organ failures during the subsequent weeks (1). Infection is the single biggest killer in the burn unit (2). Prevention of burn infection was needed quick and effective closure of deep burns is the cornerstone of infection prevention. Other methods include prophylactic antibiotics, topical antimicrobial agents, and infection control practices (3). Burn wound allows microbial penetration, and burn eschar provide an excellence culture medium for microorganisms with a significant alteration of immune function.(4). Patients have to stay for long period in the hospital and many intravascular and other devices are put in them. Hence they are at greater risk of acquiring hospital - acquired infection. Overcrowding in developing countries increases the risk (5). The organisms that predominant as causative agents of burn wound infection in any burn treatment facility change over time. Gram positive organisms are initially prevalent during hospital stay patients, then gradually become superseded by gram negative opportunists that appear to have a greater propensity to invade (6). infection in burn is not only important in being responsible for death, but it is also an important factor in the prolongation of hospitalization time and delay in skin grafting. It is therefore essential for every burn institution to determine its specific pattern of burn wound microbial

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colonization, time – related changes in predominant flora and anti – microbial sensitivity profiles (4). Secondary infection with gram – negative bacteria cause considerable morbidity and occasional mortality in burn patients. Sometimes the infection rapidly leads to bacteremia with shock and subsequent death (7). Many studies were explained, that most of burn infections which due to nosocomial – acquired infections, such as, *Staphylococcus auerus*, *P.aeruginosa*, *Klebsiella pneumoniae*, *E.coli*, *Acinetobacter*, *Klebsiella oxytoca*, group – A- *Streptoccus*, *Staphylococcus epidermidis*, and *Enterbacter* species.(8,9). *P.aeruginosa* is the most common cause of nosocomial pneumonia in patients on a ventilator and is associated with a high mortality rate, especially in pediatric patients (10) . The risk of invasive burn wound infection is influenced by the extent and depth of the burn injury, various host factors, and the quantity and virulence of the microbial flora colonizing the wound (11). Common burn wound pathogens such as *Pseudomonas aeruginosa* produce a number of virulence factors that are important in the pathogenesis of invasive infection. *Pseudomonas aeruginosa* produces a number of cell-associated (adhesins, alginate, pili, flagella, and lipopolysaccharide) and extracellular (elastase, exoenzyme S, exotoxin A, hemolysins, iron-binding proteins, leukocidins, and proteases) virulence factors that mediate a number of processes, including adhesion, nutrient acquisition, immune system evasion, leukocyte killing, tissue destruction, and bloodstream invasion (12,13). .*Pseudomonas aeruginosa* also carries many intrinsic and acquired antimicrobial resistance traits that make infected burn wounds difficult to treat (14,15).

AIM OF THE STUDY:

Identification the main bacterial isolates associated with burned patients (bacterial burn infection) in Babylon province.

MATERIALS & METHODS

Burn swabs of 50 burned patients were collected from burn unit in Al- Hilla education hospital, during the period from October 2009 to March 2010. Burn swabs were cultured on differential and selective media, like blood and maCconkey agars. Tentative diagnosis were done on the bacterial growth, by using Gram stain, by using routine biochemical reactions, and finally identification, were based on Api – 20 E system (16,17).

RESULTS.

Bacterial profile.

A total of 50 burn swabs were examined for skin associated pathogens. These burn swabs revealed 60 bacterial isolates, from which 43(71.66%) were gram negative bacteria, distributed of 18(30%) *P. aeruginosa*, 12(20%) *E.coli*, 8(13.3%) *Proteus mirabilis* and 5(8.3%) *K. oxytoca,* and 17(28.33%) gram positive bacteria (Tables 1 and Figure 1).

Single and mixed infection.

Out of 50 burn swabs, of which 40(80%) revealed a single pathogens and 10(20%) showed a mixed infections. In those with single infection, gram negative bacteria were detected from 27(54%), while in 8(16%) a mixed pathogens were detected.(Tables 2 and 3).

Antimicrobial susceptibility .

