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The prevalence of *Pseudomonas aeruginosa* as a risk factor among burn patients in Basrah – Iraq

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Abstract: Burns injury are a serious health problem in many countries. *P. aeruginosa* is a ubiquitous gammaproteobacterium found in various environments and it is multi-drug resistant (MDR). *P. aeruginosa* is an opportunistic pathogen can caused many infections in mammals, animals, and in plants. **Methods:** The samples collected from June 2020 to May 2021 from Al-Fayhaa General Hospital / Burns Unit. Written consent obtained from all the patients participating involved in the study. This study included 75 samples collected from the burn patients, 40 diagnosed as *P. aeruginosa* (17 males and 23 females) from moderate to severe burns wound infection categorized according to age, gender. **Results:** Among 75 clinical samples collected from the patients with 2nd and 3rd degree burns, 40 (53 %) of them positive bacterial growth while 35 (47 %) appeared as negative growth. The rate of *P. aeruginosa* isolates according to patients age group and their gender. A 17 (42.5 %) of them are males and 23 (57.5 %) females with age range 10-40 years, the mean age (Mean \pm SD) was 13 ± 0.58 years. The high prevalence of these isolates in 20-30 years (17.5 %) between male and female (22.5 %). **Conclusion:** The rate of *P. aeruginosa* prevalence 53.3 % in patients. The infection among the female higher than male 57.5 % and 42.5 %, respectively.

Keywords: Burns; Thermal burns; *Pseudomonas aeruginosa*; opportunistic pathogen; virulence factors

1. Introduction

Burns injury are a serious health problem in many countries. It's can classified according to causes, degree or depth, and the area of the body that has been burned.

Burns may be caused by thermal, Electrical, Chemical material. Thermal burns is a serious type of trauma may be caused by conduction or convection such as hot liquid, fire or steam (Mayhall, 2003). Thermal burns can cause a large release of immune factors, including cytokines, prostaglandins, vasoactive prostanoids, and leukotrienes (O'Sullivan and O'Connor, 1997). The loss of the cutaneous barrier due to burns, which is considered the most important protective barrier in the body, makes it easy to penetrate and invade by microbes, as the colonization of burn wounds by pathogens may lead to systemic infection and many complications, the most important of which is sepsis, which constitutes 75% of mortality among patients (Vindenes and Bjerknes, 1995; Ekrami and Kalantar, 2007; Othman *et al.*, 2014). In the burn site, Decayed and dead tissues with a moist environment provide a suitable environment for the growth of various gram-positive and gram-negative microorganisms such as *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella* species, and fungi like *Candida albicans* and *Aspergillus* (Nudegusio *et al.*, 2004). *P. aeruginosa* is a ubiquitous gammaproteobacterium found in various environments and it is multi-drug resistant (MDR). *P. aeruginosa* is an opportunistic pathogen can caused many infections in mammals, animals, and in plants (Silby *et al.*, 2011). Its have capacity to produce a different virulence factors which help the pathogen to invasion and colonization (Kesarwani *et al.*, 2011; Que *et al.*, 2013). The present study intended to determine the prevalence of *P. aeruginosa* infection among burns patients in Basrah, Iraq.

2. Methods

2.1 Collection of samples

The samples collected from June 2020 to May 2021 from Al-Fayhaa General Hospital / Burns Unit. Written consent obtained from all the patients participating involved in the study. This study included 75 samples collected from the burn patients, 40 diagnosed as *P. aeruginosa* (17 males and 23 females) from moderate to severe

burns wound infection categorized according to age, gender.

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2.2 Samples Preparation for Identification *Pseudomonas aeruginosa*

The samples were collected using sterile cotton swabs from the purulent burn wound and cultured on blood agar and MacConkey's agar and incubated at 37°C for 24 h. After incubation, The identification of *P. aeruginosa* based on the colony characteristics, the odour, pigment production (blue-green pigmented), gram staining will appear as gram negative bacilli, and its diagnosed by some biochemical tests including oxidase test, gas production, indole production, citrate utilization, H₂S production and fermentation tests (glucose, sucrose, and lactose).

2.3 Statistical Analysis

P-values were used for the statistical analyzing of the results.

3. Results

Among 75 clinical samples collected from the patients with 2nd and 3rd degree burns, 40 (53 %) of them positive bacterial growth while 35 (47 %) appeared as negative growth (Figure 3-1). Table 3-1 showed the rate of *P. aeruginosa* isolates according to patients age group and their gender. A 17 (42.5 %) of them are males and 23 (57.5 %) females with age range 10-40 years, the mean age (Mean \pm SD) was 13 ± 0.58 years. The high prevalence of these isolates in 20-30 years (17.5 %) between male and female (22.5 %).

