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Original Research Article.

Characterization of Bacteria from Blood Cultures of Cancer Patients Admitted to Cancer Institute at a Tertiary Care Hospital

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ABSTRACT

Background: Infection is a continuous and significant problem in patients with cancer. Bloodstream infection remains a major cause of morbidity and mortality in patients undergoing treatment for cancer. Bloodstream infection (BSI) is a leading infectious complication among cancer patients and has a negative impact on patients' outcome. Hence; the present study was undertaken for characterizing bacteria from blood cultures of cancer patients admitted to cancer institute.

Materials & Methods: A total of 344 blood samples were collected for culture from the suspected cases blood stream infection from cancer patients. Blood samples were collected before starting the antimicrobial therapy. Regardless of visual appearance every blood culture bottle was sub cultured after overnight incubation and on the fourth and seventh days. The inoculated pates of solid media were incubated overnight at 37°C. Organism identification was done. All the results were summarized in Microsoft excel sheet.

Results: Out of 344 blood culture samples, 86 blood stream infections were recovered from blood culture samples from all ages and both sexes. Out of total 61 blood culture samples for neutropenic patients, Gram positive cocci, CONS was isolated in 7(11.5%) while 2(3.3%) COPS were isolated. In Gram Negative bacilli enterobacteriaceae members, E. coli was isolated in 3(4.9%) and klebsiella was isolated in 6(9.8%). and in gram negative bacilli non fermenter, pseudomonas was isolated in 8(13.1%) and acinetobacter was isolated in 7(11.5%) of blood stream infection.

Conclusion: The study highlighted the variations observed in the pattern of aerobic bacterial profile from suspected cases of BSIs and also the changing trends in the susceptibility patterns of the isolates to routinely used antibiotics.

Key words: Bacteria, Blood, Culture.

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INTRODUCTION

Infection is a continuous and significant problem in patients with cancer. Cancer causes both direct and indirect effect on a patient's immune system. Many factors increase the susceptibility of immunosuppressed cancer patients to infection. These include neutropenia during aggressive therapy, altered gut flora because of frequent antibiotic administration, disruption of skin and damage of epithelial surfaces by cytotoxic agents.[1-3]

Bloodstream infection remains a major cause of morbidity and mortality in patients undergoing treatment for cancer. Bloodstream infection (BSI) is a leading infectious complication among cancer patients and has a negative impact on patients' outcome. These infections are being reported as a leading cause of morbidity and mortality worldwide. Moreover, BSI represents about 15% of all nosocomial infections.[4]

Blood stream infections due to Gram-negative bacilli are common in cancer patients during aggressive therapy. In recent years, there has been marked increase in the incidence of antibiotic resistance against Gram-negative bacilli. 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 basis in cancer patients ranges from 18 to 42%.[5]

Hence; under the light of above mentioned data, the present study was undertaken for characterizing bacteria from blood cultures of cancer patients admitted to cancer institute.

MATERIALS AND METHODS

This study was conducted in Department of Microbiology, Sardar Patel Medical College, Bikaner, Rajasthan. A total of 344 blood

samples were collected for culture from the suspected cases blood stream infection from cancer patients admitted in Aachraya Tulsi Regional Cancer Institute and Research Centre: A Regional Cancer Institute of Rajasthan, Bikaner from July 2013 to December 2013. Blood samples were collected before starting the antimicrobial therapy. 5- 10 ml of venous blood was collected by aseptic technique and dispensed in a blood culture bottle containing 50-100 ml brain heart infusion broth containing 0.05% sodium polyanetholsulfonate (Liquid). The blood culture bottles were incubated at 30°C in incubator for 7 days. Regardless of visual appearance every blood culture bottle was sub cultured after overnight incubation and on the fourth and seventh days. On each occasion of Gram's stain was prepared and a blood agar plate was kept for 48 hrs and discarded if no growth occurred. Gram's stain and blood agar subculture was repeated on fourth and seventh days. If gram-negative rods were seen by addition to blood agar plate, a Mac-conkeys agar plate and a Nutrient agar plate were also inoculated. The inoculated pates of solid media were incubated overnight at 37°C. Organism identification was done.

All the results were summarized in Microsoft excel sheet and were analyzed by SPSS software. Chi- square test and independent t test were used for evaluation of level of significance. P- value of less than 0.05 was taken as significant.