Detection and monitoring of antibiotic resistant bacterial burn isolates are important to substantial the choice of antibiotic for treatment of infection by

these organisms. The bacterial isolates were tested by Disc diffusion method (The Kirby – Bauer method) and interpreted according to an interpretive standard (8). This comparison allows the determination of whether a test organism is susceptible, intermediate or resistance. Out of the eighteen, 16 (88.8%) *P.aeruginosa* isolates were resistant to Ampicillin, 13 (72.2%) isolates were resistant to Chlromphicol, while most *P.aeruginosa* isolates were sensitive to Imipenem 17 (94.4%), Azithromycin 15 (83.3%) and Meropenem 15 (83.3%) respectively (Table 4). On the other hand, *K.oxytoca* isolates were resistant to Ampicillin, Streptomycin, and Chloromphinicol 5 (100%), while they were sensitive to Meropenem, Imipenem, Ofloxacin and Azithromycin as 100%, 100%, 60% and 60% respectively (Table 4).

DISCUSSION

Bacterial profile.

The overall rate of infection with any of the gram - negative pathogens accounted for 71.66%. This high rate of infection may be attributed to the pooling of burned wound specimens, from each patient which estimated all gram – negative bacteria. Further more the poor personal hygiene among these communities, particularly unhygienic cleaning of skin damaged area may play a role in increasing the rate of infection (19). Surveys in Iraq, Nema, (20) in Al- Najaf; Hashim, (21) in Baghdad; Abdul Wahabe *et al*., (22) and Hassan, (23) in Babylon; Manafi *et al*.,(24) and Ludwik *et al*., (25) in USA reported burned skin infection more or less of comparable rates to figures obtained from this study. However, low rates (40%) of skin burned infections were also reported by other studies (26,27). On the other hand, studies from Europe (30) reported infection rate lower than this study. This can be explained on the basis of different sampling methods, field and laboratory techniques, age, socioeconomic status, number of individual examined and the higher endiemicity of such pathogen in our area. *P. aeruginosa* was the highest pathogen recovered from swabs of burned patients (30%). Similar finding were reported by Mayhall *et al*., (26) and Gallaphere *et al*.,(27) in USA; Guggenheim *et al*., (30) in Europe; Manafi *et al*., (24) in Asia; Hashim, (21) ; Abdul Wahabe *et al*., (22) and Hassan, (23) in Iraq. This percentage of isolation among patients may indicate a potential cause of infection in some individuals and might suggest the existence of causal opportunistic carrier which are the foci of infection within hospital population (4). Ludwik *et al*., (25) reported that gram – negative pathogen continue to cause the most severe infections in burn patients. Among these organisms, *P. aeruginosa* is the most commonly encountered source of chronic or acute burn wound infection (26,27). In a recent survey of 104 U.S. burn units, 44% of the respondents identified *P. aeruginosa* as the most prevalent gram-negative pathogen, (28). The picture is slightly different in Asian countries such as China, where *Acitenobacter baumannii* and *Proteus mirabilis* are the most common causes of burn infection, with *P. aeruginosa* in third place (29). In Europe, *P. aeruginosa* and *Escherichia coli* are the two most common pathogens, with a frequency for each at 13% of all gram-negative infections (30). *Pseudomonas aeruginosa* has a predilection for moist and warm wound environments, thus posing a major challenge for burn patients (27). From these findings, it can be noticed that isolation rates of *Pseudomonas* in Iraq and

