Prevalence Of Various Bacteria And Their Antibiotic Sensitivity Pattern In Burn Unit Of Government Medical College And Hospital Srinagar

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Citation

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Abstract

Background:There is high incidence of infections and septicemias in post burn patients which in turn are associated with high morbidity and mortality; is true in our burn unit too, a fact which activated us to undertake this study.Purpose:We conducted a prospective study with the aimtodetermine specific pattern of burn wound microbial colonization, time related changes in predominant flora, and antimicrobial resistance profiles. This would allow early management of septic episodes with proper empirical systemic antibiotics before the results of microbiologic cultures become available, thus improving the overall infection related morbidity and mortality.Material and methods:This prospective study was conducted from 1stApril 2010 to 31stMarch 2011 in the Department of Surgery Government Medical College in collaboration with the Department of Microbiology on 100 Burn patients who fulfilled the standard criteria for admission in our burn unit. 10 ml of blood was drawn under all aseptic precautions in blood culture vial after 48 hr of admission and transported to the microbiology lab and then systemic antibiotics were given. In laboratory the blood sample were processed as per the standard microbiological procedure and protocols. First the culture bottles were incubated at 35 degree Celsius and observed for evidence of any growth in first 6 to 18 hours after collection, then blood subculture to Macconky agar and blood agar were made from all blood culture bottles and further incubated for 48 hours. Samples which did not show any growth at 48 hours of incubation were declared culture negative. The positive blood cultures were subjected to antibiotic susceptibility test. The data obtained was analyzed by using appropriate Statistical analytical tests.Results:The commonest organism responsible for bacteremia is pseudomonas (42%) followed by MRSA methicillin resistant staphylococcus aureus (28.9%). Most of the strains of organisms isolated were resistant to commonly used antibiotics in the hospital, pseudomonas was found 100% resistant to combination of ampicillin+ sulbactum, ceftriaxone, and was sensitive to imipenem, amikacin, and vancomycin in 89.47%, 57%, 52,63% cases respectively. MRSA (methicillin resistant staph aureus) was also found resistant to commonly used antibiotics like ceftriaxone, ampicillin + sulbactum, ceftazidime + calvulanic acid. Linzolid and vancomycin were effective in 84% and 100% cases respectively. A significant correlation of TBSA Burnt with bacteremia (p value of <.001) was observed.Conclusion:Weconcluded that our study will be helpful in providing useful guidelines for choosing effective empirical therapy which will have great impact on morbidity and mortality of burn patients due to bacteremia / septicemia.

INTRODUCTION

Most of the burn victims, who survive including the initial 24 hours after burns, succumb to infection of the burnt area and its complications[1]. Various factors responsible are disruption of the skin barrier, a large cutaneous bacterial load, the possibility of the normal bacterial flora becoming opportunistic pathogens and severe depression of the immune system, all contribute towards the sepsis in a burn victim[2]. Despite various advances in infection control measures, like early detection of micro organisms and newer and broader spectrum antibiotics, management of burn septicemia still remains a big challenge and septicemia continues to be the leading cause of death in burn patients.[3]

In spite of considerable advances in the treatment of burns, infection continues to pose the greatest danger to burn patients[4,5]. Approximately 73 per cent of all death within the first five days post-burn have been shown to be directly or indirectly caused by septic processes.[6]The common pathogens isolated from burn patients include Pseudomonas aeruginosa, Staphylococcus aureus, Klebsillea spp, and various coliform bacilli. Fungi (Candida albicans, Aspergillus fumigatus) can also cause infection.[7-11]

