



Bacteriological Profile & Drug Sensitivity Pattern of Burn Wound Infections in a Tertiary Care Hospital in Gujarat.

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Abstract

Introduction: Burn wound provides an ideal site to bacterial colonization or infection, leading to morbidity and mortality. Early identification of infection provides improved management and leads to better prognosis.

Materials & methods: A total of 118 samples (burn wound swabs and pus exudates) were received from 109 patients at bacteriology lab and were processed immediately as per the standard laboratory procedures. Identification and antimicrobial sensitivity testing of the bacterial isolates was performed and interpreted as per latest CLSI-M100 standards (January 2020).

Results: Out of 118 samples, 78(66.10%) were culture positive. Among them 60 were monobacterial dominant. The most predominant species were *Klebsiella pneumoniae*(n=31,39.74%) followed by *Pseudomonas aeruginosa*(n=25,32.05%), *Proteus mirabilis*(n=8,10.25%), *Staphylococcus aureus*(n=6,7.69%), *Acinetobacter sp.*, (n=4,5.12%), *Citrobacter sp.* (n=1,1.28%) & *E.coli* (n=3.84%). Meropenem, Piperacillin-tazobactam were mostly effective against gram-negative isolates. Linezolid, Vancomycin showed good susceptibility towards gram-positive isolates.

Conclusion: Timely and appropriate antibiotic treatment; often empiric, can improve the clinical outcome. Hence, Regular monitoring of prevalent pathogenic organisms and their sensitivities are essential.

Keywords: Burn wounds, Bacteria, Antibiotic sensitivity

Introduction

Injuries and deaths due to burn are a global concern with regards to public health, accounting for an estimated 265,000 deaths annually. The majority of these occur in low- and middle-income countries and almost half occur in the WHO South-East Asia Region.^[1] In India, in the year 2013, a total of 22,177 (5.9%) deaths and 2391 injuries occurred as a result of some form of accidents due to fire. Fire accidents constituted 5.5% of the un-natural causes of accidental deaths, of which 65.7% of those killed were females who out-numbered males (34.3%).^[2]

Infections persist as an important complication and cause of mortality in the burn patients.^[3] The use of prophylactic antibiotics is common practice with burnt patients.^[4] Drug resistant bacteria with intrinsic resistance towards antibiotics, the ability to survive longer in the hospital environment and hand-to-hand transmission of bacteria reflect their easy spread and the possible causes of outbreak.^{[5][6]} The bacterial infections in burnt patients vary both with time and place^{[7][8]}.

Materials & Methods:

This retrospective study was conducted in department of Microbiology of Tertiary Care Hospital, Rajkot for a period of 6 months (May 2020- October 2020).

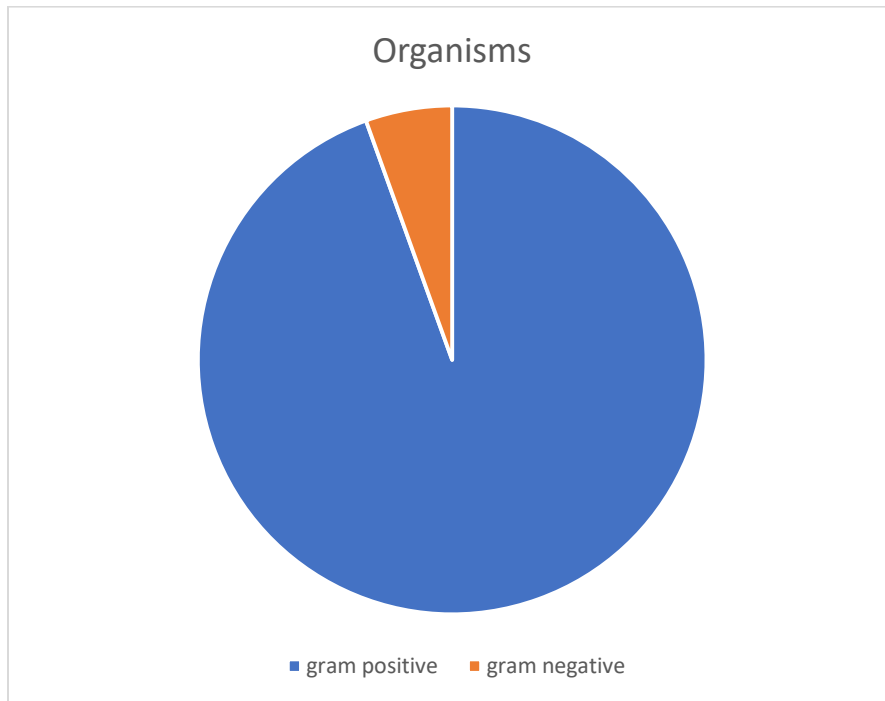
A total of 118 samples (burn wound swabs and pus exudates) were received at bacteriology laboratory. On receiving, samples were processed immediately as per the standard procedures. Identification and antimicrobial sensitivity testing of the bacterial isolates was performed and interpreted as per latest CLSI-M100 (January 2020).

