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Original Article

A Prospective Study on Antibiotic Sensitivity Pattern in Septicaemic Patients Attending Emergency Medicine Department of a Tertiary Care Teaching Hospital

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ABSTRACT

Background: Bloodstream infections are important causes of mortality and morbidity. Rapid empiric antibiotic therapy is often needed. Knowledge of epidemiological data of common pathogens and their antibiotic sensitivity pattern is needed for rapid therapy.

Methods: This study was aimed at determining the common causes of septicaemia and their antibiotic sensitivity pattern in the emergency department of a tertiary care teaching hospital. Blood samples were collected and cultured aerobically. Isolates were identified using bacteriological and biochemical methods and antibiotic sensitivity was done using the Kirby-Bauer disc diffusion method.

Results: Of the 198 patients examined for septicaemia, positive culture was found in 56 (28.3%). Age distribution of the patients is shown in Table 1. Age group 31-45 years constituted the greatest percentage of infected subjects (63.4%), followed by patients aged between 16-30 years. Among the 56 isolates, n=24 belongs to gram negative bacilli, n=32 were gram positive cocci. Among the gram negative bacilli, n=6 were E.coli, n=6 were Salmonella, n=3 were Klebsiella, n=7 were Pseudomonas and least were Proteus spp. Enterobacter spp. and Citrobacter spp. were present in only less than 3% of the patients. Among the gram positive cocci Enterococci (55%) were predominate followed by coagulase-negative Staphylococcus (n=4), Beta-haemolytic Streptococci (n=9), and Staphylococcus aureus (n=15)

Conclusion: This study shows that Staphylococcus epidermidis, S. aureus and Salmonella typhi are the living cause of bacteremia among patients presented to Emergency department. Observed decline in susceptibility of these common pathogens (especially gram-negative bacilli) to common antibiotics calls for increase effort to ensure more rational use of drugs. None of the antibiotics used singly showed high sensitivity to all the gram-negative bacteria, so a combination of two or more drugs is needed to cover the broad range of gram-negative bacilli.

KEYWORDS: Septicemia, Gram-positive, gram-negative.

INTRODUCTION

Septicaemias are important causes of mortality and morbidity and are among the most common healthcare associated infections.[1] Illnesses associated with bloodstream infections range from self-limiting infections to life threatening sepsis that require rapid and aggressive antimicrobial treatment.[2] A wide spectrum of organisms has been described and this spectrum is subject to geographical alteration. Patients who are granulocytopenic or inappropriately treated may have a mortality rate that approaches 100%.[1] Moreover, fatalities among patients infected with Gram-negative bacilli are higher than those among patients who have Gram-positive cocci as causative agents of their bacteraemia.[3] Worldwide; emergence of antibiotic resistance in all kinds of pathogenic bacteria is a serious public health issue. It is associated with greater hospital mortality and longer duration of hospital stay, thereby increasing health care costs.[4] Also, colonization and infection with antibiotic-resistant bacteria has made the therapeutic options for infection treatment extremely difficult or virtually impossible in some instances.[5] There are many reasons for this alarming phenomenon,

including increasing antibiotic use and misuse in humans, animals and agriculture, clustering and Overcrowding and poor infection control.[6]

Due to the high mortality and mobility associated with septicaemia, antimicrobial therapy in most cases is initiated empirically before the results of blood culture and antimicrobial susceptibility pattern of the isolates are available.[1]

Knowledge of local antimicrobial resistance patterns from accurate bacteriological records of blood culture results is needed to provide guidance towards an empirical therapy before sensitivity patterns are available. There is large excess `mortality in Sub-Saharan Africa particularly in children. The mortality rate among five-year-old children is about 25-100 per 1000 compared with 10-30 per 1000 in developed countries.[7] Bacteraemia is usually caused by a wide spectrum of bacteria with varying antimicrobial susceptibility pattern. However, there is a paucity of information about the relative contribution of different bacteria to infections in Sub -Saharan Africa and how this varies across the full range age groups.[7] Bacteraemia often require prompt diagnosis and effective treatment to prevent death and complications from septicaemia. Physical signs and symptoms are usually useful in identifying patients with septicaemia and other non-localized infections but these have limited specificity.[8] Bacteriological culture to isolate the offending pathogen and determine its antimicrobial sensitivity pattern has remained the mainstay of definitive diagnosis of septicaemia.[9] In most cases of suspected septicaemia antimicrobial therapy is always initiated empirically because bacteriological culture results take about a week to be available.

Epidemiological data on common blood stream pathogens and their antimicrobial sensitivity pattern is thus very important to make the right choice of empiric therapy.

This study was therefore carried out to determine the common causes of bacteraemia and their antibiotic susceptibility pattern to help guide healthcare providers initiating empirical therapy on the choice of antibiotics to be used.

MATERIALS & METHODS

The study was carried out from January 2013 October to June 2014. All the subjects were patients suspected clinically for septicaemia and sent to the bacteriology laboratory for blood culture by physicians. Written informed consent were taken before the study.

The antibiotic susceptibility of the isolates was undertaken by the disc diffusion assay on the Muller Hinton agar and Blood agar media by modified Kirby-Bauer method.[10] The antibiotics tested were Amikacin, Ciprofloxacin, Vancomycin, Ceftriaxone, Piperacillin /tazobactum, Meropenem, Imipenem, and Levofloxacin.

Table 1: Age distribution of patients with septicaemia.