Multidrug resistant bacteria have frequently been reported as the cause of nosocomial outbreaks of infection in burn units or as colonizers of the wounds of burn patients.[12,13]Gram-negative organisms have long been known to cause serious infection in burn patients. Gram-negative bacteraemias have been associated with a 50% increase in predicted mortality for patients with bacteremia compared to those without bacteremia.[14]Systemic antimicrobial treatment must be thoughtfully considered in the care of the burn patient to prevent the emergence of resistant organisms. The burn wound will always be colonized with organisms until wound closure is achieved and administration of systemic antimicrobials will not eliminate this colonization but rather promote emergence of resistant organisms. If antimicrobial therapy is indicated to treat a specific infection, it should be tailored to the specific susceptibility patterns of the organisms, as soon as this information is available. Also, if antibacterial treatment is necessary, awareness should be heightened for the possibility of super infection with resistant organisms, yeasts, or fungi. Systemic antimicrobials are indicated to treat documented infections, such as pneumonia, bacteremia, wound infection, and urinary tract infection (UTI). Empirical antimicrobial therapy to treat fever should be strongly discouraged because burn patients often have fever secondary to the systemic inflammatory response to burn injury. Studies have established that: (a) infection is the most frequent and the most severe complication of burn injuries[15](b) the organisms that predominate as causal agents of burn wound infection in any burn treatment facility change over time, and (c) in recent decades, the antimicrobial resistance of bacteria isolated from burn patients has increased.[16]It is therefore, essential for every burns unit to determine its specific pattern of burn wound microbial colonization, time related changes in predominant flora, and antimicrobial resistance profiles. This would allow early management of septic episodes with proper empirical systemic antibiotics before the results of microbiologic cultures become available, thus improving the overall infection related morbidity and mortality.

MATERIAL AND METHODS

This prospective study was conducted for a period of one year from 1stApril 2010 to 31stMarch 2011 in the Department of Surgery Government Medical College in collaboration with the Department of Microbiology on patients admitted in the burn unit. Burn patients who fulfilled the standard criteria for admission were admitted in our burn unit. A total of one hundred patients were taken into study. In order to minimize the bias in our observations, the following admitted patients were excluded from the study:

Patients with immunosupresion, patients with known malignancies as the chances of bacteremia are more in such patients because of their immunocompromised state.

Patients who reported to hospital 48 hours after sustaining burn Injury as these patients could have acquired infection before admission or may have started systemic antibiotics.

Patients with 50% of total body surface area were also excluded from the study because of critical nature and severity of their burn injury.

Following admission in the burn unit, a detailed history was taken with regard to age, sex, residence, type, cause and place of burn, and a thorough general and systemic examination was performed and required investigations done. . Estimation of the burn surface area was done as per the Lund-Browder chart and the clinical assessment of the depth was carried out. None of the patient in the study group was given the prophylactic systemic antibiotics for first 48 hours, however, topical antiseptics were used. Blood cultures were taken after 48 hr of admission and then systemic antibiotics were given. For blood culture 10 ml of blood was drawn and transported to the microbiology lab under all aseptic precautions in blood culture vial as soon as possible. In laboratory the blood sample were processed as per the standard microbiological procedure and protocols.[68]First the culture bottles were incubated at 35 degree Celsius and observed for evidence of any growth in first 6 to 18 hours after collection, then blood subculture to Macconky agar and blood agar were made from all blood culture bottles and further incubated for 48 hours. Samples which did not show any growth at 48 hours of incubation were declared culture negative. The positive blood cultures were subjected to antibiotic susceptibility test. The data obtained was analyzed by using Statistical Package for Social Sciences (SPSS 13) version-chi-sq and one way analysis of variance (ANOVA) used.

RESULTS

The most common type of burn were flame burn seen in 72% of cases followed by, scald in 22%. The mean age of patients was 21.91±11.546 (min of .8 to max of 60) years. 79 patients were from rural background and 21 from urban dwellings. It is clear that infections are severe problem among burn patients. The incidence of bacteremia is nearly