Results:

A total of 118 samples were collected from burn wounds of 109 patients, of which 69 swabs showed growth and 40 swabs showed no growth after 24 h of incubation. Among them 60 were mono bacterial dominant.

Among the 78 samples with bacterial growth, gram-negative organisms (92.30%) outnumbered the gram-positive organisms (~8%). Figure 1 shows the distribution of bacteria isolated from burn wound.

Figure -1 Showing Distribution of Gram- positive and Gram-negative isolates



In the present study, the most predominant species were *Klebsiella pneumoniae*(n=31,39.74%) followed by *Pseudomonas aeruginosa*(n=25,32.05%), *Proteus mirabilis*(n=8,10.25%), *Staphylococcus aureus*(n=6,7.69%), *Acinetobacter sp.*, (n=4,5.12%), *Citrobacter sp.* (n=1,1.28%) & *E.coli* (n=3.84%). Of the 6 isolates of *S. aureus*, 2 were tested to be MRSA, and 4 were Methicillin-susceptible *S. aureus* (MSSA).

Figure-2: Distribution of the various bacterial isolates grown in clinical samples from burn wound patients.

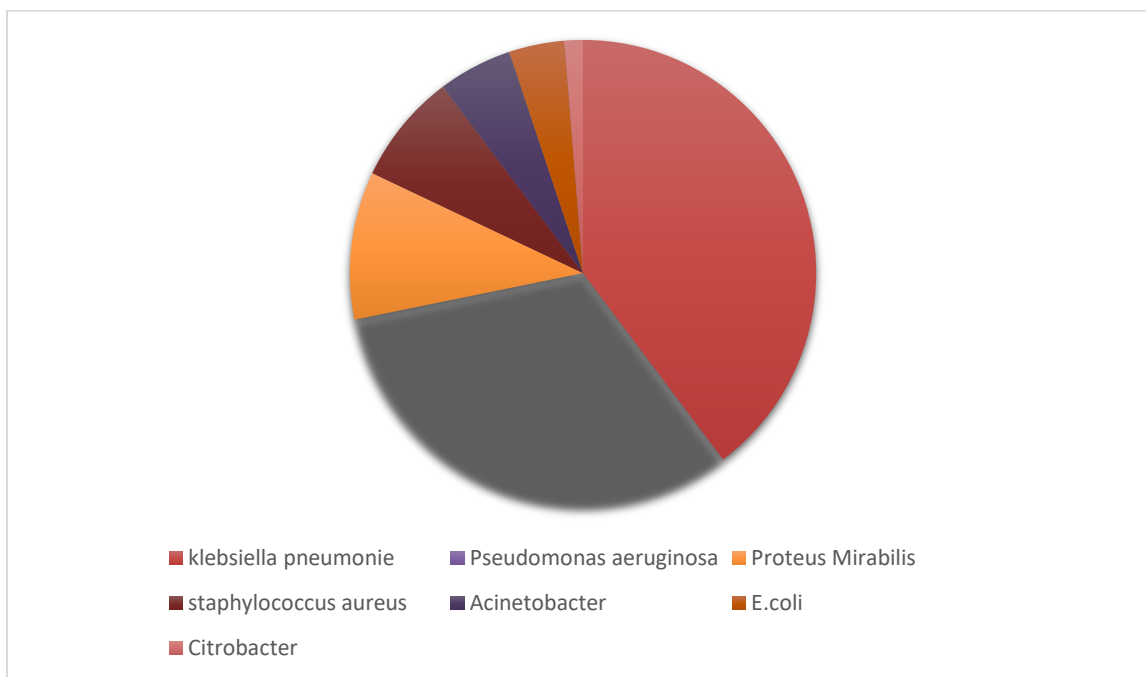


Table-1 Age wise distribution of patients

Age range (in years)	No. of patients (%)
1-15	11 (10.09%)
16-30	55 (50.45%)
31-45	22 (20.18%)
46-60	17 (15.59%)
>60	4 (3.66%)

The antimicrobial susceptibility pattern of the Gram-negative and Gram-positive isolates is shown in Table 2 and Figure 3, respectively.

Figure 3: Antimicrobial susceptibility pattern of Gram-positive bacteria (*S. aureus*) isolated from burn wound of patients