Age ranges (years)	No clinically examined	No (%) of positive culture
16-30	52	20 (10.7)
31-45	90	25(8.0)
46-60	42	6(9.8)
61-75	19	3 (4.5)
>76	5	2(3.6)
Total	198	56 (100)

Table 2: The type and distribution of bacteria isolates n=56

Bacteria	Isolates	Urine culture Positive
Gram Negative (n=24, 44.68%)	**E. coli sp**	6
	Salmonella	6
	Pseudomonas aeruginosa	7
	Klebsiella sp	3
	Citrobacter sp	1
	Enterobacter	1
Gram Positive (n=32, 55.3%)	**Enterococci**	3
	Coagulase-negative Staphylococcus	4
	Beta-hemolytic Streptococci	9
	Staphylococcus aureus	15
	Total	56

Table 3: Sensitivity pattern of gram-positive and gram-negative bacilli to selected antibiotics

Organism	Gram Negative Bacilli (n=24, 44.68%)		Gram Positive Cocci (n=32, 55.3%)	
	Sensitivity	Resistant	Sensitivity	Resistant
Amikacin	45	55	24	76
Ciprofloxacin	38	62	32	68
Levofloxacin	72	28	25	75
Piperacillin /tazobactum	88	12	46	54
Ceftriaxone	75	25	55	45
Imipenem	92	8	56	44
Meropenem	88	12	45	55

RESULTS

Of the 198 patients examined for septicaemia, positive culture was found in 56 (28.3%). Age distribution of the patients is shown in Table 1. Age group 31-45 years constituted the greatest percentage of infected subjects (63.4%), followed by patients aged between 16-30 years. Among the 56 isolates, n=24 belongs to gram negative bacilli, n=32 were gram positive cocci. Among the gram negative bacilli, n=9 were E.coli, n=6 were Salmonella, n=3 were Klebsiella, n=7 were Pseudomonas and least were Proteus spp. Enterobacter spp. and Citrobacter spp. were present in only less than 3% of the patients. Among the gram positive cocci Enterococci (55%) were predominate followed by coagulase-negative Staphylococcus (n=4), Beta-haemolytic Streptococci (n=9), and Staphylococcus aureus (n=15) (Table-2).

The antibiotic sensitivity patterns of the isolates to various antimicrobial agents are shown in Table-3. Gram negative bacilli were found to be highly sensitive to Imipenem (92%), followed by Meropenem (88%) piperacillin / tazobactum (82%), Ceftriaxone (88%), Levofloxacin (88%), whereas Gram positive cocci were highly sensitive to Imipenem (56%), followed by Ceftriaxone (55%), and least sensitive to Amikacin (24%).

Grampositive bacteria were encountered more often than gram negative bacteria (55.3% versus. 44.68%). Among the gram- positive bacteria, Staphylococci constituted (82.5 %), Streptococci species (9.5%) and unidentified gram-positive bacteria 5 (7.9%). Among gram-negative bacteria, enterobacteriacea 79.6 % and non-fermenting bacteria 20.1 % were more frequent.

DISCUSSION

This study is a record of septicaemia in patients attending the Tertiary care teaching Hospital. We included patients of 15-78 years age groups. Results showed that septicaemia was present in 28.3% of patients examined. Gram positive bacteria were encountered more than gram-negative bacteria, and the most frequent invasive bacteria were Staphylococcus epiderimidis, S. aureus, Salmonella typhi and Klebseilla species.[6]

These results are similar to those obtained in some previous studies[9]: Bacteremia was identified in 552 (45.9%) of 1201 children in Nigeria; 53.4% of the infections were due to gram positive bacteria and 46.6% due to gram negative bacteria. The most frequent isolate was S. aureus (47.7%),

followed by coliforms (23.4%), unidentified gram negative rods (8.0%), Pseudomonas aerugenosa (5.8%), Streptococcal species (4.7%) and Chromobacteria species (4.5%). Hill et al[7] also reported an incidence of 34% (297) out of 871 patients studied. The isolates were dominated by

gram-positive bacteria. Streptococcus pneumoniae accounted for 45.2%, S. aureus –18.3%, E. coli-9.7% and non-typhoidal Salmonella (8.6%) of the isolates.

Our study showed that Amikacin was seen resistant in most of the cases of gram negative bacilli infections. This finding was contradictory to other previous studies showed that Amikacin was found to be sensitive in most of the cases. Ciprofloxacin was found sensitive in only 38% of gram negative bacilli infections, contradictory to study conducted by Ramana BV, Chaudhury A. 2012, who showed Ciprofloxacin was sensitive in 65% cases.[5] Sensitivity of 3rd generation Cephalosporin Ceftriaxone and Levofloxacin was in accordance to previous studies showing good response against gram negative bacilli infections.[4] Imipenem and Meropenem was found to be highly sensitive against gram negative infection as well supported by previous studies. Only drugs which have showed good activity against gram positive cocci were Imipenem, Ceftriaxone and Meropenem.

Our results agree with the work of Meremikwu et al[9] who found that S. aureus and coliforms were highly resistant to amoxicillin, and cotrimoxazole. Sensitivity of S. aureus to gentamycin was 86.6% and 61.6% for coliforms. Atul et al[1] found that 80% of S. aureus strains were penicillin resistant. Resistance to erythromycin ciprofloxacin and gentamycin were above 45%. No

strains showed resistance to vancomycin. Among enterobacteriaceae ceftriaxone was very effective and amikacin was very effective for gram-negative non-fermenters like Pseudomonas and Acinectobacter species.

CONCLUSION

This study shows that Staphylococcus epidermidis, S. aureus and Salmonella typhi are the living cause of bacteraemia among patients presented to Emergency department. Observed decline in susceptibility of these common pathogens (especially gram-negative bacilli) to common antibiotics calls for increase effort to ensure more rational use of drugs. None of the antibiotics used singly showed high sensitivity to all the gram-negative bacteria, so a combination of two or more drugs (such as gentamicin, cefoxitime and ciprofloxacin) is needed to cover the broad range of gram-negative bacilli.

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