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Antimicrobial Drug Utilization and Culture Sensitivity Pattern in Sepsis Patients in a Tertiary Care Hospital

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Abstract

Sepsis is a potentially life threatening condition that is caused by an extreme response of the immune system of the body to an infection, where the response damages its own tissues. This study aims to study culture sensitivity and antimicrobial drug utilization pattern in sepsis patients in TUTH. It is a qualitative prospective and observational study, which was carried out in 105 sepsis patients at TUTH. The blood culture was positive in 105 (9.23%) patients of which 60 (57.1%) were male and 45 (42.9%) were female. A total of 59 (56.1%) gram-negative and 45 (43.9%) gram-positive bacteria were isolated. The common isolates were Coagulase negative *Staphyloccus aureus* (CoNS), *Klebsiella pneumoniae* and *Pseudomonas aeruginosa*. The most common source of infection in sepsis patients was Pneumonia (57.1%). The sensitivity of gram-positive organism was better to antibiotics such as Amikacin (84.8%), Piperacillin + Tazobactam (78.3%) and Gentamicin (76.1%). The Sensitivity of gram-negative organisms was better to antibiotics like Piperacillin + Tazobactam (86.5%), Levofloxacin (72.8%) and Ciprofloxacin (69.5%). The average number of antibiotics prescribed for sepsis patients was 3.07. In our study, gram-negative bacteria were isolated more than gram positive bacteria, whereas CoNS followed by *Klebsiella pneumoniae* were the most isolated pathogens. Sepsis was more common among male patients than female. Pneumonia was the major source of infection in sepsis patients. Most frequently used antibiotics both empirically and after antibiotic culture sensitivity test were Amikacin (67), Ceftriaxone (48), Ciprofloxacin (46) and Piperacillin + Tazobactam (39).

Key words: Sepsis, Drug sensitivity, Coagulase negative *Staphyloccus aureus* (CoNS), *Klebsiella pneumoniae*, Antibiotics.

INTRODUCTION

A life-threatening organ dysfunction caused by a dysregulated host response to infection is known as sepsis. If the sepsis is caused by bacteria, then it is termed as bacteremia. When sepsis progresses to cause any organ dysfunction, it is termed as severe sepsis which could lead to septic shock, defined as "sepsis-induced hypotension persisting despite adequate fluid resuscitation." Septicemia is the combination of sepsis, severe sepsis and septic shock.[1]

Older definition defines sepsis as a systemic illness caused by microbial invasion of normally sterile parts like blood of the human body.[2] Infection is defined as presence of microorganisms or the invasion of normally sterile host tissue by an organism which leads to inflammatory response. The presence of viable bacteria in blood is known as bacteremia.[2]

In developed countries, sepsis occurs in approximately 2% of all hospitalized cases and in case of patients who are admitted in ICU, it is about 6–30%. In ICUs the leading causes of mortality and morbidity are sepsis and septic shock with the prevalence of 28% and 21% respectively.[3]

The Epidemiology of Sepsis in the United States from 1979 through 2000 shows that there were 10,319,418 reported cases of sepsis and per year the patients increased from 164,072 in 1979 to 659,935 in 2000 (an increase in 13.7 percent per year). The increment in incidence of sepsis is from 82.7 cases per 100000 population to 240.4 cases per 100000 population with annual increase of 8.7 percent during the 22-year study period.[4]

The difference in incidences of sepsis is influenced by age variation, sex, race and ethnic groups. In terms of age variation infants and elderly are

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in greater risk than in other age groups, similarly higher in males than in females. Alike, for all sources of sepsis expect genitourinary sources, men had higher extent than did women.[5]

In the early 20th century, when the first antibiotics were discovered, the rate of death from infectious diseases fell dramatically. But as a result of antibiotic misuse, the emergence of multidrug resistant bacteria is increasing and by the year 2050, the same disease may once again become the global cause of death.[6] Today, antibiotic resistance is emerging dangerously at high levels in all parts of the world due to its high overuse, misuse as well as poor infection prevention and control. Most of the infections such as pneumonia, tuberculosis, blood poisoning, gonorrhea, and food borne diseases are becoming difficult to treat or often sometimes impossible as antibiotics are becoming less effective, which leads to use of most expensive second line drugs or other alternative treatments. This might increase the health care costs, duration of illness and treatment. In several countries antibiotics are often overprescribed by health workers, misused by patients as well as bought without a prescription which makes the problem of antibiotic resistance even worse. Thus, it is urgent to change the way of antimicrobial drug prescription as well as its utilization.[7]

Antimicrobial drug utilization is a means to evaluate the appropriateness of antimicrobial therapy. Sepsis and septic shock are the important causes of deaths in ICUs of any age. It has been found that 13 million people develop sepsis each year worldwide, out of them 4 million people have died.[8] The therapeutic management of sepsis requires broad and systemic approach such as diagnostic method, including empirical antibiotic use along with supportive therapy.[9] The aim of this study is to analyze the pattern of antimicrobial drug use and the culture sensitivity pattern of microbial samples from sepsis patients. The information obtained from this study can be used as a reference for pathogen identification, selection of empirical antibiotic therapy and to serve policies to control antibiotic resistance in sepsis patients.

