International Journal of Medical Research Professionals
P-ISSN: 2454-6356; E-ISSN: 2454-6364
DOI: 10.21276/ijmrp

IJMRP

Original Research Article.

Bacteriological Profile and Antibiogram of Burn Wound Infections from Burn Patients at RIMS, Ranchi

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ABSTRACT

Introduction: Burn wounds are especially prone to infection which is a major cause of morbidity and mortality in hospitalised burn patients. Identification of bacterial isolates from specimens of burn patients and study of their drug susceptibility pattern helps in improving the outcome and determining empirical antimicrobial therapy to burn patients.

Aims and Objectives: To identify the common aerobic bacterial isolates and study their antimicrobial susceptibility in specimens collected from burn wounds at RIMS, Ranchi.

Material and Methods: The study was done in the Department of Microbiology RIMS, Ranchi from July 2016 to Dec. 2016. Specimens were obtained from Burn ward. Total 50 samples were collected, processed according to standard laboratory protocols and AST was done by using Kirby Bauer method as per the CLSI guideline.

Results: Out of 50 samples, 48 (96%) samples were culture positive and 2 (4%) were sterile. The predominant isolate was Pseudomonas (37.04%) followed by Staphylococcus aureus (33.33%), Klebsiella species (14.81%), CONS (7.41%), E.Coli (5.56%) and Acinetobacter species (1.85%). In case of gram negative isolates high level of drug resistance was observed for Amoxicillin, Cefotaxime, and Ceftazidime whereas Imipenem, Piperacillin/Tazobactam and Colistin were found to be most effective. In case of Gram positive bacteria Amoxicillin and Amikacin were the resistant antibiotics and Vancomycin and linezolid were found to be 100% sensitive.

Conclusion: For the prevention of emergence and spread of multidrug resistant pathogens there is an urgent need to develop institutional programs to enhance antimicrobial stewardship.

Keywords: Antibiotic Susceptibility Burns, Infection.

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Article History:

Received: 15-10-2018, **Revised:** 09-11-2018, **Accepted:** 26-11-2018

Access this article online	
Website: www.ijmrp.com	Quick Response code
DOI: 10.21276/ijmrp.2018.4.6.043	

INTRODUCTION

A burn is an injury to the skin or other organic tissue primarily caused by heat or due to radiation, radioactivity, electricity, friction or contact with chemicals. Skin injuries due to ultraviolet radiation, radioactivity, electricity or chemicals, as well as respiratory damage resulting from smoke inhalation, are also considered to be burns. Globally, burns are a serious public health problem. An estimated 265 000 deaths occur each year from fires alone, with more deaths from scalds, electrical burns, and other forms of burns, for which global data are not available. Over 96% of fatal fire-related burns occur in low- and middle-income countries. In addition to those who die, millions more are left with lifelong disabilities and disfigurements, often with resulting stigma and rejection.[1]

The survival rates for burn patients have improved substantially in the past few decades due to advances in modern medical care in specialized burn centers. Improved outcomes for severely burned patients have been attributed to medical advances in fluid resuscitation, nutritional support, pulmonary care; burn wound care, and infection control practices. As a result, burn-related deaths, depending on the extent of injury, have been halved within the past 40 years. In patients with severe burns over more than 40% of the total body surface area (TBSA), 75% of all deaths are currently related to sepsis from burn wound infection or other infection complications and/or inhalation injury. An intact human skin surface is vital to the preservation of body fluid homeostasis, thermoregulation, and the host's protection against infection. The skin also has immunological, neurosensory, and metabolic functions such as vitamin D metabolism.[2-4]

The pathogenesis of colonisation, infection and invasion of microorganisms is related to the fact that there is a disruption of the normal skin barrier at the site, as well as a large amount of necrotic tissue and protein-rich wound exudate at the burn surface, providing a rich growth medium for colonisation and growth of microorganisms, which is poorly controlled due to depressed immune responses.[5,6] Risk factors for burn wound colonization or infection are the size of the burn wound, i.e., the

percentage of total body surface area (TBSA) burnt and the duration of hospitalization.[7]

The pathogens that infect the wound are primarily Gram-positive bacteria such as Staphylococcus aureus and Gram-negative bacteria such as Pseudomonas aeruginosa, Klebsiella species, E.Coli and Acinetobacter species. These pathogens are notable for their increasing resistance to a broad array of different antimicrobial agents.[8]

Emergence of multi drug resistant pathogens in hospital setting has seriously constrained the available therapeutic options. This necessitates periodic review of the isolation pattern and study of antibiogram of the isolates to strengthen surveillance activities.[9] The present study was undertaken to know the antimicrobial susceptibility profile of various bacterial isolates recovered from patients of infected burn wounds which will help in instituting empirical therapy and minimize irrational use of antimicrobial agents.