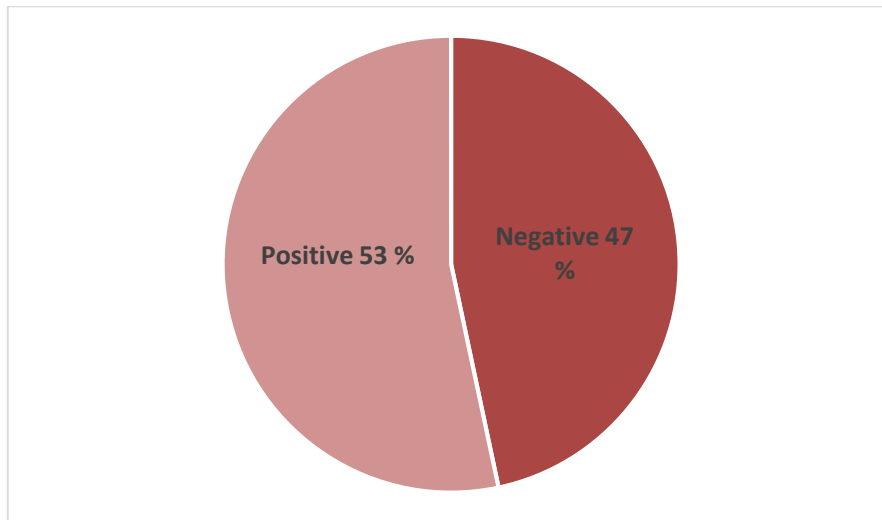


Figure (3-1) Prevalence of *P. aeruginosa* in burns wound samples

Table 3-1: Distribution of the isolates according to age and gender

Age Group (years)	Male		Female		Total	
	No.	%	No.	%	No.	%
10-20	6	15	8	20	14	35
20-30	7	17.5	6	15	13	32.5
30-40	4	10	9	22.5	13	32.5
Total	17	42.5	23	57.5	40	100
Mean \pm SD	6 \pm 1.53		8 \pm 1.53		13 \pm 0.58	

All isolates diagnosed as *P. aeruginosa* based on Gram stain and a number of biochemical tests such as Oxidase test, Gas production, H₂S production, Lactose fermentation, Citrate utilization, and Indole test (Table 3-2).

Table (3-2) Some Biochemical Test for Identification *P. aeruginosa* Isolates

Type of tests	<i>P. aeruginosa</i>
Gram stain	+ ve
Oxidase test	+
Gas production	-
H ₂ S production	-

Lactose fermentation	-
Citrate utilization	+
Indole test	+

+ Positive, - Negative

4. Discussion

Burns infection and their complications to be a major problem of morbidity and mortality in many countries (Washington *et al.*, 2006). *Pseudomonas aeruginosa* is one of the most pathogens related with burns infection in Iraqi hospitals and its responsible for 10% of hospital-acquired infection (Obritsch *et al.* 2004). The prevalence of *P. aeruginosa* in burn units is a source of concern due to its resistant to multiple antibiotics that used in the treatment of these infection (Lambert *et al.*, 2011). In the current study, Among 75 clinical samples collected from the patients with 2nd and 3rd degree burns, 40 (53 %) of them positive bacterial growth while 35 (47 %) appeared as negative growth. Other studies recorded a different percentage of infections with *P. aeruginosa*, which reported 27% in Iraq and Tunisia (Chahed *et al.*, 2014; Othman *et al.*, 2014), 14.5% in South Africa (Coetzee and Kahn, 2013) and 19.5% in Egypt (Hassuna *et al.*, 2015). These results showed that the rate of *P. aeruginosa* among the female higher than male (57.5 % and 42.5 %, respectively). Compared to a study conducted in Sulaimania by Rashid *et al.*, (2017), the male infection rate was 56.5% and the highest groups were Hot water (72.5%), flame (22.8%) then electrical (1.8%), This is due to the cleanliness of hospitals and nursing staff, as well as frequent suicides in hot water. In females, burns mostly attributed to suicides as well as household responsibilities such as cooking and heating. While in males, it can be reasoned to the occupational activities and may be due to the behaviors of males that might be associated with the type of work.

Conclusion

The rate of *P. aeruginosa* prevalence 53.3 % in patients. The infection among the female higher than male 57.5 % and 42.5 %, respectively.

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