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Pattern of Microbial Flora and Antimicrobial Sensitivity in Burn Center in Patna Medical College and Hospital in Patna

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Abstract: ***Background: Burn*** *wounds injuries continue to be prevalent and devastating form of trauma. People with burn wound are specially vulnerable to infections. The goal of systematic antibiotics is to prevent/treat infections.*
Infection of burn wound is a serious problem because it can delay healing, and invasive infections may lead to septicaemia that may result in the death of the patient. Antibacterial therapy is one of the several interventions that may prevent/treat burn wound infections and protect the burn patient from invasive infections which may lead to septicaemia and multiple organ failure.
Objective: *To access the pattern of microbial flora and sensitivity of systemic Antimicrobial Therapy in burn wound management.*
Materials and Methods: *A Retrospective study done from evaluation of medical records of patients in Burn ward/unit of Plastic Surgery department of Patna Medical College and Hospital (P.M.C.H), Patna from May2016- July2017 was done on 300 patients.*
Results: *Cultures from burn wound revealed Pseudomonas aeruginosa as the most common organism followed by Staphylococcus aureus, Escherichia coli, Acinetobacterbaumanniiand Klebsiellapneumoniae. There was a high rate of multidrug-resistant organisms. However, all the Staphylococci were susceptible to Vancomycin and the gram-negative organisms were susceptible to Carbapenems.*
Conclusion: *Collection of appropriate specimens for cultures before starting of antibiotics helps in better management of burn patients. However, close follow-up and repeat specimens cultures may be necessary for appropriate change in antimicrobials in some patients.*

Keywords: *Burn, Pseudomonas aeruginosa, Staphylococcus aureus, Antibiotics, Methicillin-resistant staphylococcus aureus(MRSA),Extended-spectrum beta-lactamases (ESBL), Multi drug resistant(MDR)*

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I. Introduction

Burn wound infection leading to sepsis, remains the leading cause of death in patients with severe burns[1-3]. Children and the elderly have an increased risk of being burnt and have worse clinical outcomes and prognosis than patients in other age groups[4-5]. Microorganisms colonizing the burn wound originate from patient's endogenous skin, gastrointestinal tract and upper respiratory tracts. Microorganism may also be transferred to patient's skin surface via contact with contaminated external environmental surfaces, water, fomites, air and the soiled hand of health care worker[6].

Staphylococcus aureus and *Pseudomonas aeruginosa* are the most common isolates in burn patients, followed by members of enterobacteriaceae and gram-negative bacilli like *Acinetobacter baumanni*[7-8]. Early culture of the bacteria that cause these infections and their sensitivity pattern helps to institute appropriate and rational antibacterial therapy early and avoid further complications.
The goal of Antimicrobial therapy is to prevent/ treat infections appropriately.

II. Aims and Objective

To access the role of Antimicrobial Therapy in burn wound treatment.

III. Materials and Methods

A Retrospective case series evaluation of medical records of patients in Burn ward of Plastic Surgery department of Patna Medical College and Hospital (P.M.C.H), Patna from May2016- July2017 was done on 300 patients.

IV. Result

Maximum numbers of patients were in the age group 15-30 years (70%). Of the 210 adult cases, 120 (57%) were females and 90 (43%) were males. In contrast to adults, in children, the incidence of burns was more in males (56.25%). In Adults 128 (61%) cases were accidental, 75 (36%) were suicidal, and 7 (3%) was homicidal.

V. Microbial Profile

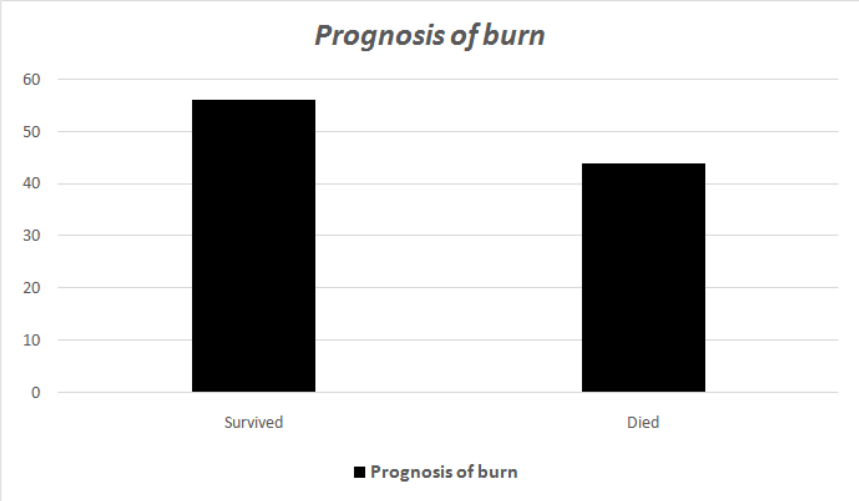
On the third postburn day, the numbers of monomicrobial isolates were found in 240(80%) patients and it reduced to 214 (71.42%) patients on the fifth postburn day. But the polymicrobial infections that were 12 (3.94%) in number on the third day increased to 74 (24.63%) on the fifth day in post burn patients.

The isolates of *P. aeruginosa, S. aureus, E. coli, K. pneumoniae* and *A. baumannii* were more on the third post burn day compared to fifth post burn day. But Methicillin-resistant *S. aureus* (MRSA) increased from 20 (6.83%) on the third post burn day to 70 (23.45%) on the fifth post burn day. The number of polymicrobial isolates was less on the third postburn day compared to that on the fifth postburn day. The most common combination was *P. aeruginosa* and *S. aureus.*

Among the isolates of *P. aeruginosa*, 13 (11.34%) were sensitive to Gentamicin, 82 (72.36%) to Ciprofloxacin, 100 (88.15%) to Ceftazidime, 36 (31.57%) to Amikacin and 114 (100%) were sensitive to Piperacillin-Tazobactam and Imipenem on the third post burn day. But on the fifth day, the resistance increased.