Table 1: Prevalence of BSI in blood culture sample of cancer patients

No. of blood culture sample	No. of BSI	% of BSI
344	86	25.0

Table 2: Showing age wise distribution of blood stream infection

Age Group	No. of blood culture samples	%	No. of BSI	% of BSI
12-19 year	80	23.3	21	26.2
20-50 year	170	49.4	40	23.5
>50 year	94	27.3	25	26.6
Total	344	100	86	25.0

Table 3: Gender wise distribution of blood stream infection

Sex	No. of blood culture samples	%	No. of BSI	%
Female	143	41.6	37	25.9
Male	201	58.4	49	23.4
Total	344	100	86	25.0

Table 4: Shows distribution of GPC versus GNB among blood culture isolates

Blood Stream Isolate	No. of Blood Culture Isolates	%
GPC	42	48.8
GNB	44	51.2
Total	86	100

Table 5: Micro-organism isolated in blood stream infection and distribution according to neutrophil count

Organism		Neutropenic		Non Neutropenic		% of Positivity
		No. of Blood Culture Isolates	%	No. of Blood Culture Isolates	%	
G.P.C	**CONS**	7	11.5	23	8.1	34.9
	COPS	2	3.3	10	3.5	14.0
G.N.B.	**E. Coli**	3	4.9	7	2.5	11.6
Enterobacteriaceae	**Klebsiella**	6	9.8	7	2.5	15.1
G.N.B. Non	**Pseudo**	8	13.1	3	1.1	12.8
Fermenter	**Acineto**	7	11.5	3	1.1	11.6
No Growth		28	45.9	230	81.3	0
Total		61		283		100

RESULTS

Out of 344 blood culture samples, 86 blood stream infection were recovered from blood culture samples from all ages and both sexes attending Cancer Department, Acharya Tulsi Regional Cancer Hospital, P.B.M. and Associate Group of Hospitals were studied over a period of six months from July 2013 to December 2013.

Table 1 showing that out of 344 blood culture sample of cancer patients studied only 86(25%) represent blood stream infection. Table 2 shows that maximum number of blood stream infection 25(26.6%), were found among 94 blood culture samples of age group >50 years, whereas in age group 12-19 years total 80 blood culture samples were included out of them 21(26.2%) had blood stream infection, in age group 20-50 year, total 170 blood culture samples were included, out of them 40(23.5%) were found blood stream infection. Out of total 344 blood culture samples studied, 143 were from female patients and 201 from male patients. Out of 143 blood culture samples from female patients 37(25.9%) were found blood stream infections while out of total 201 males, 49(23.4%) had blood stream infection. Out of 86 blood culture isolates GNB (51.2%) were more in number as compared to GPC (48.8%). The ratio of GPC: GNB was 1:1. Out of total 61 blood culture samples for neutropenic patients, Gram positive cocci, CONS was isolated in 7(11.5%) while 2(3.3%) COPS were isolated. In Gram Negative bacilli enterobacteriaceae members, E. coli was isolated in 3(4.9%) and klebsiella was isolated in 6(9.8%). and in gram negative bacilli non fermenter, pseudomonas was isolated in 8(13.1%) and acinetobacter was isolated in 7(11.5%) of blood stream infection.

Out of total 283 blood culture samples for neutropenic patients, Gram positive cocci, CONS was isolated in 23(8.1%) while 10(3.5%) COPS were isolated. In Gram Negative bacilli enterobacteriaceae members, E. coli was isolated in 7(2.5%) and klebsiella was isolated in 7(2.5%). and in gram negative bacilli non fermenter, pseudomonas was isolated in 3(1.1%) and acinetobacter was isolated in 3(1.1%) of blood stream infection.

Overall blood stream infection positivity was 34.9% in CONS, 15.1% in Klebsiella, 14% in COPS, 12.8% in Pseudo, 11.6% in E.coli and Acineto each.

DISCUSSION

Blood stream infections especially sepsis is a major challenge in medicine.[6] They cause substantial morbidity and mortality. Changing patterns of the isolates, increasing rates of antimicrobial resistance, wide application of new medical technologies like rampant usage of indwelling devices, may change the epidemiology and outcome of BSIs.[7] It is therefore important to continually review and update the epidemiology of BSIs mainly with respect to the antibiotic susceptibility pattern of the common pathogens, so that it is useful for prompt treatment of patients.[8,9]

In the present study, out of the total 344 blood culture samples that were received, 201 samples (58.4%) were from male patients while 143 samples (41.6%) were from female patients. Among the positive blood culture samples, males contributed for 57% (49/86) of the BSI and females for 43% (37/86).