other countries vary greatly. This probably due to the nature of location studies, number of burned wound samples examined, laboratory techniques applied for the detection of such pathogen in addition to the severity degree and type of the burn (31) *P. aeruginosa*: in contrast to our results, studies from Asian countries reported higher isolation figures of *P.aeruginosa* in India (32) reported that 59% of *P. aeruginosa* may be isolated from burned swabs, in Korea, (33) found that 45.7% of burned swabs examined were positive for *P. aeruginosa*, and in Iran (31) were also explained *P. aeruginosa* isolates (68.3%) associated with burn infection.*K. oxytoca* was detected from a minority of burned patients (8.3%) compared to 3.9% in Indian burned patients (32) and contributed your result to numbers of burned samples and might be due to good management in burn unit and decreased the nosocomial acquired infection. In contrast to our results, Hashim (21) in Baghdad explained the role of gram – negative bacteria associated with burned patients, that *Klebsiella* species were isolated in (22.4%) and contributed this result to increasing number of individually examined and higher endemicity of such pathogens. Podschun *et al* (34) and others were explained that gram negative bacteria do not find good growth conditions on the human skin, so *K.* species are rarely found there and are regarded simply as transient member of the flora. These carrier rates change drastically in the hospital environment (35). Reported carrier rate in hospitalized patient are more than 77% in the stool, more than 19% in the pharynx, and about 42% on the hands of patients, therefore, easily to reach the infected area (burn) and infection occur (36). The ability of this organism to spread and cause nosocomial outbreaks, accordingly to the reported data of the Centers for Disease Control and Prevention, *Klebsiella* spp. account for 8% of endemic hospital infection and 3% of epidemic outbreaks (34). Although a low percentage of positive results for *K. oxytoca* among burned patients were recovered, still the problem of hospitalized patient, carriers of such organisms may form very important foci of infection in the community and more emphasis should be paid for these studies periodically. This prestige may be useful in developing countries to eradicate this important source of infection. The same information conducted by Christoph *et al* (19), were explained this gram negative bacterium has been found in patients with antibiotic associated haemorrhagic colitis, but it also found in stool of healthy subjects. *Klebsiella oxytoca* were isolated from burned patients, can isolated from patients with antibiotic- associated hemorrhagic colitis and induced mucosal damage, then invasion to other regions like, lung and skin damaged area. (19).

Single and mixed infection:

Single and mixed pathogens were recovered from 80% and 20% of human burned patients, respectively (Table 4). These results were consistent with the results from other studies in Iraq (21,23,22). These figures were also consistent with the results from other parts of the world Saha *et al*., (4), which explained, that among the total burn isolates in Bangladesh, single organisms were isolated in 71% samples, while mixed organisms were isolated in 13.5% of samples. In addition to that, among single gram negative isolates *P.aeruginosa* was leading 18%, followed by *E.coli* 12%, this result was inconsistent with our results for *Pseudomonas* isolates percentages, which

might be due to the higher endemicity of such pathogen in our area or due to the severity degree of the burn.

Antimicobial susceptibility test for bacterial isolates

Burned- bacterial pathogens represent critical medical problem in large areas of the world, and antibiotic resistance is a part of this problem that deserve a major commitment of attention and resources. *P. aeruginosa* isolates have been reported to be resistance to many tested antibiotics (37,24,4). These results were agreement with the finding obtained from this study. The pattern of high rates of resistance to antibiotics imply an emergency to control the extent of use of various antimicrobial agents. So in this respect the recommendation forwarded by Saha *et al* (4) will be of great value for the control of such resistance strains of such pathogens. Table 4, explained that most isolates were resistant to most antimicrobial agents. A study done by Manafi *et al* (24), explained that, one of the most important features of the *P. aeruginosa* was resistance to various antibacterial agents, and this agreed with our results. *P.aeruginosa,* which is considered as multi-drug resistance bacteria (4), therefore can be isolated within burned patient cases. In our results, revealed that, most *P.aeruginosa* were resistant to Ampicillin (88.8%), Chloromphicol (72.2%), and Streptomycin with (44.4%), on the other hand, it was sensitive to Meropenem, Azitrhromycin, and Imipenem with (83.3%), (83.3%), and (94.4%) respectively. These investigations were as a result of the fact that bacteria were resistant to routine antimicrobial drugs, while they were sensitive to new antimicrobial generation like Meropenem, Imipenem and Azithromycin. Accordingly, to our results, *K.oxytoca* were resistant to Ampicillin, Streptomycin, and Chloromphicol as 100% for each antimicrobial agent, while they were sensitive to Meropenem (100%), Imipenem with (100%), Ofloxacin and Azithromycin with (60%) for each (table 4). A study done by Hamid *et al* (37), explained, the frequency of *P.aeruginosa* resistance to the most tested antimicrobial agents, was over 90%, this bacterium was associated with burn wound infection, and this result was agree with our results. A study done by Yah *et al* (38), explained, the aerobic bacteria were isolated from freshly admitted and prolonged hospitalized kerosene burn wounds were carried out, from both cases different of bacterial isolates were identified like *P.aeruginosa* and *Klebsiella* species. The organisms were further tested for their antibiotic sensitivity pattern, the results explained in generally *P. aeruginosa* were the most resistant organisms to the various antibiotics tested, and this study was agreed with our results about *P.aeruginosa* isolates. Multi-drug resistant *P.aeruginosa* is common among burn-wound infections, the high incidence of *P.aeruginosa* and the wide spread high resistance to antibiotics (24), so it is necessary for measures to be taken to restrict the spread of the species in the hospital and to limit administration of these antimicrobial agents. Study done by David, (39), explained that most *P.aeruginosa* and the other gram negative bacteria resistant to many β- lactam and quinolone antibiotics, so they have been associated with numerous outbreaks of infection particularly in intensive care units (ICUs). Consequently, the usage of routine antibiotic against bacterial agent associated burned cases not useful. In case studies of burn patients who developed *P.aeruginosa* septicemia, mortality rate greater than 75%

