Bacteriological Etiology and Antibiotics Susceptibility Pattern in Blood Samples from the Patients Attending Emergency Department of a Tertiary Care Hospital, Nepal

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ABSTRACT

Background: Blood cultures are among the most important laboratory tests performed in the diagnosis of infections. Blood-stream infections cause significant morbidity and mortality, increase in length of hospital stay and increased cost of care. Undiagnosed blood-stream infections and frequent inappropriate antibiotic use contributes to emergence of drug-resistant bacteria pathogens.

Objectives: This study was carried out to identify likely bacteriological etiology and its antibiotics susceptibility profile in blood stream infection from the patients attending Emergency Department of a Tertiary Care Hospital, Nepal.

Methodology: This study was conducted between July and August of 2017. A total of 282 blood specimens were collected from the patient attending Emergency Department of a tertiary care hospital and reported with signs and symptoms of fever, body ache, relative bradycardia and burning micturition. Collected Blood specimen was kept in a container containing 50ml of Tryptone Soy-Broth and sent to the microbiology lab for culture and antibiotic susceptibility test (AST). All procedure, specimen collection, culture and AST were performed from isolates by using standard protocol. Data were entered and analyzed by using SPSS.

Results: Among the total (282), male patients were more (58.2%) and more patients were from 41-50 years age group. Only 18 patients were from age of above 60 years. Out of the total specimens (282), no growths were reported in 74.11% (209) and growth of microorganism was reported in 10.28% (29) blood specimens. The most common bacterial isolates were found Enterobacter species reported highest percentages (48.27%), followed by Streptococcus pneumoniae (13.79%) and Salmonella typhi (10.34%) Enterobacter species was more sensitive to Chloramphenicol, Amikacin and Gentamycin. While Streptococcus pneumoniae was sensitive to most of the antibiotics, it was found that 65.3% bacterial isolates were resistant to Cephalosporin.

Conclusion: Contaminated blood samples were found more, therefore, emphasis should be given in reducing the contamination. Proper cleaning of skin with antiseptic and guidelines to draw blood for culture should be familiarized and strictly followed while drawing the blood and others from Emergency Department.

Key words: Antibiotics, Bacteriological pattern, Culture sensitivity, Emergency Department.

INTRODUCTION

Antibiotic resistance in healthcare system is a widespread and inevitable problem which is mainly due to their inappropriate and indiscriminate prescribing or use and the misuse of antibiotics which is having substantial detrimental consequences for patients.[1]Bloodstream infections are associated with significant patient morbidity and mortality. Antimicrobial susceptibility patterns should guide the choice of empiric antimicrobial regimens for patients with bacteremia.[2]

Blood is normally in a sterile environment, so the detection of bacteria in blood mostly obtained by blood cultures is abnormal. Bacteremia is different than sepsis as later is the host response to the bacteria. Septicemia is potentially life threatening. Bacteriological pattern and its culture sensitivity is an important parameter for evaluating antibiotic use in the Emergency Department.[3,4]

Bloodstream infections are a major cause of morbidity and mortality in children in developing countries.[5] It is important to continuously monitor any change in the local patterns of infection and susceptibility to various antibiotics so that unnecessary use of antibiotics can be avoided and drug resistance can be minimized.

Bacteremia prolongs duration of hospital stay and also increases the financial burden for patients. Frequent inappropriate antibiotic use contributes to the emergence of drug-resistant pathogenic bacteria. 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

Third Generation Cephalosporin like Ceftriaxone is being widely used in the Emergency Department for sick patients as a start dose and usually continued till the blood culture report available. This study attempts to identify the likely etiologic agents and the antibiotic sensitivity profile of blood stream infection in Emergency Department of Patan Hospital.

MATERIALS AND METHOD

This is a descriptive cross-sectional study conducted at a tertiary care hospital during, July and August of 2017. Ethical approval for this study was taken from Institutional Review Board of study hospital. Two hundred and fifty patients were participating in the study after taking verbal/written consent. Five ml of patient's blood sample was mixed in a container (containing 50 ml of Tryptone Soy-Broth) and sent to the Microbiology lab from Emergency Department. Incomplete laboratory reports on culture and sensitivity tests were excluded from the study. Statistical Package for the Social Sciences (SPSS) version 20.0 software was used for data entry and analysis.

The blood sample was incubated at 37^0 C for overnight. The following day, if the sample was turbid then sub-cultured was done in Blood, MacConkey and Chocolate agar and kept overnight. On third day, if pathogenic organism was observed in culture plate, sensitivity was done in Muller Hinton agar from pure colony and incubated overnight. If no changes in sample's color were observed from 2nd day to 7th day, no growth was reported only then.