Our study is comparable with the observations made by Reynolds et al[4] (56.7% males and 43.3% females), Riedel et al[10] (67% men and 33% women), Diekema et al[11] (56% males and 44% females), Pittet et al[12] (57% males and 435 females).

Martin et al[13] showed in their study that sepsis was more common among males than females. Similar to these studies, BSI was predominantly seen in males than in females even in our study.

Out of the 86 blood culture positive isolates, GNB (51.2%) were the more in number compared to GPC (48.8%) in the present study. The ratio of GPC and GNB was 1:1. In present study, overall blood stream infection positivity was 34.9% in CONS, 15.1% in Klebsiella, 14% in COPS, 12.8% in Pseudo, 11.6% in E.coli and Acineto each. In Present study, out of total 61 blood culture samples for neutropenic patients, Gram positive cocci, CONS was isolated in 7(11.5%) while 2(3.3%) COPS was isolated. In Gram Negative bacilli enterobacteriaceae members, E. coli was isolated in 3(4.9%) and klebsiella was isolated in 6(9.8%). and in gram negative bacilli non fermenter, pseudomonas was isolated in 8(13.1%) and acinetobacter was isolated in 7(11.5%) of blood stream infection. Out of total 283 blood culture samples from non neutropenic patients, Gram positive cocci, CONS was isolated in 23(8.1%) while 10(3.5%) COPS was isolated. In Gram Negative bacilli enterobacteriaceae members, E. coli was isolated in 7(2.5%) and klebsiella was isolated in 7(2.5%). and in gram negative bacilli non fermenter, pseudomonas was isolated in 3(1.1%) and acinetobacter was isolated in 3(1.1%) of blood stream infection. Wide variations are thus noted among the pattern of the isolates, as well the trends of the pathogen isolated from BSIs in relation to different primary sources of infections. Obeng-Nkrumah N et al[14] presented the first report on the microbiological profile of bacteraemia and fungaemia among cancer patients in Ghana. They retrospectively analyzed the spectrum of bloodstream pathogens in cancer patients from Korle-Bu Teaching Hospital, Ghana—focusing on multidrug resistant isolates (MDRs). Overall BSI were confirmed in 22 % (n = 93/453) of total blood cultures. Our data highlights a co-dominance of Gram-negative (n = 49/93, 52.6 %) and Gram-positive (n = 40/93, 43.0 %) bacteria with the former less likely to infect children than adults. Staphylococcus epidermidis was the most isolated bacteria (30.1 %; n = 28/93). About 61 % (n = 25/41) of Enterobacteriaceae isolates were resistant to cefotaxime; a majority (n = 24/25, 96 %) of which were MDRs and mostly susceptible to amikacin and levofloxacin. Four (80 %) penicillin resistant streptococci were found; 2 of which were MDRs and sensitive to erythromycin and cefuroxime. Methicillin resistant Staphylococcus aureus and vancomycin resistant enterococci were not identified. In multivariate analysis, the Enterobacteriaceae compared to other organisms were significantly associated with multidrug resistance (adjusted OR, 33.6; 95 % CI 6.41–88.73; p value 0.001). MDRs, especially cefotaxime resistant Enterobacteriaceae, are common among patients with cancer in our institution but vary among different patient populations.

In normal conditions, blood is sterile. Severe localized or systemic infections can cause micro-organisms to enter the bloodstream through the lymphatic system. This presence of bacteria in the bloodstream is called “bacteremia.” Most of the time, these bacteria are cleared quickly by the immune system. In the case of overwhelming infections or intravascular focus of infection, the immune system may be unable to clear the bacteria from the blood, resulting in a bloodstream infection (BSI). Lubwama M[15] et al determined the predominant bacterial species causing bacteremia among febrile cancer patients, and their antibacterial

resistance profiles at the Uganda Cancer Institute. They concluded that multidrug resistant Gram-negative bacteria were the main cause of bacteremia in febrile cancer patients.

CONCLUSION

The study highlighted the variations observed in the pattern of aerobic bacterial profile from suspected cases of BSIs and also the changing trends in the susceptibility patterns of the isolates to routinely used antibiotics.

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