Among the total of 98 isolates of *S. aureus*, 17 (16.92%) were resistant to Cefoxitin and identified as MRSA. Of the 81 (83.07%) isolates of Methicillin-sensitive *S. aureus*(MSSA), all were sensitive to Cefoxitin, Amikacin, Vancomycin, Rifampicin, Linezolid and Clindamycin on the third and fifth days. Of the MRSA isolates, all were sensitive toVancomycin, Rifampicin, Clindamycin and Linezolid on the third and fifth postburn days.

Of the 300 cases, 173 (57.8%) survived and 127 (42.3%) died.



VI. Discussion

This study was carried out to study the pattern of microbial flora and antimicrobial sensitivity and its role in burn wound management.

In the present study, monomicrobial infection occurred in 240 (80%) cases on the third day and 214 (71.42%) cases on the fifth day. Polymicrobial infection occurred in 12 (3.94%) cases on the third day and 74 (24.63%) cases on the fifth day. 50 (16.74%) of the swabs were sterile on the third day and 12 (3.94%) were sterile on the fifthday. This may be due to prior intake of antibiotics or due to anaerobic infections.

Among the monomicrobial infections, *P. aeruginosa* was the most common organism obtained [9-10]. Among the polymicrobial infections, the combination of P. aeruginosa and S. aureus was the commonest (50%)[11].

VII. Antibiotic Sensitivity Pattern

P. aeruginosa(111 patients on the third day and 93 patients on the fifth day)

In the present study, among the isolates of *P. aeruginosa*, 100% were sensitive to Piperacillin-Tazobactam and Imipenem on the third day. But on the fifth day, 76 (82.25%) cases were sensitive to Piperacillin-Tazobactam and 100% cases were sensitive to Imipenem. A study by Agnihotri et al. showed Piperacillin-Tazobactam was the most effective drug against *P. aeruginosa*[12].

98 (88.15%) cases were sensitive to Ceftazidime on the third day, but on the fifth day, only 48 (43.54%) cases were sensitive, a study conducted by Revathy et al also showed that Pseudomonas was highly susceptible to ceftazidime[13]. . In the present study, 12(11.34%) cases were sensitive to Gentamicin and 35 (31.57%) cases were sensitive to Amikacin on the third day. But on the fifth day, only 3 (3.22%) cases were sensitive to Gentamicin and 12 (12.90%) cases were sensitive to Amikacin. This is quite alarming as aminoglycosides are the mainstay of treating *Pseudomonas* sepsis. This finding is similar to the study finding of Branski et al. [14].

S. aureus(81 patients on the third day and 60 patients on the fifth day)

In the present study, all the MSSA (81 on the third day and 60 on the fifth day) were sensitive to Amikacin, Vancomycin, Rifampicin, Clindamycin and Linezolid. This finding is similar to the study finding of Sharma et al.[15].

A high degree of Penicillin resistance was noted in our study. Only 6 (7.40%) isolates were sensitive to Penicillin on the third day and 3 (5%) were sensitive on the fifth day.

In the present study 100% MRSA isolates were sensitive to Vancomycin, Rifampicin, Clindamycin and Linezolid on the third day. This finding is similar to the study finding of Revathy et al.[13]. But on the fifth day, there were few MRSA isolates, all of which were sensitive to the above drugs.

All the isolates of E. coli (12 on the third day and 3 on the fifth day) and *K. pneumoniae* (6 on the third day and 5 on the fifth day) were extended-spectrum beta-lactamase (ESBL) producers by double disc method.

S. aureus was the most common isolate in children, followed by *P. aeruginosa.* This finding is similar to the study finding of Bhama et al.[16].

A high percentage of multidrug-resistant (MDR) isolates is probably due to empirical use of broad-spectrum antibiotics and no adherence to hospital antibiotic policy.

Once MDR strains become established in the hospital environment, they can persist for months. Therefore, careful microbiological surveillance and in vitro testing before the startof antibiotic therapy and strict antibiotic policy may be of great help in prevention and treatment of MDR isolates in burn units and, thus, reduction of overall infection-relatedmorbidity and mortality. The overcrowding in burns ward is an important cause of cross-infection and must be avoided in order to control a hospital-acquired infection.

VIII. Proposed Antibiotic Regimens

A combination of Cloxacillin and Amikacin is proposed as the best regimen in early-onset burn wound infection (within 3 days), due to the low prevalence of MRSA here. However, late-onset (after 5 days) infections may be treated with Linezolid as MRSA appeared in late-onset infections.

Infections with ESBL producing gram-negative bacteria may be treated with Piperacillin-Tazobactam or Cefoperazone-Sulbactam after proper susceptibility tests.

Prevalence of MRSA is likely to influence the empirical management of burn wound infections. The prevalence of MDR organisms is to be considered as a warning sign for the emerging spread of antibiotic resistance and the need for urgent implementation of strict antibiotic policy and infection control measures. For the development of an antibiotic policy, good communication must exist between the surgeon, the pharmacologists and the microbiologist and such studies help in promoting this interaction.

IX. Conclusion

Based on this study guidelines proposed for management of burn wound infection.

Collection of appropriate specimens for culture was taken before starting of antibiotics.Empirical antimicrobial therapy was started based on the susceptibility. However, in life-threatening infections, Vancomycin and Imipenem combination was given.

Close follow-up of the patients, repeat cultureand changes in antibiotics as and when necessary according to the antibiotic susceptibility pattern was done.Strict aseptic precautions and source isolation was implemented incase of infection with MDR organisms to prevent cross-transmission.

Financial and other competing interests-None

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