INTERNATIONAL JOURNAL OF PHARMACEUTICAL RESEARCH AND BIO-SCIENCE

MICROBIOLOGICAL PROFILE OF BLOOD STREAM INFECTIONS IN CANCER PATIENTS

J. NAGA SUDHA RANI,[1] BV RAMANA[2]

1. Assistant Professor, Department of Microbiology, Sri Venkateswara Medical College, Tirupati.
2. Assistant Professor, Department of Microbiology, Sri Venkateswara Institute of Medical Sciences, Tirupati.

Accepted Date: 25/12/2014; Published Date: 27/12/2014

Abstract: Patients with cancer are predisposed to infection and often the focus of infection is not evident. Bloodstream infections (BSIs) are one of the most serious complications in these patients following intensive cytotoxic therapy. Blood stream infections increase the length of hospital stay, cause significant morbidity and mortality and increase the cost of care. The crude mortality rate for BSIs in cancer patients. Currently, gram-positive bacteria are isolated more often than gram negative bacteria in bloodstream infections in cancer patients. The emerging trends in antibiotic resistance and their implications for empirical therapy indicate that institutions caring for cancer patients should have active ongoing microbiological surveillance studies with the objective of monitoring infections due to antibiotic-resistant pathogens, in order to improve their current antimicrobial regimens.

Keywords: Bloodstream infections, Cancer patients, Immunocompromised hosts

Corresponding Author: DR. J NAGA SUDHA RANI

Access Online On:

www.ijprbs.com

How to Cite This Article:

J Naga Sudha Rani, IJPRBS, 2014; Volume 3(6): 496-500

PAPER-QR CODE

INTRODUCTION

Patients with cancer are predisposed to infection and often the focus of infection is not evident. Bloodstream infections (BSIs) are one of the most serious complications in these patients following intensive cytotoxic therapy. In this patient population BSIs are the most frequently documented microbiological infections.[1] BSIs are associated with severe complications such as septic shock and multi-organ failure, which is potentially life threatening, especially in immunocompromised hosts.

Blood stream infections increase the length of hospital stay, cause significant morbidity and mortality and increase the cost of care. the crude mortality rate for BSIs in cancer patients ranges from 18 to 42%.[2] Most of these infections are hospital-acquired in nature, because patients with cancer have prolonged and repeated contact with hospital environment and are exposed to numerous sources of infection which may involve invasive procedures. Additionally, they generally suffer from immunosuppressive chemotherapy and radiation. Bloodstream infections in cancer patients account for approximately more than 20% of hospital-acquired infections.[3] Hospital-acquired bloodstream infections in cancer patients can be caused by a variety of microorganisms, but the most common pathogens are bacteria followed by fungi.[4] Bloodstream infections are often associated with high mortality rate.

Currently, gram-positive bacteria are isolated more often than gram negative bacteria in bloodstream infections in cancer patients. However: in developing countries this shift is not true because of the limited sources for infection control measures.[5] The treatment of these infections often relies on the use of empirical therapy based on established guidelines with due consideration to the local microbiology and antibiotic sensitivity patterns. One of the major principles of the management of infections in patients with cancer is to recognize the variability from one time period to another. Regular local data relating causative microorganisms leading to hospital acquired bloodstream infections are very important to control infections in these countries. For this reason, local surveillance data should be maintained regularly for early and appropriate empirical therapy.

MATERIAL AND METHODS

The bacterial spectrum and antimicrobial susceptibility pattern of organisms causing bloodstream infections was studied in all hospitalized cancer patients suffering from various types of malignancies and those undergoing anticancer therapy. No discrimination was made on the basis of age or gender. Patients already on antimicrobial therapy and those having fever due to non-infectious causes, such as blood transfusion, drug infusion etc. were excluded from the study. Blood specimens for culture and antimicrobial susceptibility testing were obtained from peripheral veins when the patients developed fever. Immediately after collection, blood was directly added to brain heart infusion (BHI) broth. The blood culture bottles were incubated

at 37^0 C for up to 7 days and regular subcultures were done. Identification of the isolates was done by Gram staining and standard biochemical tests. Antimicrobial susceptibility testing was done by the modified Kirby-Bauer disk diffusion technique and the results were interpreted according to the recommendations of Clinical and Laboratory Standards Institute (CLSI) .[6]

RESULTS

One hundred and thirty patients were included in the study. Out of these, 80 were males and 50 were females. Among these 100 blood samples were positive and 30 blood samples were negative for bacterial culture. Fifty five isolates (55%) were Gram-negative rods and forty five (45%) isolates were Gram-positive cocci. Among the Gram-positive cocci, coagulase-negative staphylococci (CoNS) were the predominant pathogens (*n*=25), followed by *Staphylococcus aureus* (*n*=20) and *Enterococci (n=10).* Among Gram-negative rods, *Escherichia coli* was the predominant organism (*n*=16), followed by *Klebsiella pneumoniae* (*n*=11), *Pseudomonas aeruginosa* (*n*=10) and NFGNB (*n*=8).

Among the Gram-positive isolates 50% of *Staphylococcus aureus* (*n*=10) and 60% of CoNS (*n*=13) were resistant to methicillin. All the Gram-positive isolates were susceptible to vancomycin and teicoplanin.

Among the Gram-negative bacilli, there was 90% resistance to ampicillin, 80% to amoxicillin-clavulanic acid, 65% to gentamicin, 50% to ciprofloxacin, 45% to amikacin, 18% to cefoperazone–sulbactum, 14% to piperacillin-tazobactam and 8% of the isolates were resistant to imipenem.

