Pattern of Antibiotics Usage in a Community Hospital of Malwa Region of Punjab, India

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Abstract
To assess the pattern of antibiotic utilisation and outcome of patients with bacteraemia in the hospital. All positive blood cultures (BC) over a 12-month period from January 2011 to December 2011 were retrospectively reviewed. Positive BC were recorded in 54 patients. 51.9% of the patients received antibiotics before or soon after obtaining the BC, and ceftriaxone was the most frequently-prescribed antibiotic (42.9%), either alone or in combination with other antibiotics. The bacteraemia was due to gram-negative rods in 84.9% and gram-positive cocci in 15.1% of cases. Most common gram-negative bacilli were \( E. coli \), \( Klebsiella pneumoniae \) and \( Salmonella \) species while most common gram-positive cocci was \( Staphylococcus aureus \). Antibiotics regimen was changed in 37% cases after BC results became available. Most frequent change was addition of meropenem in case of gram-negative bacilli (29.6%) and vancomycin in gram-positive cocci (12.5%). Ten (18.5%) patients developed serious sepsis or septic shock; 3 (30.0%) improved and 7(70.0%) had fatal outcome. Antibiotic selection needs to be tailor made for each patient. However, most bacteraemia necessitating hospital admission are due to gram-negative bacilli and it should be considered in antibiotic selection prior to BC.

Introduction
In developing nations, the cost of drugs is a major concern to medical health care professionals and patients. Antibiotic expenditures account for nearly 50% of a hospital’s total drug budget.¹ Extensive usage of antimicrobial drugs with possibility of higher adverse effects has been reported recently, and nearly half of all antibiotic prescriptions have been found to be poorly selected. Inappropriate and unreasonable utilisation of antimicrobials can cause microbial resistance to the commonly-prescribed antimicrobials.² This may necessitate use of newer, more costly antibiotics.¹

Information about microorganisms and their sensitivity patterns are helpful in developing infection control plans in hospital.³ Retrospective analysis of the pattern of antibiotics use over 1-year period (January 2011 to December 2011) in community hospital was done with aim to assess the pattern of microbes, sensitivity, antibiotic utilisation and outcome of patients with bacteraemia.

Material and Methods

Study design
Retrospective analysis of all patients admitted in a community hospital over a period of 12 months between January 2011 and December 2011 was done. Patients were considered to have infection if they had at least one positive blood culture (BC) for organisms known to cause bacteraemia. Any nosocomial infection was defined by Standard Centre for Disease Control and Prevention.

Blood culture
Using all aseptic precautions, 10 ml of venous blood from the patients was obtained. Blood cultures were incubated in BacT/ ALERT 3D. Positive BC were inoculated on
MacConkey and Blood agar plates and incubated at 37°C. The plates were examined for growth at 24-48 hours. Isolates, if any, were identified and their sensitivity was read on mini API system.

Results

A total of 54 patients were affected by infection; 36 (66.7%) were males and 18 (33.3%) were females. The mean age of patients was 60.0 ± 15. Twenty-eight (51.9%) had received empirical antibiotics before availability of results. Ceftriaxone was the most frequently prescribed antibiotic before the results were obtained. Twelve (22.2%) had received ceftriaxone, either alone or in combination with other antibiotics.

Bacteraemia was caused by gram-negative rods in 45 patients (84.9%) and gram-positive cocci in 8 patients (15.1%). Gram-negative bacilli identified were E. coli, Klebsiella pneumoniae and Salmonella species. Various gram-positive cocci were identified, including Staphylococcus aureus, Coagulase-negative Staphylococcus and Streptococcus pyogenes. The most common gram-positive cocci was S. aureus. The suspected source of the bacteraemia was identified in 22 patients, including respiratory (57.4%), urinary (36.8%) or skin (5.8%). Post availability of sensitivity, antibiotic treatment was changed in 20 (37%) patients; those who were not responding to empirical antibiotic therapy. Majority received an add-on therapy of meropenem in gram-negative bacteraemia and vancomycin in gram positive bacteraemia. Ten patients (18.5%) developed serious sepsis or septic shock; 3 (30.0%) improved and 7 (70.0%) succumbed.

Discussion

Monitoring of systems and intervention is useful in improving quality of health care system. This is especially relevant for the appraisal of antibiotics utilisation. High rate of antibiotic use combined with high percentage of critically ill patients has made intensive care units (ICU) a major source of antibiotic resistant infections. Borg et al while investigating factors driving the development of third-generation cephalosporins resistance in Escherichia coli and methicillin-resistant Staphylococcus aureus (MRSA) found a positive correlation between the level of antibiotic administration and resistance development and recommended a judicious use of antibiotics. 50% of prescribed antibiotic use in antibacterial prophylaxis and treatment was said to be unnecessary. Shimemeri et al reported that most of the patients had infection from gram-positive organisms and approximately 30% of patients had infection due to gram-negative organisms. Change of treatment was mandated in 30 patients who did not respond to treatment and this may be an indication of antibiotic resistance.

We observed that a high proportion of patients received antibiotics prior to the availability of the BC results. This is crucial for arresting or preventing the spread of infection in severe infection cases. Experience of the prescriber is called upon in selecting antibiotic treatment so as to appropriately cover the suspected agents. However such usage should be limited to an initial intervention therapy and replaced by culture sensitivity medications as soon as possible. The most commonly prescribed drug was the third-generation cephalosporin, ceftriaxone. The antibacterial activity of ceftriaxone covers Streptococci, Staphylococci, Citrobacter, Gonococci, Escherichia, Shigella, and Clostridia infections, which are normally susceptible to ceftriaxone treatment. Most of the patients had infection from gram-negative organisms and change in treatment/ add on drug was required in 20 patients who did not respond to the initial treatment, and such change often involved addition of meropenem or vancomycin to the antibiotic regimen. While the need for antibiotic change may be as a result of demonstrated greater antibacterial effects of the new medications, it is also likely to be an indication of the involvement of antibiotic resistance in the patients group.

A physician shall not be able to determine the identity of the microbial organism involved in infection before BC results are available. Crucial factor in selecting appropriate antibiotic is prescriber’s familiarity with antibacterial infections and susceptibility pattern in the local community. As observed majority of patients were infected by gram-negative organisms and significant proportion by gram positive organisms, the ideal treatment option should be the administration of antibiotic agents capable of eradicating both types of infection.

The study had some limitations. Patients in a single hospital were assessed and caution must be exercised in extending the conclusions to a larger number of patients. Drug utilisation pattern was considered only over a 1-year period and it may be different from pattern obtained over longer period. Commencement of empirical antibiotic treatment in serious infections is needed but it should be limited till the availability of microbial culture and sensitivity test results. Antibiotic management guidelines should, as much as possible, limit the pre-culture use of antibiotic agents with broad-spectrum antibacterial effects (e.g., the third-generation cephalosporins). This change of attitude shall reduce risk of development of multi-drug resistant strains and decrease the cost of drug treatment.
Conclusions

Most bacteraemia necessitating hospital admission were due to gram-negative bacilli and it should be considered in antibiotic selection prior to BC. This would help in controlling drug expenditure, minimise the potential health hazards from unnecessary antibiotics consumption and reduce the incidence of drug resistant strains. Strict adherence to antibiotic protocols is mandated.

References