MATERIAL AND METHODS

The study was done in the Department of Microbiology RIMS, Ranchi from July 2016 to Dec. 2016.Specimens were obtained from Burn wards. Total 50 burn wound swabs samples were collected, processed and AST was done by using Kirby Bauer method as per the CLSI guidelines.

In this study, patients who were >10 years and either gender were included. Adult patients with partial thickness burns less than 10% body surface area were excluded. Patients with perineal burns and those with chronic diseases like tuberculosis, diabetes mellitus were excluded from the study. Under aseptic precautions, clinical specimens were collected from open burn wounds preferably from upper and lower extremities avoiding oral, genital, scalp, and anal regions. These were taken initially on admission before dressing changes and before administration of antibiotics. The samples were collected prior to antibiotic therapy by commercially available sterile swabs and transported to the lab. The samples were processed in the laboratory as per the standard protocol by inoculating on Blood agar, MacConkey agar and incubated overnight at 37°C aerobically. Pathogenic organisms were isolated and identified by conventional biochemical tests. The antibiotic susceptibility testing was performed by Kirby- Bauer disc diffusion method as per CLSI guidelines.

For Gram positive cocci the following discs were used Amoxycillin (10mcg), Ceftriaxone (30mcg), Gentamicin (10mcg), Amikacin (30mcg), Linezolid (30mcg), Vancomycin (30 mcg), Ofloxacin (5mcg), Amoxyclav (20/10mcg), Azithromycin (15 mcg), Cefoxitin (30mcg), For Gram negative bacilli – Imipenem (10mcg), Ciprofloxacin (5mcg), Piperacillin+ Tazobactum (100/10mcg), Gentamicin (10mcg), Amoxyclav (20/10mcg), Ceftazidime (30mcg), Cefotaxime (30mcg), Amoxycillin (10mcg), Amikacin (30mcg), Colistin (10mcg). MRSA Detection was done by Cefoxitin (30µgm) disc diffusion method (zone size ≤ 21 mm for Staphylococcus and ≤ 22 mm for CONS) is resistant.

Table 1: Age wise distribution of patients

Age in years	Numbers	Frequency (%)
11 – 20	9	18
21 – 30	21	42
31 – 40	12	24
41 – 50	8	16

Table 2: Antibiotic sensitivity pattern of gram negative isolates.

Antibiotic	P. aeruginosa (n=20)	Klebsiella sp.(n=8)	E.coli (n=3)	Acinetobacter sp. (n=1)
Amoxicillin	5 (25%)	2 (25%)	1 (33.3%)	0
Amikacin	15 (75%)	6 (75%)	2 (66.6%)	1 (100%)
Amoxyclav	20 (100%)	6 (75%)	2 (66.6%)	1 (100%)
Cefotaxime	7 (35%)	4 (50%)	2 (66.6%)	0
Ceftazidime	14 (70%)	4 (50%)	2 (66.6%)	0
Imipenem	20 (100%)	8 (100%)	3 (100%)	1 (100%)
Gentamicin	9 (45%)	3 (37.5%)	2 (66.6%)	0
Piperacillin- tazobactum	20 (100%)	8 (100%)	3 (100%)	1 (100%)
Ciprofloxacin	15 (75%)	7 (87.5%)	2 (66.6%)	1 (100%)
Colistin	20 (100%)	8 (100%)	3 (100%)	1 (100%)

Table 3: Antibiotic sensitivity pattern of gram positive isolates.

Antibiotic	Staphylococcus aureus (n=18)	CONS (n=4)
Amoxicillin	2 (11.1%)	1 (25%)
Amikacin	9 (50%)	2 (50%)
Amoxyclav	15 (83.3%)	3 (75%)
Cefoxitin	14 (77.8%)	3 (75%)
Ceftriaxone	15 (83.3%)	3 (75%)
Gentamicin	9 (50%)	2 (50%)
Ofloxacin	13 (72.2%)	3 (75%)
Vancomycin	18 (100%)	4 (100%)
Linezolid	18 (100%)	4 (100%)
Azithromycin	13 (72.2%)	3 (75%)

