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Original Research Article

Bacteriological profile of clinical isolates in cancer patients with febrile neutropenia in a tertiary care hospital in Kurnool, Andhra Pradesh

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ABSTRACT

Introduction: In cancer patients, infection is the most significant and continuous problem. This study was done to show the spectrum of bacteria and sites of isolation in febrile neutropenic cancer patients.
Materials and Methods: A 1-year study of all isolates was conducted from various sites in our hospital. All the samples were processed, and isolates were identified as per CLSI guidelines.
Results: The commonest organism isolated was Escherichia coli among Gram negative organisms and Staphylococcus aureus among Gram positive organism. Out of 76 isolates 49 were Gram negative and 27 were Gram positive.
Conclusion: The pattern of infectious agents has changed in neutropenic patients over time and this postulates the need of other studies to give the most up to date insight of the causative organism to the physician.

1. Introduction

In cancer patients, infection is the most significant and continuous problem.[1] After chemotherapy approximately 10 to 50% of patients with solid tumors and more than 80% of these with hematological malignancies will develop febrile neutropenia.[2] Both direct and indirect effect on a patient's immune system are caused by cancer. Many factors increase the susceptibility of immunosuppressed cancer patients to infection.[1] As the therapy directly affects the production of neutrophils patients under chemotherapy are susceptible to infections.[3]Neutropenia is defined as a neutrophil count of <500 cells/mm^3, or a count of <1000 cells/mm^3 with a predicted decrease to <500 cells/mm^3.[4] Reduction in neutrophils predisposes the body to bacterial invasion, proliferation and inhibits the appearance of any inflammatory response.[3]Now a days the management of neutropenic cancer patients has become particularly challenging compared to previous decades, because of the adoption of intensive chemotherapy protocols, widespread use of monoclonal antibodies or other biological agents, the increasing age of cancer patients and frequent presence of multiple co-morbidities. These neutropenic patients are vulnerable to a wide spectrum of infectious agents which are responsible for substantial mortality and morbidity among them.[4] The principal complication in neutropenic cancer patients is infection. The commonest site of infections in neutropenic cancer patients is respiratory tract infection followed by blood stream infection, urinary tract infection, surgical site infection, oropharynx and gastrointestinal tract.[5] Several studies assumed that the shift of infecting pathogens was more towards gram positive due to long term indwelling catheter, aggressive chemotherapy, continuous antibiotic use and changes in clinical and local antibiotic resistance. Recently the etiology of infecting pathogens changed again. The studies done from the United states and Europe reported the re-emergence of gram-negative bacteria in neutropenic cancer patients.[5]

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2. Materials and Methods

The specimens from all neutropenic patients were collected from hospital and sent to laboratory. A retrospective study was conducted on the bacterial spectrum and isolation sites in adult febrile neutropenic patients hospitalized between January 2016 and December 2016 in a tertiary care hospital in Kurnool.

2.1. Inclusion criteria

Male and female >18 years, presence of neutropenia, known malignancy. Fever was considered as single oral temperature of ≥ 38.3^{o}C or a temperature of ≥38^{o}C for ≥ 1 hour and absolute neutrophil count of < 500/mm^3.[4]

2.2. Exclusion criteria

Patients already on antimicrobials and those with fever due to noninfectious causes such as blood transfusion, drug infusion and others.

All microbiology reports were as per CLSI guidelines. The specimens were inoculated on blood agar and Mac Conkey agar plates at microbiology laboratory. The plates have been incubated at 37^{o}C for 24 hrs. The control organisms used were Escherichia coli ATCC 35218, Klebsiella pneumoniae ATCC 700603, Pseudomonas aeruginosa ATCC 27853, Acinetobacter baumanii ATCC BAA – 747, Staphylococcus aureus ATCC 29213, Staphylococcus epidermidis ATCC 12228, Enterococcus faecalis ATCC 29212 for quality control.

Data was collected with respect to gender, underlying diseases, chemotherapy, neutropenia, presence of infection, microorganisms in culture (blood, urine, catheter tip), antimicrobials used and clinical outcome (discharge or death) from requisition form and from respective units and wards. Data was obtained through an active daily evaluation of all neutropenic patients identified by blood count screening. Cultures were obtained from blood, urine, sputum, wound abscess or any other focus of infection. All isolates were identified at the microbiology laboratory by routine methods.

