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Original Research Article

Antibiotic Resistance Pattern in Aerobic Gram Negative Bacterial Infection in Burn Patient's at Tertiary Care Hospital in Maharashtra

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ABSTRACT

Background and objective: The present study performed on patients admitted in burns unit to determine aerobic bacterial flora of burn wound infection and to study their antibiogram.
Methods: A total of 277 cases of different percentage of burns were studied for isolation of microbes. Bacterial isolates were identified by conventional biochemical methods and antibiotic susceptibility was performed by Kirby- Bauer method.
Results: From 277 patients, a total of 384 organisms were isolated from burn wound swabs. *Pseudomonas aeruginosa* (20.05%) were the most common isolate followed by *Proteus* species (16.40%), *Klebsiella pneumoniae* (16.14%), *Acinetobacter baumannii* (8.59%), *Citrobacter freundii* (6.25%), *Escherichia coli* (4.42%) and *Enterobacter spp* (3.38%). *Pseudomonas aeruginosa* and Proteus species shows good sensitivity to piperacillin/tazobactam (67.53%).
Conclusions: In conclusion, this study shows that various factors involved in the burn wound infections. There is continuous changing pattern of infecting organism and multidrug resistance among them. So continuous microbiological surveillance and regular antimicrobial susceptibility pattern helps to clinician in treatment and prevention of multidrug resistance in our burn unit. It also helps in institution guideline for antibiotics.

Key-words: Burns, Antibiotic sensitivity Test.

INTRODUCTION

Burn injury is a major problem in many parts of the world. It has been estimated that 75 % of all deaths following burns are related to infection. [1] Burn wound infection and septicemia still remains a major problem. [2] Cross infection results between different burn patients due to overcrowding in burn wards. [3] The emergence worldwide of antimicrobial resistance among a wide variety of human bacterial and fungal burn wound pathogens, particularly nosocomial isolates, limits the available therapeutic options for effective treatment of burn wound infections. [4] Emerging antimicrobial resistance trends in burn wound bacterial pathogens represent a serious therapeutic challenge for clinicians caring for burn. [5]

MATERIALS AND METHODS

The study was conducted in department of microbiology, tertiary care hospital Latur, India. A total of 277 cases of different percentage of burns were studied for isolation of microbes. For sample collection large, raw, burnt area was chosen. Specimen collected by swabs, and then cultured on blood agar, MacConkey agar. The plates were incubated overnight at 37^0c, aerobically. On the following morning, colony morphology was observed. Smears

were made from colonies on both agar plates and stained by Gram's staining. The isolates were identified by conventional methods. [6] After identification, antibiotic sensitivity testing was done by modified Kirby Bauer method. [7] Antibiotics used piperacillin (100ug), piperacillin tazobactam (100/10ug), gentamicin (10ug), amikacin (30ug), Cefepime (30ug), cefotaxime (30ug), imipenem (10ug), ciprofloxacin (5ug), co-trimoxazole(25ug), ampicillin (10ug), ceftazidime(30ug).

RESULTS

Out of 277 patients, there were 105 (37.90%) male patients and 172 (62.10%) female patients. The most commonly affecting age groups among male patients were 31-50 years and among female patients were 16-30 years. There is correlation between age and gender, P value < 0.0001, which is highly significant.

246 (88.80%) patients were of thermal burn and followed by scalding 22 (7.9%) and electrical burn 9 (3.2%). Single microorganism was isolated in 210 (59.49%) wound swabs, while more than one organism was isolated in 84 (23.79%) wound swabs. Sterile lesions were found in 59 (16.71%) wound swabs. Among the 384 isolate Gram negative organisms causing infection were more 289 (75.26%).

Table-I : Showing various Gram negative organisms isolated from wound culture.

Organism	No. of isolates	Percentage (%)
Pseudomonas aeruginosa	77	20.05%
Klebsiella pneumoniae	62	16.14%
Proteus mirabilis	50	13.02%
Acinetobacter baumannii	33	8.59%
Citrobacter freundii	24	6.25%
E.coli	17	4.42%
Proteus vulgaris	13	3.38%
Enterobacter spp.	13	3.38%

Among the various organisms isolated from wound culture, *Pseudomonas aeruginosa* was the most predominant organism, isolated 77 (20.05%) cases. Other organisms were the *Klebsiella spp.* 62 (16.14%), *Proteus* spp. 63 (16.40%), *Acinetobacter baumannii* 33 (8.59%), *Citrobacter* freundii. 24 (6.25%), *E.coli* 17 (4.42%) and *Enterobacter spp*

Table -II : Showing the antibiotic sensitivity of non- fermenters in isolates

organism	CIP	GEN	AK	PI	PIT	IPM	CAZ	COT	CTX	CPM
P. aeruginosa	48	25	39	44	52	50	23	8	20	34
n=77	62.33%	32.46%	50.64%	57.14%	67.53%	64.93%	29.87%	10.38%	25.97%	44.15%
A. baumannii	22	7	10	17	23	21	11	4	5	7
n=33	66.66%	21.21%	30.30%	51.51%	69.69%	63.63%	33.33%	12.12%	15.15%	21.21%

The most common isolate *Pseudomonas aeruginosa* were sensitive to Piperacillin/ Tazobactam followed by Imipenem, Ciprofloxacin, Piperacillin, Amikacin ,Cefepime.