Figure 1: Type of bacteria in gram stain smear study

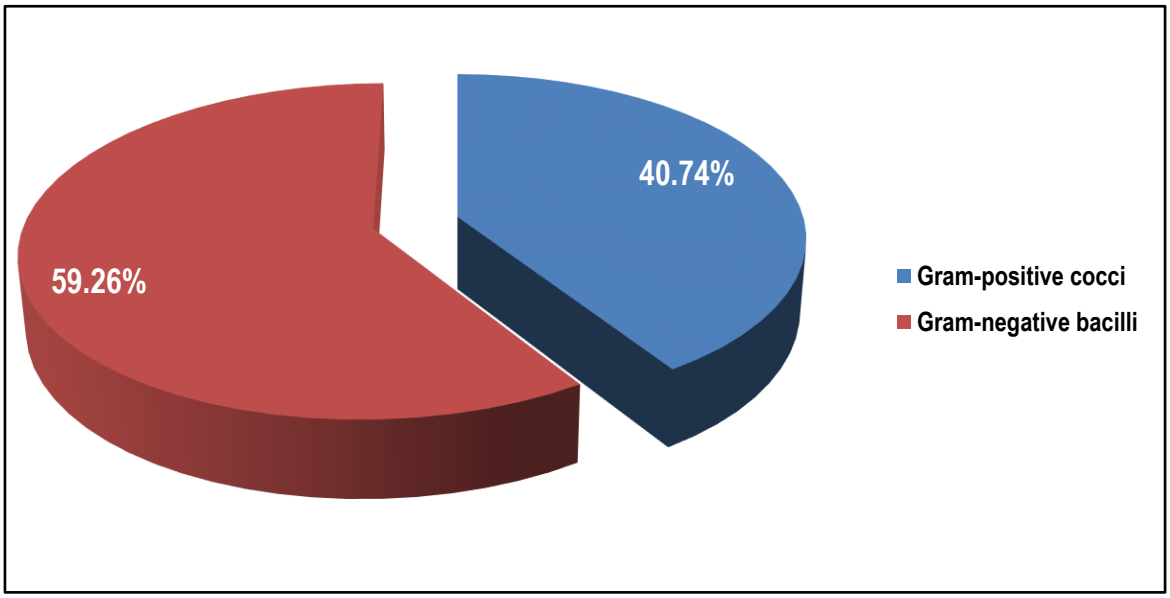
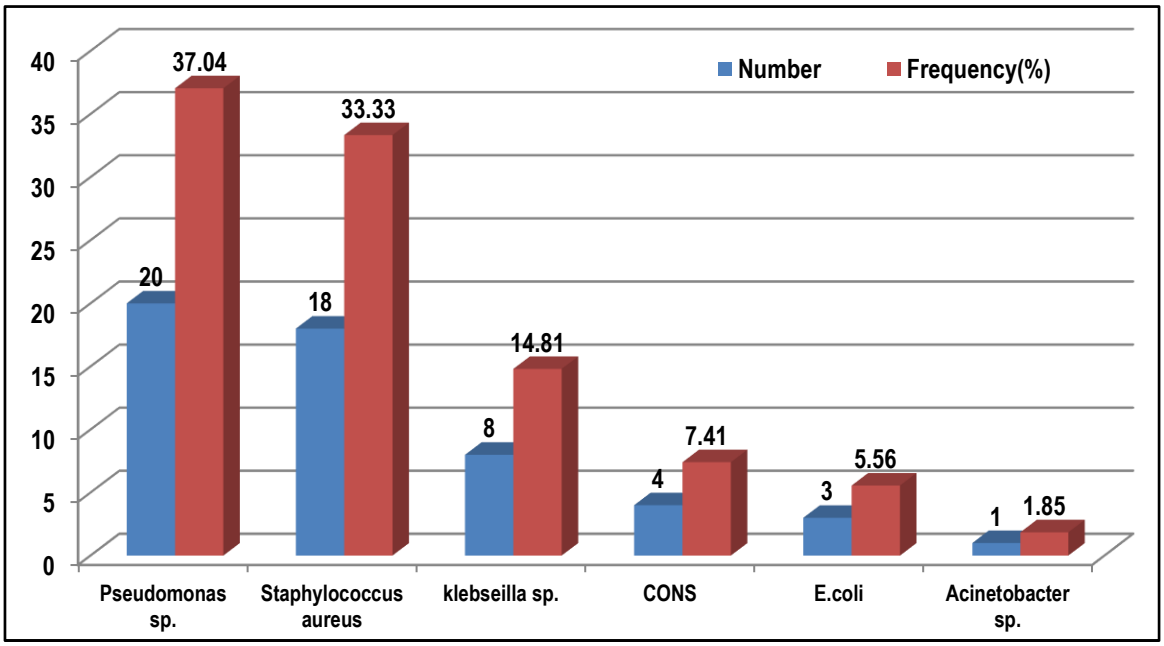


Figure 2: Isolation rate of organisms from burn wound swabs (n=56)