RESULTS

This study was conducted between July and August of 2017. A total of 282 blood specimens were collected from the patient reported with signs and symptoms of fever, body ache, relative bradycardia and burning

micturition. Collected Blood specimen was kept in Tryptone Soy-Broth, collected from patients attending Emergency Department of a tertiary care hospital and sent to microbiology lab for culture susceptibility test. After data was obtained and compute; the demographic profile of the patients was found as follows:

Male patients were more (164n; 58.2%) than female patients (118n; 41.2%). Among the total (282), 22 patients were from age group of 20-30 years, 48 patients were from 31-40 years of age group, 112 patients were from 41-50 years age group and similarly 82 patients were from 51-60 years age group. Only 18 patients were from age of above 60 years.

Out of the total specimens (282), no growths were reported in 74.11% (209) and growth of microorganism was reported in 10.28% (29) blood specimens. In this study, 15.60% (44) blood specimens were rejected as they were reported to contaminate. (Figure 1).

Enterobacter species were observed to be sensitive towards Chloramphenicol, Amikacin and Gentamycin respectively; while Streptococcus pneumoniae was equally sensitive towards antibiotics Chloramphenicol, Amoxycillin, Cephotaxim and Penicillin (Table 1).
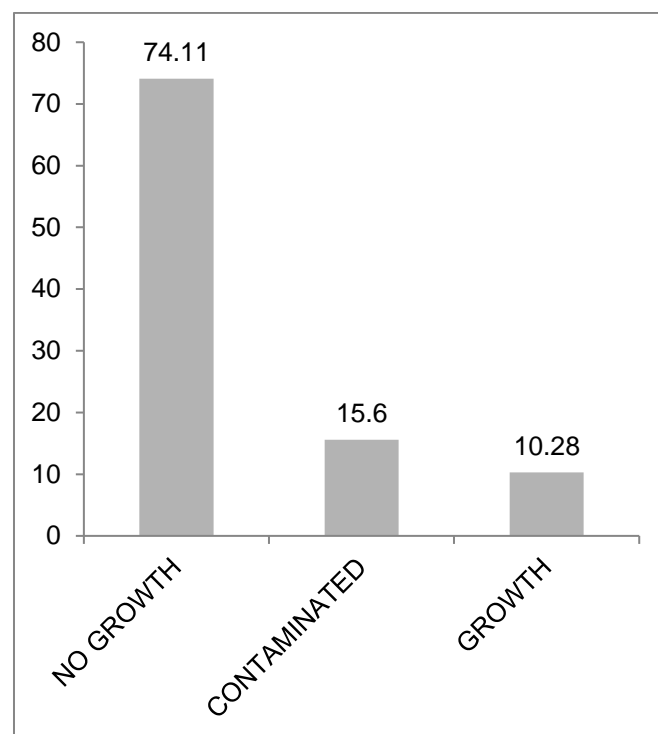

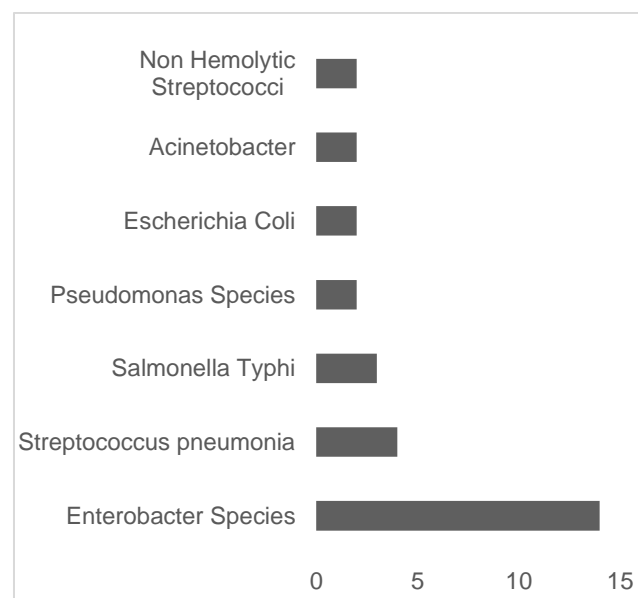**Figure 1: Bacteriological Growth Pattern in Percentages**

