e-ISSN: 2455-667X

Annals of Natural Sciences
(Peer Reviewed and UGC Approved International Journal)
Vol. 3(4), December 2017: 38-41
Journal's URL: http://www.crsdindia.com/ans.html
Email: crsdindia@gmail.com

Annals of Natural Sciences

ORIGINAL ARTICLE

Screening the Effect of Antibiotics on Bacteria Isolated from Burn Wound Infection

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ABSTRACT

The study was to investigate the drug resistance bacteria isolated from burn wound infected pus sample. Totally, five bacteria Escherichia coli, Proteus vulgaris, Pseudomonas aeruginosa, Serratiamarcescens and Streptococcus pyogenswere identified. In antibiotic sensitivity test, twelve antibiotics were used against the pathogens. The E. coli (24 mm, 22 mm), P. aeruginosa (each 20 mm), Serratiamarcescens (22 mm, 20 mm) and Streptococcus pyogens (30 mm, 20 mm) were highly sensitive to chloramphenicol and rifambicin. E. coli resistance to azithromycin (5 mm), erythromycin (6 mm), penicillin G (4 mm) and ofloxacin (7 mm). Proteus vulgaris sensitive to, azithromycin (18 mm), erythromycin (24 mm) and rifampicin (19 mm). Resistance to chloramphenicol (8 mm), gentamycin (8 mm), penicillin G (7 mm).Pseudomonas aeruginosa more resistance to pencillin G (4 mm) and tetracycline (4 mm).Serratiamarcescens, and Streptococcus pyogens highly resistance to norflaxin, ofloxacin and pencilin G.

Key words: *Burn wound infection, Bacteria, Antibiotics, Resistance*

Received: 10th Sept. 2017, Revised: 19th Oct. 2017, Accepted: 23rd Oct. 2017

How to cite this article:
Kumar R.S., Dhivyabharathi C. and Mahalakshmi K. (2017): Screening the Effect of Antibiotics on Bacteria Isolated from Burn Wound Infection. Annals of Natural Sciences, Vol. 3[4]: December, 2017: 38-41.

INTRODUCTION

Human skin surface play important role in protection against infections. Thermal injury creates a break in the surface of the skin (DeBoer and Connor, 2004) that require immediate and specialized care in order to minimize morbidity and mortality (Roth and Huges, 2004). Because of the importance of the skin as a barrier to microbial host invasion, it is not surprising that the risk of subsequent burn wound infection and systemic infection correlates with the size of the burn injury (Heimbach*et al*., 2004). The burn wound surface is a protein-rich environment consisting of a vascular necrotic tissue that provides a favorable niche for microbial colonization and proliferation. Although burn wound surfaces are sterile immediately following thermal injury, these wounds eventually become colonized with microorganisms (Erol, *et al.,* 2004).

Microorganisms may also be transferred to a patient's skin surface via contact with contaminated external environmental surfaces, water, air, and the soiled hands of health care workers (Weber, *et al*., 1997). It is very crucial for every burn center to determine the specific pattern of burn wound microbial colonization, and the antimicrobial sensitivity profiles (Macedo and Santos, 2005). Burns provide a suitable site for bacterial multiplication and are more persistent richer sources of infection than surgical wounds, mainly because of the larger area involved and longer duration of patient stay in the hospital (Agnihotri, *et al.,* 2004). The pattern of infection differs from hospital to hospital;

the varied bacterial flora of infected wound may change considerably during the healing period (Kumar, *et al.,* 2003).

Bacterial infections following severe thermal injuries can be most simplistically attributed to the extensive breaches in the skin barrier (Church *et al*., 2006). Almost all the clinical cases of *P. aeruginosa*infections are associated with the compromised host defense as seen in burn patients (Bowers, *et al*., 2013).

MATERIALS AND METHODS

SAMPLE COLLECTION:

To isolate and identify the bacteria from burn wound infection, samples were collected from 30 patients affected with burn wounds at Government Hospital, Perambalur, and Tamilnadu. Among the 30 patients 16 male, 14 female candidates age group between 15-45 years old. The infected burn wound pus samples were collected using sterile cotton swabs during February 2017 to March 2017. The swabs were transferred into sterile tubes with 1% peptone broth. The tubes were immediately transported to the microbiology laboratory for further analysis.

ISOLATION AND IDENTIFICATION OF BACTERIAL PATHOGEN:

For isolation of burn wound infected bacterial strains, loop full samples were streaked on Mac Conkey agar, Blood agar and Nutrient agar plates (Hi Media, India) and incubated at 37±2ºC for 24 hrs. After incubation, colonies were characterized on the basis of morphological, cultural physiological and biochemical characteristics (Mac Faddin, 2000). A presumptive identification was performed by Gram staining, catalase production, oxidase activity, hydrogen sulfide production, Indole test, Voges-Proskauer test. The bacterial isolates were identified with the help of Bergey's Manual of Systematic Bacteriology (Kreig and Holt, 1984).

DISC DIFFUSION METHOD:

The isolated bacterial species were tested for the antibacterial susceptibility test against standard antibiotics. The test was done by disc diffusion method as recommended by CLSI M45-A2 guidelines on Muller Hinton agar (CLSI, 2015). The commercially available standard antibiotics *viz.* Ampicillin, Azithromycin, Cefotaxime, Chloramphenicol, Erythromycin, Gentamicin, Norfloxacin, Ofloxacin, Penicillin-G, PiperacillinTazobactam, Rifampicin and Tetracycline were used.