RESULTS

Out of 50 samples, 29(58%) were from females and 21 (42%) were from males. Majority of the cases were from 21 to 30 years age group (42%). Out of 50 samples, 48 (96%) samples were culture positive and 2 (4%) were sterile. 42 Specimens yielded single aerobic bacterial growth and mixed bacterial growth was seen in 6 specimens. Thus total 54 isolates were tested for antimicrobial susceptibility. Among 6 mixed isolates, E.Coli + Pseudomonas were seen in 2 specimens, Klebsiella + Pseudomonas in 3 specimens and Staphylococcus aureus + Pseudomonas in 1 specimens. Among 54 bacterial isolates, 32 (59.26%) were Gram negative bacilli and 22(40.74%) were Gram positive cocci. Among Gram negative bacilli Pseudomonas aeruginosa was the predominant isolate (20, 37.04%) followed by Klebsiella species (08, 14.81%), Escherichia coli (03, 5.56%) and Acinetobacter species (01, 1.85%). Among Gram positive cocci Staphylococcus aureus (18, 33.33%) was the predominant isolate followed by Coagulase negative Staphylococci (4, 7.41%). Among Staphylococcus aureus, 22.2% were MRSA and all were susceptible to vancomycin and linezolid (100%).Gram negative isolates were 100% sensitive to Imipenem, Piperacillin-tazobactum and Colistin.

DISCUSSION

In the present study, the incidence of burn wound infection was higher in females (58%) which correlates with Sharma L et al[10] (56%), N. Lakshmi et al[11] (59.3%) and Rajeshwar et al[12] (56.2%). Incidence of burn was higher in females because females mostly spend their time in kitchen where accidents happen, their loose outfits and unfortunate practice of bride-burning for dowry. This may be due to socioeconomic reasons in our society. The age group mostly affected by burn injury was between 21- 30 years (42%). This was consistent with the study conducted by Rajeshwar et al (38%), Datta et al(33.3%) and Preeti. K.Sharma et al[13] (41.25%) in which the most common age was 20-30 years.

In the present study, very high culture positivity 96% was found in the samples from burn patients. The most commonly isolated organism in the present study was Pseudomonas aeruginosa followed by S. aureus and Klebsiella spp.

In the present study, Pseudomonas aeruginosa was the commonest isolate(37.04%) which correlates with Sharma L et al(38%), Alirej Ekrami et al[14] (37.5%), N. Lakshmi et al(33.6%) and Preeti. K.Sharma et al reported 35.5%. Second most common organism was S.aureus which correlates with Sharma L et al(35%) and Naveen Saxena et al(19.29%). Among the *S.* aureus isolated from patients within the burn center, the incidence of methicillin-resistant *S.* aureus (MRSA) was 22.2% which correlates with Roopa Hegde et al[15] (26%) and M. Chauhan et al[16] (20%) and all were susceptible to vancomycin and linezolid (100%). Antibiotic sensitivity patterns revealed that many of the isolates were resistant to commonly used antibiotics like cephalosporin group, penicillin group etc. which are being indiscriminately used on empirical basis for prolonged duration of time. Antibiogram of gram positive cocci revealed that they show susceptibility towards Amoxyclav, vancomycin, cefoxitin, Azithromycin and linezolid but resistance towards gentamycin penicillin. Whereas gram negative bacilli showing good response towards Imipenem, Colistin, Amoxyclav, Piperacillin- tazobactum but resistance towards cephalosporin group and penicillin group. All these study were inaggrement with the study by Mehta et al.[17]

CONCLUSION

The wide use and frequent misuse of antimicrobials in all countries has resulted in the emergence of drug resistance, with 'superbugs' being resistant to most or even all antimicrobials. It is therefore essential to optimize the use of antimicrobials which are still effective. This is particularly relevant in the case of critically ill patients and multidrug resistant infections, which are more difficult to treat. As a result, the way infections are prevented and treated needs to be improved by:1) Using antimicrobials only where an evidence based indication exists.2)Optimizing antimicrobial dosing enabling patients to be cured faster and to slow the rate of emerging resistance.3)Performance of continuous surveillance of drug susceptibility profiles and Minimal Inhibitory Concentrations (MICs) by the microbiology laboratory to reliably guide selection of empiric and directed therapies.4)To choose empiric antibiotic according to the antibiotic police(antibiogram) of the concern hospital till the antibiotic susceptibility report is pending.

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Source of Support: Nil. **Conflict of Interest:** None Declared.

Cite this article as: Megha Priyadarshini, Manoj Kumar, Ashok Kumar Sharma, Amber Prashad, Kumari Seema. Bacteriological Profile and Antibiogram of Burn Wound Infections from Burn Patients at RIMS, Ranchi. Int J Med Res Prof. 2018 Nov; 4(6):203-06. DOI:10.21276/ijmrp.2018.4.6.043