45% and more so in more severe burn patients (table 1 and fig 1). The commonest organism responsible for bacteremia is pseudomonas 42% followed by MRSA (methicillin resistant staph aureus), in 28.9% the other organism isolated include staph aureus, e coli, proteus, kleibsella, acinetobacter (table 1). Bacteremia usually occurred in 2nd and 3rd week of hospital stay. Most of the strains of organisms isolated were resistant to commonly used antibiotics in the hospital, pseudomonas was found 100% resistant to combination of ampicillin + sulbactum, ceftriaxone, and was sensitive to imipenem, amikacin, and vancomycin in 89.47%, 57%, 52,63% cases respectively (table 2). MRSA (methicillin resistant staph aureus) was also found resistant to commonly used antibiotics like ceftriaxone, ampicillin + sulbactum, ceftazidime + calvulanic acid. Linzolid and vancomycin were effective in 84% and 100% cases respectively (table 2). The other organisms isolated were also resistant to commonly used antibiotics in the hospital (table 2). There was high incidence of bacteremia and mortality in patients with total body surface area burn of more than 30% (mean TBSA burn of patients who succumbed to burn injury was 39.5%) (table 3 and 4). A significant correlation of TBSA Burnt with bacteremia (p value of <.001) was observed (table 3 and 4).

Figure 1

Figure 1 incidence of Bacteremia

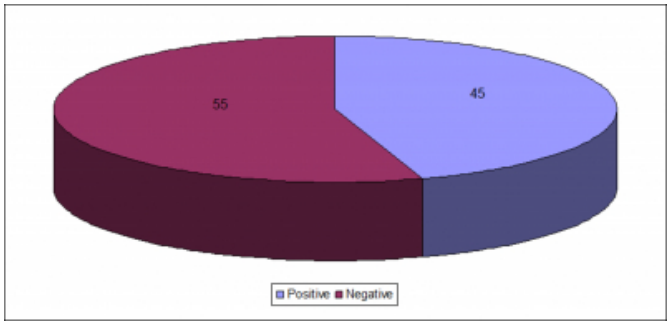

Figure 2

Table – 1 Micro-organisms Isolated in Blood Culture

Microbe	No. of Patients	Percent
Staph. Aureus	5	11.1
Pseudomonas aeruginosa	19	42.2
MRSA	13	28.9
Klebsiella species	2	4.4
E.Coli	3	6.7
Acitinobacter	1	2.2
Proteus	2	4.4
Total	**45**	**100**

Figure 3

Table 2 Antibiotic sensitivity pattern of different isolates

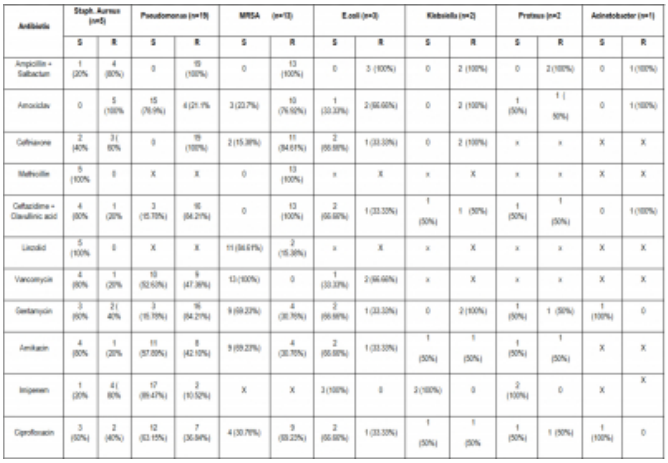

Figure 4

Table 3 Correlation of percentage of Total Body Surface Area Burnt with Bacteremia

% TBSA Bunt	Total No. of Patients	Bacteremia	%
10 – 20	21	02	9.52
21 – 30	39	12	30.76
31 – 40	26	22	84.61
41 – 50	14	09	64.28
Total	**100**	**45**	**45**

Chi sq 32.46 p value < .001

Figure 5

Table 4 Bacteremia related mortality with Different Percent of TBSA burnt

TBSA (%)	Patients with Bacteremia	Patients Expired
41-50	9	7
31-40	22	6
21-30	12	0
UPTO 20	02	0

Chi-sq =16.18; p value= 0.001, Spearman correlation 0.57

DISCUSSION

Bacteremia is an invasion of the bloodstream by bacteria. Bacteremia develops as a result of damage to the external (skin) or the internal (respiratory tract, digestive tract) barriers of the body. Bacteremia is one of the criteria for the diagnosis of sepsis. Sepsis is very dangerous for burnt patients, because it increases the production of inflammatory mediators and cytokines and causes their interaction that predisposes to the development of multiple organ failure (MOF). MOF at present is the main cause of mortality in burnt patients.[4,5]Despite significant improvement in the survival of burn patients, Infection and its complications remains the leading cause of morbidity and mortality and continues to be the most challenging concern for burn team. The infection and pathogen responsible for infection differs from hospital to hospital all over the world.