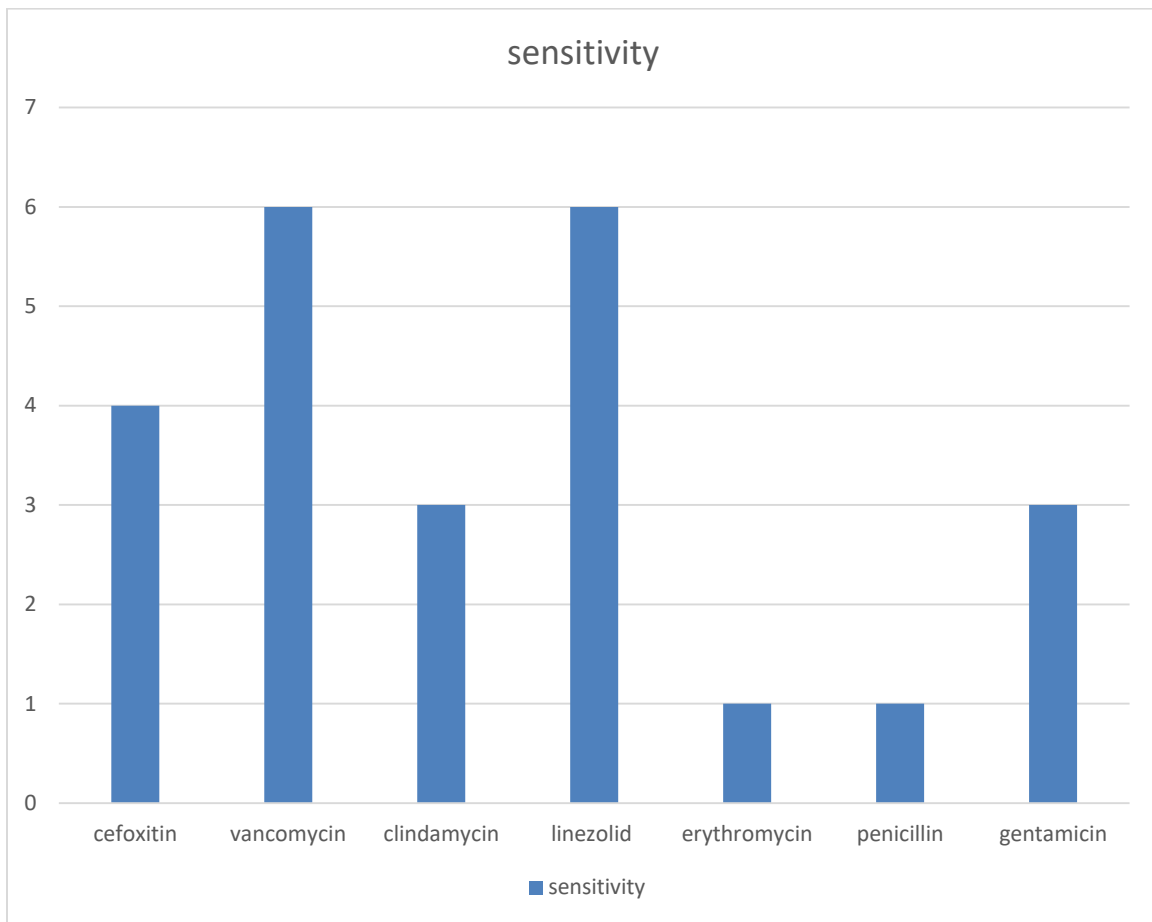


Table 2: Antimicrobial susceptibility pattern of Gram-negative bacteria isolated from burn wound of patients

	Klebsiella Pneumoniae	Pseudomonas aeruginosa	Proteus Mirabilis	Acinetobacter Spp	E.Coli
Meropenem	100%	100%	100%	100%	100%
Tetracycline	48.38%	-	5%	100%	33.33%
Amikacin	16.12%	8%	0	0	66.66%
Gentamicin	9.6%	0	37.5%	0	0
Cefepime	19.35%	4%	62.5%	0	100%
Ceftriaxone	0	-	37.5%	0	0
Ceftazidime	3.22%	4%	50%	0	0
Cefuroxime	0	-	37.5%	0	0

Ceftazidime Clavulanic acid	6.45%	-	25%	-	66.66%
Polymyxin B	-	100%	-	-	-
Levofloxacin	70.96%	12%	62.5%	100%	100%
Ciprofloxacin	51.61%	4%	62.5%	0	66.66%
Cotrimoxazole	9.67%	-	0	50%	33.33%
Ampicillin Sulbactam	6.45%	-	12.5%	0	0
Piperacillin- Tazobactam	80.64%	76%	87.5%	75%	100%
Aztreonam	-	28%	-	-	-

Discussion:

A total of 118 samples were collected for the study, of which, 78 samples showed growth. So, in this study, the overall isolation rate was 66.10%.

Regarding the sex distribution of the samples collected, females (60.5%) were more in number than males (39.44%), with a female to male ratio of 1.5:1. This can be attributed to females being more exposed to household fire while cooking and also suicidal and dowry deaths. This finding of female predominance in burn patients correlated with other studies done in different hospitals in India.[8] [9]

The patients belonging to 16-30 years age group (50%) were most affected. This finding may be due to the reason that most of the patients admitted to the burn unit were in this age group and also because these are the years of life more exposed to working with fire, both household and occupational.

In our study *Klebsiella* sp, *P. aeruginosa*, *E. coli.*, *Citrobacter* sp., *Acinetobacter* sp., *Proteus* sp. are the most common gram-negative bacteria whereas *Staphylococcus aureus* is the only gram-positive bacteria isolated from burn wound. The same microorganisms were found in a study carried out by Patil et al. [10] So gram negative bacterial prevalence is very high in our study. This is mostly due to the local practices in villages such as use of gentian violet, cow dung, tooth pastes and mud over the burn wound.

Meropenem, Piperacillin-tazobactam were mostly effective against gram-negative isolates. Linezolid, Vancomycin showed good susceptibility towards gram-positive isolates.

The strength of this study was that it would be helpful for better patient care in burn units, and precautionary actions to prevent the emergence and spread of resistant microorganisms can be undertaken. The limitation of the study was that it was conducted for a short span of time; it would have been better if the study could be performed for a longer duration with a larger sample size.

Conclusion:

Data extrapolated from the study can be utilised to optimize the treatment modalities, formulating policies for empiric and drug sensitivity guided antimicrobial therapy. This will reflect with shorter stay, lesser complications and thus reduced patient mortality and morbidity.

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