RESULTS AND DISCUSSION

A total of 30 burn wound infected samples were analysed for isolation of predominant bacterial pathogens. Out of which most of the samples showed prominent bacterial count. Few of the samples showed very low bacterial count. The demographic characterization of the patients showed that, the significant proportions were males (54%), in the age group of 15 to 45 years, 21 married (70%) and 4 (13.5%) were capable of read and write, up to SSLC grade (30%) and HSC level 46.5% (Table 1). Five bacteria were isolated from 30 burn wound infected pus samples. The isolates were characterized and identified by studying different properties as mentioned in materials and methods. The identification characteristics were confirmed with standard manual (Krieg and Holt, 1984). The biochemical characteristics revealed that, these isolates belonging to 5 genera (Table 2). Of these *Escherichia coli, Proteus vulgaris, Pseudomonas aeruginosa, Serratiamarcescens* and *Streptococcus pyogens*were identified (Table 3). Similarly, Anuradha*et al*. (2008) reported that the most common isolate was *Pseudomonas aeruginosa* (55.0%), followed by *Staphylococcus aureus* (19.29%), *Klebsiella* sp. (11.43%), *Acinetobacter* sp. (7.14%), *Proteus* sp. (4.29%), *Escherichia coli* (2.85%). AlsoSuzan*et al.* (2016) reported that the common problems in burn units are wound infections and mostly originated from nosocomial contamination. Many burned patients die as a result of infection during their

hospital courses. *Pseudomonas aeruginosa*was found to be the most common isolate (27.6%) followed by *Staphylococcus aureus* (23.8%), *Klebsiella spp.* (19%), *Proteus spp.* (17.1%), *E. coli* (11.4%) and *Acinetobacter* (0.9%). In antibiotic sensitivity test twelve antibiotics are used against pathogen isolated from burn wound infection. The *E. coli* (24 mm, 22 mm), *P. aeruginosa* (each 20 mm), *Serratiamarcescens* (22 mm, 20 mm) and *Streptococcus pyogens* (30 mm, 20 mm) were highly sensitive to chloramphenicol and rifambicin. *E. coli* resistance to azithromycin (5 mm), erythromycin (6 mm), penicillin G (4 mm) and ofloxacin (7 mm). *Proteus vulgaris* sensitive to, azithromycin (18 mm), erythromycin (24 mm) and rifampicin (19 mm). Resistance to chloramphenicol (8 mm), gentamycin (8 mm), penicillin G (7 mm). Similarly, Rajalakshmi and Amsaveni, (2011) reported that the bacterial pathogens showed resistance to most of the antibiotics. *Pseudomonas aeruginosa* more resistance to pencillin G (4 mm) and tetracycline (4 mm). Similarly, Azar and Ali, (2016) reported that the emergence of highly drug resistant *Pseudomonas aeruginosa*in burn wounds is becoming a challenging problem for infection control programs. *Serratiamarcescens*, and *Streptococcus pyogens* highly resistance to norflaxin, ofloxacin and pencilin G (Table 4). In the present study correlated with Suzan, *et al.* (2016) antimicrobial susceptibility test against burn wound bacterial isolates, the Imipenem and Ciprofloxacin were found to be the most effective drugs against most of the isolates, followed by Amikacin. Doxycycline, Tetracycline and Azithromycin were less sensitive to some isolates, while Gentamycin and Oxacillin were the weakest antibiotics.

Table 1: Characteristics of burn wound culture positive patients

Variables	Number	Percentage
Age	15-45	
Sex		
Male	16	54
Female	14	46
Martial status		
Single	9	30
Married	21	70
Education level		
Write and read only	4	13.5
SSLC	9	30
HSC	14	46.5
University level	3	10

Table 2: Boichemical characteristics testing of bacterial isolates from burn wound infected sample

Isolates	Gram Strainig	Shape	Motility	Indole	MR	VP	Citrate	TSI	H_2S	Urease	Catalase	Oxidase	Suspected Organisms
1	-	Rod	+	+	+	-	-	-	-	-	+	-	***Escherichia coli***
2	-	Rod	+	+	+	-	-	+	+	+	+	-	***Proteus vulgaris***
3	-	Rod	+	-	-	-	+	+	-	-	+	+	***Pseudomonas aeruginosa***
4	-	Rod	+	-	-	+	+	-	-	-	+	-	***Serratiamarcescens***
5	+	Cocci	-	-	-	+	-	-	-	-	-	-	***Streptococcus pyogens***

Table 3: Bacteria isolated from the burn wound infected sample

S.No	Name of the organism
1.	***Escherichia coli***
2.	***Proteus vulgaris***
3.	***Pseudomonas aeruginosa***
4.	***Serratiamarcescens***
5.	***Streptococcus pyogens***

Table 4: The effect of antibacterial susceptibility testing of isolated burn wound infected bacterial pathogens

S.No	Organisms	Ampicilin	Azithromycin	Cefotaxime	Chloramphenicol	Erythromycin	Gentamican	Norfloxacin	Ofloxacin	Penicilin-G	PiperacillinTazopactam	Rifampicin	Tetracycline
		Zone of Inhibition in mm											
1.	***Escherichia coli***	10	5	12	24	6	20	30	7	4	13	22	24
2.	***Proteus vulgaris***	7	18	10	8	24	8	11	10	7	15	19	6
3.	***Pseudomonas aeruginosa***	8	9	13	20	7	9	7	7	4	12	20	4
4.	***Serratiamarcescens***	10	18	14	22	9	15	6	6	6	14	20	24
5.	***Streptococcus pyogens***	10	9	10	30	9	8	4	7	6	20	17	10

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