DISCUSSION:

The higher proportion of nosocomial BSI was probably related to the greater risk of hospitalized Cancer patients in comparison with those in ambulatory care. Nevertheless, it should be stressed that the differentiation between hospital- and community-acquired infections in oncology patients, especially among those who are severely immunocompromised, is somewhat irrelevant because most etiological organisms have an endogenous origin. As these patients are frequently hospitalized or exposed to ambulatory instrumentation and broad-spectrum antibiotics, their endogenous microbial flora change rapidly to more invasive and resistant pathogens.

Bacterial infections in cancer patients are a major cause of morbidity and mortality. Knowledge of the locally prevalent pathogens and their susceptibility patterns is important before putting these patients on empiric antimicrobial therapy. Thirty years ago most of the infections in these patients were caused by aerobic Gram-negative bacilli. Over the last twenty years however, a shift in the bacterial spectrum towards Gram-positive cocci has been reported in the West. Although the exact cause of this shift is not known, long-dwelling intravascular devices,

fluoroquinolone prophylaxis and chemotherapy-induced mucositis have been implicated.[2,9] This trend however has not been prominent in the developing world.[8]

Similar to other infections, the incidence of BSI increases with age and is influenced by a variety of physiological factors.[7] The influence of neoplastic diseases and poor performance status as factors predisposing towards BSI has been described in many reports.[9] In contrast to other studies,[10] we found a greater number of BSI among non-neutropenic patients. This distribution may be related to the high number of BSI among hospitalized patients in poor clinical condition and with advanced solid tumors with normal or increased neutrophil counts.

In our study although Gram-negative bacilli (57%) were the predominant isolates, statistically their isolation rate did not significantly differ from Gram-positive isolates (0.5>p>0.1). Almost half (43%) of the patients were infected with Gram-positive cocci, CoNS being the commonest (26%). In 1998, Karamat *et al* had reported a predominance of Gram-negative isolates from neutropenic patients in the same setting. Among Gram-positive organisms, *Staphylococcus aureus* was the commonest isolate in their study.[11]

CONCLUSION:

In conclusion, the present study describes the epidemiological characteristics and the etiological microorganisms of BSI in a high-risk group of patients. Several aspects were noteworthy and consistent with the literature: the predominance of primary BSI, most of them from unknown sources; the importance of the respiratory tract as the main source for secondary BSI; the previous use of chemotherapy, antibiotics, central venous lines and poor performance status scoring as potential risk factors; the predominance of staphylococci and fungi as causative pathogens, especially among patients with CVC; the low appropriateness of initial empirical antimicrobial therapy; and the higher case-fatality rate during fungal episodes. The observed high frequency of coagulase-negative staphylococci is an unresolved problem, since physicians have difficulties in interpreting the significance of these isolates.

The emerging trends in antibiotic resistance and their implications for empirical therapy indicate that institutions caring for cancer patients should have active ongoing microbiological surveillance studies with the objective of monitoring infections due to antibiotic-resistant pathogens, in order to improve their current antimicrobial regimens.

REFERENCES:

1. Almyroudis NG, Fuller A, Jakubowski A et al. Pre- and post-engraftment bloodstream infection rates and associated mortality in allogeneic hematopoietic stem cell transplant recipients. Transpl Infect Dis 2005; 7: 11–17.

2. Collin BA, Leather HL, Wingard JR, Ramphal R. Evolution, incidence, and susceptibility of bacterial bloodstream isolates from 519 bone marrow transplant patients. Clin Infect Dis 2001; 33: 947-53.

3. Cometta A, Zinner S, de Bock R, Calandra T, Gaya H, Klastersky J, et al. Piperacillin tazobactam plus amikacin versus ceftazidime plus amikacin as empiric therapy for fever in granulocytopenic patients with cancer. Antimicrob Agents Chemother 1995; 39: 445-452.

4. Cometta A, Calandra T, Gaya H, SH Zinner, R de Bock, A Del Favero et al. Monotherapy with meropenem versus combination therapy with ceftazidime plus amikacin as empiric therapy for fever in granulocytopenic patients with cancer. Antimicrob Agents Chemother 1996; 43: 1108-1115.

5. 10. Velasco E, Byington R, Martins CS, Schirmer M, Dias LC, Gon_alves VM. Bloodstream infection surveillance in a cancer centre: A prospective look at clinical microbiology aspects. Clin Microbiol Infect 2004;10:542-9.

6. Clinical and Laboratory Standards Institute; 2008 Performance standards for antimicrobial susceptibility testing; Eighteenth informational supplement. M100-S18. CLSI, Wayne, PA.

7. Emori TG, Banerjee SN, Culver DH, et al. Nosocomial infections in elderly patients in the United States, 1986-90. National Nosocomial Infections Surveillance System. Am J Med 1991;91: 289S-93S.

8. Hughes WT, Armstrong D, Bodley GP, Bow EJ, Brown AE, Calandra T, et al. 2002 guidelines for the use of antimicrobial agents in neutropenic patients with cancer. Infectious Diseases Society of America. Clin Infect Dis 2002; 34: 730-51.

9. Gonzalez-Barca E, Fernandez-Sevilla A, Carratala J, Gudiol F. Prospective study of 288 episodes of bacteremia in neutropenic cancer patients in a single institution. Eur J Clin Microbiol Infect Dis 1996; 15(4): 291-6.

10. Pittet D, Li N, and Woolson RF, Wenzel R. Microbiological factors influencing the outcome of nosocomial bloodstream infections: a 6-year validated, population-based model. Clin Infect Dis 1997; 24: 1068-78.

11. Karamat KA, Tariq TM, Hanan A, Siddiqi MS, Butt T, Anwar M, et al. Bacterial infections in neutropenic cancer patients. Pak J Pathol 1998; 9 (1): 38-43.