Table-III : Showing antibiotic sensitivity of Enterobacteriaceae isolates in wound culture

organism	CIP	GEN	AK	PI	PIT	IPM	CAZ	COT	CTX	CPM	AMP
Proteus spp.	46	20	25	44	50	46	39	15	18	21	11
n=63	73.01%	31.74%	39.68%	69.84%	79.36%	73.01%	61.90%	23.80%	28.57%	33.33%	17.46%
K.pneumoniae	26	16	22	19	20	44	14	12	15	18	9
n=62	41.93%	25.80%	35.48%	30.64%	32.25%	70.96%	22.58%	19.35%	24.19%	29.03%	14.51%
C.freundii	17	5	7	10	13	18	6	3	4	7	2
n=24	70.83%	20.83%	29.16%	41.66%	54.16%	75%	25%	12.5%	16.66%	29.16%	8.33%
E. coli	6	3	7	8	11	12	9	4	5	6	1
n=17	35.29%	17.64%	41.17%	47.05%	64.70%	70.58%	52.94%	23.5%	29.41%	35.29%	5.88%
Enterobacter	6	3	4	6	7	9	3	2	2	2	0
spp	46.15%	23.07%	30.76%	46.15%	53.84%	69.23%	23.06%	15.38%	15.38%	15.38%	00%
n=13											

Maximum isolates were sensitive to Piperacillin/Tazobactam and Imipenem followed by Ciprofloxacin and Piperacillin. While least sensitive to Ampicillin and Co-trimoxazole.

DISCUSSION

In our study, the largest numbers of cases were in the age group between 16 to 30 years (51.62%). According to Chalise PR *et al* [8] the maximum numbers of patients

were reported in 20-30 years age group. Incidence was more in females than males [9-11] Thermal injuries were most common cause of burn. According to other studies, thermal burns are the most common type of burn injuries [12,13,8] In the our study, the culture positivity rate were found to be 83.28%. [1,14,10] In our study, single bacterial isolate were (59.49%), whereas , multiple isolates were (23.54%). Saha *et al* [15] reported monomicrobial isolates in 71% cases and polymicrobial in 13.5%. Rajput *et al* [9] showed 58.5% were single isolates and 37.5% were multiple isolates. In our study, the most common isolate in burn patients were the *Pseudomonas aeruginosa*. [3,9,15,16-20] The reasons for high prevalence are as follows: factors associated with the acquisition of nosocomial pathogens in patients with the recurrent or long term hospitalization, complicating illness, prior administration of antimicrobial agents, the immunosuppressive effects of burn trauma and other factors as yet unknown. [16] Even, moisture is a critical factor in hospital reservoirs of *Pseudomonas aeruginosa.* [21] The antimicrobial sensitivity testing was performed by Kirby Bauer's disc diffusion method. The antibiogram of *Pseudomonas aeruginosa* showed sensitivity to commonly used drugs piperacillin/tazobactam (67.53%) followed by imipenem (64.93%). This finding is consistent with Bayram *et al* [22] reported sensitivity to piperacillin/ tazobactam (69%) followed by imipenem (54%). In our study *Pseudomonas aeruginosa* showed sensitivity to ciprofloxacin (62.33%), piperacillin (57.14%), amikacin (50.64%). Similar sensitivity pattern observed by Rajput *et al*. [9] While, *Pseudomonas aeruginosa* showed resistant pattern to Ampicillin, Co-trimoxazole (10.38%), Cefotaxime (25.97%), Ceftazidime (29.87%). Hussain *et al* [20] reported similarly high resistant to these drugs. Among the enterobacteriaceae *Proteus* species showed sensitivity to Piperacillin / Tazobactam (79.36%) followed by Imipenem (73.01%), Ciprofloxacin (73.01%) Piperacillin (69.84%) and Ceftazidime (61.9%). This result found to be consistent with Rao *et al*. [23] While, *Proteus* species showed resistant pattern to other commonly used drugs found similar with Vinodkumar *et al*. [24] Other enterobacteriaceae such as *Klebsiella pneumoniae*, *Citrobacter freundii*, *E coli* and *Enterobacter* species showed good sensitivity to Imipenem followed by Piperacillin/ Tazobactam and moderately sensitive to Ciprofloxacin and Piperacillin. [16,23,25] While, they showed resistant pattern to other commonly used drugs. [24] The high incidence of multidrug resistant isolate is probably due to empirical use of broad-spectrum antibiotics and non adherence to hospital antibiotic policy. The early detection of isolates is also very important to prevent treatment failure as the time involved isolation. [9] Considering the high incidence of burn wound infection and pan resistant strains in burn care unit, more strict infection control policies are required and a comprehensive education campaign for all health measures and more restricted antibacterial prophylaxis should be introduced for burn patients. [18]

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