3. Results

72 patients (49 males, 23 females) were evaluated over a period of 12 months and 76 bacterial isolates were cultured from them while they were febrile and neutropenic. Total number of Gram-negative bacteria isolated were 49/76 isolates. Among them Escherichia coli was the commonest organism isolated followed by Pseudomonas aeruginosa and Klebsiella pneumoniae. Total number of Gram-positive bacteria isolated were 27/76 isolates. Amongst them Staphylococcus epidermidis was the commonest comprising of 11/27 followed by Staphylococcus aureus 6/27. The most common source of bacterial isolation site was blood 29.6% (8/27) followed by urine 25.9% (7/27), wound 22.2% (6/27), sputum and body fluids 11.1% (3/27).

Table 1: Frequency of organisms at different isolation sites

Site	Gram positive organisms	Percentage %	Gram negative organisms	Percentage %
Blood	8	29.6	20	40.8
Urine	7	25.9	11	22.4
Wound	6	22.2	7	14.2
Sputum	3	11.1	5	10.2
Body fluids	3	11.1	6	12.2
Total	27		49	

Table 2: Distribution of microorganisms isolated

Gram negative organisms	Number	Gram positive organisms	Number
Escherichia coli	21	Staphylococcus aureus	11
Pseudomonas aeruginosa	10	Staphylococcus epidermidis	6
Klebsiella pneumoniae	8	Enterococcus	8
Acinetobacter baumanii	5	Streptococcus	2
Stenotrophomonas	1		
Proteus	2		
Enterobacter	2		

Table 3: Sources of isolation of Gram-negative organisms

Organism	Blood	Urine	Body fluids	Wound	Sputum
Escherichia coli	6	4	2	7	2
Pseudomonas aeruginosa	3	2		3	2
Klebsiella pneumoniae	-	2	1	2	3
Acinetobacter baumanii	-	2	-	2	1
Stenotrophomonas	-	-	-	-	1
Proteus	-	1	-	1	-
Enterobacter	-	1	-	1	-

Table 4: Sources of isolation of Gram-positive isolates

Organism	Blood	Urine	Body fluids	Wound	Sputum
Staphylococcus epidermidis	5	1	-	4	1
Staphylococcus aureus	3	1	-	2	-
Enterococcus	4	3	-	1	-
Streptococcus	1	-	-	1	-

4. Discussion

The study was done to evaluate the developing bacterial trends to understand the prevalence and to determine the effectiveness of the antibiotics to treat the infections. The studies done from different parts of the world showed a changing of trend in organisms from Gram positive to Gram negative similar to our study where Gram negative organisms accounted to 64.4% and Gram positive to 35.5%.[6,7] The potential for antibiotic resistance is an important concern for clinicians treating patients with confirmed or suspected bacterial infections as they are often resistant to a broad range of antimicrobial agents. Febrile neutropenia is of specific concern in immunocompromised patients as this state makes them more prone to bacterial infections. The commonest complication of chemotherapy is infection as it causes morbidity and mortality in neutropenic cancer patients. In order for clinician to treat effectively, the knowledge of likely pathogens and local bacterial spectrum is very important. Regarding the duration of neutropenia, infections caused by gram negative organisms accounted for greater proportion and are associated with the longest duration that is > 29 days. In our study Escherichia coli was most prevalent followed by Pseudomonas aeruginosa.[4] Of the Gram-positive cocci, the commonest isolate was coagulase negative staphylococcus particularly from patients who had indwelling venous access devices.[3,8] Our study showed that Gram negative isolates accounted for a higher percentage of bloodstream infections compared to Gram positives which is similar to many other studies.[9–12] In our study, Gram negative bacteria were seen more than other organisms in febrile neutropenic patients and Escherichia coli was the most common pathogen. Because of obtaining the samples from patients with nosocomial fever and neutropenia in our study the high rates of Gram-negative organisms may be reasonable. Continuous surveillance to identify changes in microbiologic patterns is recommended for the purpose of guiding proper antimicrobial use and to give the most up to date insight of the organisms to physicians.

5. Source of Funding

None.

6. Conflict of Interest

The authors declare that there is no conflict of interest.

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