was observed, this study done by Dale *et al* (40). So antibiotics that are administered orally are generally ineffective against most serious skin and soft tissue infections by *P.aeruginosa.* Treatment of such infections is confounded by innate and acquired resistance of *P.aeruginosa* to many antimicrobial agents. Hence, the development of new therapeutic and prophylactic agents for the control of bacterial infection in patients with burn wounds is needed.

TABLES

Table 1: Numbers and percentages of bacterial isolates, Identified from 50 Burn swabs.

Type of bacteria	No. Total (%)
I- G-ve bacteria *P.aeruginosa* *E.coli* *Proteus mirabilibs* *K.oxytoca*	 18 : 60 (30) 12 : 60 (20) 8 : 60 (13.3) 5 : 60 (8.3)
Total	**43 : 60 (71.66)**
II- G+ve bacteria	**17 : 60 (28.33)**
Total	60 : 60 (100)

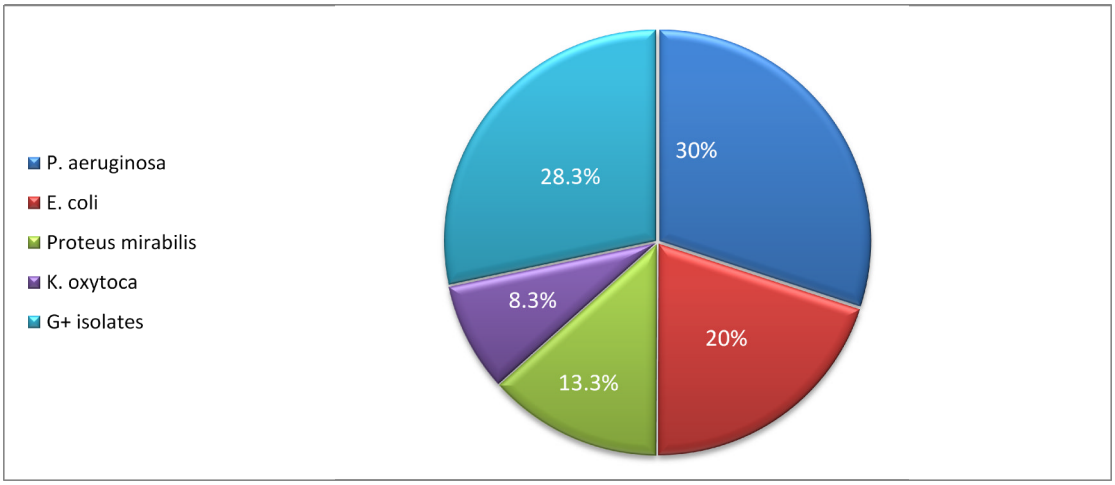

Figure 1: Percentages of bacterial burn isolates

Table 2: Types of bacteria isolated from 50 burn patients.

Type of infection	G-ve	G+ve	Total
	No. : Total (%)	No: Total (%)	No: Total (%)
Single	27 :50 (54)	13 : 50 (26)	40 :50 (80)
Mixed	8 :50 (16)	2 : 50 (4)	10: 50 (20)
Total	35 :50 (70)	15 : 50 (30)	50: 50 (100)

Table 3: Distributed of mixed infection among 50 burn patients.