MATERIALS AND METHODS

Study Design and Setting

The descriptive study was conducted by visiting different wards and microbiology laboratory of Tribhuvan University Teaching Hospital (TUTH) located in Kathmandu, Nepal. TUTH is one of the renowned national hospitals in Nepal with 700 bed facility.

Inclusion and Exclusion Criteria

In this study, patients of all age groups, neonates, male and female patients who were diagnosed with sepsis when admitted to hospital during the study period were included. All the 105 cases of sepsis were included during our study period. Patients who were not diagnosed with sepsis were excluded.

Data collection and processing

All the data required for study was obtained from the medical record of the patient within the ward from the microbiology lab patient registration book. Individual patient's information to fill the data sheet form which is related to the study was collected by visiting the patients in their respective wards and in case of some patients in certain circumstances, by visiting the medical record department. Sample collection, bacteriological processing and AST were done as per CLSI guidelines by medical professionals.

Data management and Statistical Analysis

Data entry, data checking, compiling and editing were done manually and data analysis was done as per the objectives of the study. After data collection it was entered in Microsoft Excel data sheet. Data analysis was done by using Statistical Package for Social Sciences (SPSS) software of version 25. The statistical analysis method includes descriptive statistics involving "frequencies, descriptives, Cross tabs" custom tables, multiple response bar-diagrams, tables, averages, significance tests and other methods where necessary.

Ethical consideration

An approval from the Institutional Review board of TUTH was taken before initiation of study. The IRB reference no. was 497/ (6-11) E2/075/076. All the patients in the study were informed in detail about the study. A written informed consent was obtained from all patients and only those patients who gave consent were included in the study. Confidentiality of all information was maintained.

RESULTS AND DISCUSSION

This study was carried out to determine culture sensitivity and antimicrobial drug utilization pattern in sepsis patients of all age groups at TUTH. It has been found that in one study there was wide variation in growth positivity of bacterial culture in case of sepsis patients which ranged from 16 to 54% over a period of 6 years.[10] In our study, blood culture positivity rate was found to be 11.08% and confirmed sepsis cases were 9.23%; similar results were found by Mudzikati *et al.,* 2015 (9.8%)[11] and Ansari *et al.,* 2015 (12.6%) [12] whereas lower incidence rate was reported by Nepal *et al.* 2013 (2.1%)[13] and higher incidence rate was reported by Sarasam *et al.* 2014 (36.1%).[14] This type of variation in culture positivity test in case of sepsis patients might be due to difference in sample size collection, administration of antibiotic prior to sample collection and effective control in spread of nosocomial infection.[15] During the study period, 1137 blood culture were done, out of which the blood culture test was found to be positive on 126 (11.08%) samples and septicemia was confirmed in 105 (9.23%) patients.

Sex and age wise distribution of sepsis patient

Out of the total 1137 cases, the blood culture test was found to be positive on 126 cases (11.08%) and septicemia was confirmed in 105 (9.23%) patients. Of these 105 patients, 60 (57.1%) were males and 45 (42.9%) were females with predominant male to female ratio of 1.33:1. The difference in incidence of sepsis with related to gender is due to difference in immune response, since increasing age and body mass index can affect the production of arotamase activity in adipose tissue, increasing estrogen level which influences greater activity of the immune system in women than men and also there is higher incidence of production of cytokines by peripheral blood mononuclear cells in women.[16] Whereas in age wise distribution, the neonates of age group 0-7 days (49.5%) were found to be more susceptible to sepsis followed by age group 8-28 days (19.1%) and patients from age group 21-30 years and 51-60 years, (1.9%) both were found to be least vulnerable to sepsis. (*P* value>0.05) Such cases arise due to low immune system of patients.[17] The study shows that the disease affects all the age groups but it is more noticeable in neonates than in other age group patients Table 1.

Distribution of isolates from blood culture

During the study, it has been observed that there was a total of 59(56.1%) gram-negative bacteria isolation compared to gram positive organism

Table 1: Sex and age wise distribution of Sepsis patients.