Figure 2: Growth of Microorganism in Blood

Table 1: Antibiotic Sensitivity Pattern of Enterobacter spp. and Streptococcus

Antibiotics	Enterobacter species (n=11)		Streptococcus pneumoniae (n=4)	
	Sensitivity (%)	Resistant (%)	Sensitivity (%)	Resistant (%)
Chloramphenicol	11	0	4	0
Amikacin	9	1	0	0
Gentamycin	8	3	2	2
Nitrofurantoin	1	0	0	4
Amoxycillin	0	12	4	0
Ceftriaxone	0	12	4	0
Ciprofloxacin	0	12	0	0
Cotrimazole	0	11	2	2
Ofloxacin	0	12	3	1
Erythromycin	0	0	3	1
Penicillin	0	0	4	0
Tobramycin	0	0	0	0
Nalidixic Acid	0	0	0	0

DISCUSSION

Enterobacter species from the family Enterobacteriaceae was isolated the most in our study. Similar to our finding, in a study conducted in 74 medical centers from 23 countries in five geographic regions in 2003, which included Asia/Pacific, Enterobacter species were the third most common Enterobacteriaceaeisolated.[6]

Likewise, Salmonella Typhi, other species from the same family of Enterobacteriaceae was also isolated in our study; Salmonella Typhi was isolated at 64.43% of the total bacteriological isolates in a study conducted in 2007 by Amatya et.al (3).Antibiotics are commonly prescribed for Emergency Department patients even though they are usually ineffective in otherwise healthy adults. Efforts should be made to reduce inappropriate antibiotic use for the sake of containing costs, preventing side effects, and limiting the spread of antibiotic resistance.[7]

One aspect for increase in the number of gram negative bacteria in the sample could be timing of the study. Our study was conducted in the middle of monsoon season which usually lies between the months of June to September. Enterobacter, Serratia, Citrobacter, and Proteus species live in water, soil, and occasionally food and, in many cases, form part of the intestinal flora of humans and animals

The usefulness of blood cultures taken in the Emergency department remains open to question. In two Emergency Department based studies only 1.6% of blood cultures taken in one study had an impact on the management of patients and in another only 0.52% potentially had their medical management affected by the positive blood culture results.[8]We found that around 15.60% of our sample collected from Emergency was contaminated. Contamination of blood cultures is also a common problem and false positive results due to contaminants may lead to errors both in clinical interpretation and administration of inappropriate treatment. There are several problems which may contribute to high contamination rates of blood cultures—these

include a rapid turnover of staff, lack of ongoing training, workload, and the nature of the presenting patients.

The role of blood cultures in emergency department remains a major problem. Reduction in the number of contamination will not only give the true picture but also will be helpful in patient management and avoid unnecessary broad spectrum antibiotics which are also an emerging problem now. Most false positive blood cultures are caused by endogenous microbial skin flora so strict skin preparation and good vein puncture technique are important factors in reducing the rate of contamination.

The contamination rate when using alcohol and chlorhexidine (1 of 215, 0.5%) did not differ significantly from the contamination rate when using tincture of iodine (3 of 215, 1.4%; P = .62, McNemar test). There was an 87% probability that the two interventions differed by less than 2% in their rate of contamination. Both of these antiseptic kits were highly effective for skin preparation prior to drawing blood for cultures. The uses of these kits contribute to the low contamination rate.[9]Proper cleaning of the skin with antiseptic and guidelines to draw blood for culture should be familiarized to all Emergency Department nurses and implemented. Skin preparation is an important factor in reducing the rate of blood culture transmission.

This study showed Enterobacter species to be more sensitive for Cholramphenicol, Gentamicin and Amikacin. From the potentially serious adverse effects associated with the indiscriminate use of chloramphenicol, and a practice of empirical basis of prescription, the wide use of chloramphenicol may evoke some concern.[10] Gentamicin and amikacin requires monitoring of renal function and as it is available in IV form requires a skilled human resource.

Third generation cephalosporin has been widely used. However, 65.3% resistance seen in our study raises a question of its empirical use. A study done by Nwadioha et.al showed greater sensitivity pattern for 3rdgénération cephalosporin.[11]

CONCLUSION

Enterobacter species from the family Enterobacteriaceae was isolated the most of the blood specimens in our study. This study showed Enterobacter species to be more sensitive for Chloramphenicol, Gentamicin and Amikacin. Greater resistance for ceftriaxone for Enterobacter species was also observed in our study possibly due to its extensive use and as a first line drug. Further study and explorations are required for rational behind use of this drug. Contamination of the blood samples were observed to be high so emphasis should be given in reducing thesecontamination.

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