Mixed pathogens	No. :Total (%)
E.coli + *S.aureus*	2 : 50 (4)
P.aeruginosa + *K.oxytoca*	3 : 50 (6)
P.aeruginosa + *E.coli*	3 : 50 (6)
Proteus mirabilis + *S.auerus*	2 : 50 (4)
Total	10 : 50 (20)

Table 4: Antimicrobial susceptibility test for *P. aeruginosa* and *K. oxytoca*, isolated from 50 burned patients.

Antibiotics	*P.aeruginosa*			*K.oxytoca*		
	R No %	I No %	S No %	R No %	I No. %	S No. %
Ampicillin 10 µg	16 88.8	1 5.5	1 5.5	5 100	0.0 0.0	0.0 0.0
Strepmycin 5 µg	8 44.4	3 16.6	7 38.8	5 100	0.0 0.0	0.0 0.0
Meropenem 10µg	3 16.6	0.0 0.0	15 83.3	0.0 0.0	0.0 0.0	5 100
Oflaxacin 5µg	4 22.2	1 5.5	13 72.2	2 40	0.0 0.0	3 60
Azithromycin 15 µg	3 16.6	0.0 0.0	15 83.3	2 40	0.0 0.0	3 60
Chloromphincol 30 µg	13 72.2	1 5.5	4 22.2	5 100	0.0 0.0	0.0 0.0
Imipenem 10 µg	0.0 0.0	1 5.5	17 94.4	0.0 0.0	0.0 0.0	5 100

R: resistance, I: intermediate, S: sensitive.

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اصابة الحروق الجرثومية في محافظة بابل

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المستخلص

تم دراسة المسببات الجرثومية المصاحبة للحروق في محافظة بابل من خلال ،خمسين مسحة قطنية جمعت من خمسين شخص قد ادخلوا الى ردهة الحروق في مستشفى الحلة التعليمي. جمعت المسحات القطنية للفترة من تشرين الأول ٢٠٠٩ وحتى نهاية أذار ٢٠١٠ . أظهرت النتائج أن ٦٠ عزلة جرثومية قد عزلت من هؤلاء الأشخاص المصابين بالحروق، وكانت أغلبية الجراثيم المعزولة عبارة عن جراثيم سالبة لصبغة الجرام والتي كان عددها ٤٣ عزلة وبنسبة مئوية (٦٦ .٧١ %)، بينما كانت جراثيم الموجبة لصبغة الجرام هي ١٧ عزلة وبنسبة مئوية (٣٣ .٢٨ %).

الجراثيم السالبة لصبغة الجرام كانت موزعة على النحو الأتي، ١٨ عزلة وبنسبة مئوية (٣٠ %) عبارة عن جراثيم الزوائف الزنجارية ، (١٢)عزلة (٢٠ %) جراثيم الاشريكيا القولونية ، (٨)(٣ .١٣ %) جراثيم المتقلبات و (٥)(٣ .٨ %) عبارة عن جراثيم الكلبسيلا اوكسيتوكا. من ناحية أخرى أظهرت النتائج أن (٨٠ %) من اصابة الحروق كانت اصابة فردية بينما (٢٠ %) كانت اصابة مختلطة ، أي أكثر من مسبب جرثومي مصاحب لتلوث الحروق. أظهرت نتائج الحساسية الدوائية للمسببات الجرثومية المصاحبة للحروق أن جراثيم الزوائف الزنجارية كانت مقاومة للكثير من المضادات الحياتية المستخدمة مثل الأمبسلين والكلورومفنيكول والستربتوماسين وبنسب مئوية (٨ .٨٨ %)،(٢ .٧٢ %)و (٤ .٤٤ %) على التوالي. بينما أظهرت حساسية دوائية واضحة لبعض المضادات الحياتية مثل ميروبنيم والابنيم والافلوكساسين والازثروماسين وبنسب مئوية (١٠٠ %)،(١٠٠ %)،(٦٠ %)و (٦٠ %) على التوالي.

من ناحية أخرى جراثيم الكلبسيلا أظهرت مقاومة واضحة لنفس المضادات الحياتية (المبسلين، استربتوماسين والكلورومفنيكول) وبنسب مئوية (١٠٠ %). بينما كانت حساسة للميروبنيم والابنيم والافلوكساسين والزثروماسين بنسب مئوية (١٠٠ %)،(١٠٠ %).(٦٠ %) و(٦٠ %) على التوالي.

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