In our study 45 patient had positive blood culture during the course of hospital stay while as 55 patients had sterile blood cultures these observations are in accordance with those of Santucci et al[17]who in their study on burn wound infection had found the culture positivity of blood to be 49%. In our study majority of patient had bacteremia in second (28.9) and third week (24.5%) after admission. These observation are in accordance with Kristina et al who in their study had found a mean time of 16±11days and Zorgani A et al[18]who in their study had found majority of positive blood culture in first two weeks. In present study we observed pseudomonas in 19 (42.2%) as the commonest organism isolated from positive blood cultures followed by methicillin resistant staph aureus (MRSA) in 13 (28.9%), staph aureus in 5 (11.1%) E coli in 3 (6.7%) while as kleibsella, proteus and acineto bacter were found in less than 10% of cases. Our observations are in accordance with Nagoba B.S et al[33]who in their study had found pseudomonas 53.8% as the most common organism isolated in sepsis patients followed by staph aureus in 38.4 %. Yildirim et al[20]who in their study had found pseudomonas 40.4% to be the most common organism, followed by staph aureus 29.3%. Zorgani et al[18]who in their study had found pseudomonas in 41% of cases followed by staph aureus in 28%. Wonkeun Songa et al[21]had found pseudomonas 45.7% as the most commonly isolated organism from burn patients. The sensitivity and resistance pattern of pseudomonas aeruginosa observed in our study revealed 100% resistance to ampicillin and ceftriaxone, 84% resistance to gentamycin and ceftazidime+calvullinc ,and was found to be sensitive to imipenem and amoxyclave in 89.47% and 78.9% respectively. Methicillin resistant staph aureus (MRSA) 100% resistant to ampicillin, amoxyclave, and ceftazidime, and was found 69%, 100%, 69% sensitive to gentamycin, linzolid, amikacin respectively. Staph aureus, klebseilla, MRSA, pseudomonas were seen resistant to most commonly used antibiotic in our hospital e.g. Ceftriaxone, ampicillin sulbactam. Linzolid wase effective against methicillin resistant staph aureus and staph aureus in 84%and 100% respectively. While as amikacin was effective against staph aureus, pseudomonas, methicicillin resistant staph aureus in 80%, 57%, 69% respectively. Most of the organism were resistant to commonly used antibiotics. Our observation were in accordance with Sanjay Dhar et al[22], Abdul Rahim Khan et al[23], Yildirim et al[20], Kristina Vostrugina et al[24,]who also demonstrated the similar sensitivity and resistance pattern in their studies.

We observed an overall mortality of (19%), however Ashish K Jaiswal et al[25]had observed case fatality of 62.4%, and Ashraf F et al[26]had observed overall mortality of 33%. The difference in mortality rates could be explained on the basis that we excluded the patients with total body surface area (TBSA) burn of more than 50%.[25,26]Kristina et al[24,]in their study had observed a higher mortality in bacteremic patients 33%, R Bang et al[3]observed 29.1% mortality in patients with bacteremia. In our study we have observed 28.88% mortality in bacteremic patients which is consistent with what above studies observed.

A strong correlation between total body surface area burnt and bacteremia was observed in the present study, the patients with TBSA burn >30% in 31 (77.5%) developed bacteremia. As compared to only 14 (23.33%) patients with TBSA burn <30%. These observations are in accordance with Kristina et al[24]who also had observed that bacteremic patient had larger body surface area burnt as compared to non bacteremic patients.

CONCLUSION

We concluded that our study will be helpful in providing useful guidelines for choosing effective empirical therapy which will have great impact on morbidity and mortality of burn patients due to bacteremia / septicemia and we also believe that prevalent microflora, their sensitivity and resistance pattern should be studied in every burn unit in order to prevent the emergence of multi drug resistant strains, because of indiscriminate use of antibiotics.

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