Age	Sex		Total (%)
	Male	Female	
0-7 Days	27	25	52(49.5)
8-28 Days	13	7	20(19.1)
1-10 Years	5	3	8(7.6)
11-20 Years	2	3	5(4.7)
21-30 Years	1	1	2(1.9)
31-40 Years	0	2	2(1.9)
41-50 Years	2	1	3(2.9)
51-60 Years	5	1	6(5.7)
61-70 Years	3	0	3(2.9)
> 70 Years	2	2	4(3.8)
	60(57.1)	45(42.9)	105(100)

Table 2: Distribution of organisms isolated from blood culture in patients.

Sex N (%)			
Organisms isolated	**Male**	**Female**	**Total no of organism N(%)**
Gram-positive organism (*n*=46)			
CoNS	21(20.0)	9(8.6)	30(28.6)
Enterococcus faecalis	6(5.8)	1(0.9)	7(6.7)
Staphylococcus aureus	4(3.8)	5(4.7)	9(8.5)
Gram-negative organism (*n*=59)			
Acinetobacter sp.	2(1.2)	8(8.5)	10(9.5)
Citrobacter sp.	2(1.9)	2(1.9)	4(3.8)
Escherichia coli	2(1.9)	3(2.9)	5(4.8)
Klebsiella pneumoniae	16(15.2)	12(11.5)	28(26.7)
Pseudomonas aeruginosa	7(6.7)	5 (4.8)	12(11.5)
Total no of organisms	60(57.1)	45(42.9)	105(100)

isolates 45(43.9%). From 105 blood samples, 8 bacterial species were isolated which is shown in Table 2. Coagulase negative *Staphylococcus aureus* 30(28.6%) was by far the most frequently isolated organism and it was also the most common pathogen (65.2%) among the gram-positive group. Others frequently reported among the gram-positive group were *Staphyloccus aureus* (19.5%), *Enterococcus faecalis* (15.2%) isolates. Whereas, *Klebsiella pneumoniae* was the most isolated (26.7%) after coagulase negative *Staphyloccus aureus* and it was the most common pathogen (47.4%) among the gram negative group. Other encountered gram-negative bacteria were *Pseudomonas aeruginosa* 12(20.3%), *Acinetobacter sp.*10 (16.9%), *Escherichia coli* 5(8.5%), *Citrobacter sp.*4 (6.8%) [Table 2].

Identification of Source of infection for causing sepsis

Table 3 in our study, the most common source of infection for septic patients was found to be pneumonia (57.1%), followed by urinary tract infection (22.9%) and intra-abdominal infection (9.5%). [Table 3] Similar finding was reported in other studies where pneumonia (45.9%), UTI (18.8%) and intra-abdominal infection (17.6%) contribute to source of infection in sepsis.[18] A separate study shows that predominant source of infection that develops in sepsis changed from intra-abdominal infection to pneumonia.[19] Beside this, wound infection and unknown source of infection also lead to sepsis. [Table 3] The knowledge of common pathogen based upon the source of infection will help us to determine rational empirical antimicrobial drug therapy in sepsis patient.

Table 3: Source of infection for causing Sepsis.

Source of infection	No of patients (N)	Percentage (%)
Pneumonia	60	57.1
UTI	24	22.9
Intra-abdominal infection	10	9.5
Meningitis	7	6.7
Wound infection	2	1.9
Unknown	2	1.9
Total	105	100

Bacteriological profile and antibiotic sensitivity pattern

The culture positivity rate was 11.08% (126/1137). With the process of gram staining, 105 organisms were identified where 59 (56.1%) were gram negative [Figure 1] and 46 (43.9%) were gram positive [Figure 2]. CoN*S*, *Enterococcus faecalis* and *Staphyloccus aureus* were the isolated gram-positive bacterial pathogen causing bacteremia whereas *Acinetobacter sp, Citrobacter sp, Escherichia coli, Klebsiellae pneumoniae, Pseudomonas aeruginosa* were isolated gram-negative organism in our study. Within our study, gram-negative bacteria was predominant causative agent but individually the most commonly isolated pathogen was Coagulase negative *Staphyloccus aureus* (28.6%) and similar finding was found in other studies.[20] The findings by Zenbe *et al*., also shows that 26.1% of CoNS has been isolated.[21]

In case of gram-negative bacteria, *Klebsiella pneumoniae* (26.7%) was the most common isolated bacteria followed by *Pseudomonas aeruginosa* (11.5%). *Klebsiella pneumoniae* was the most common pathogen in pneumonia infection and intra-abdominal infection that develops into sepsis which is similar to finding in study done by Bugano.*et al*.[22]

Among gram-positive organism

Table 4 the sensitivity of gram-positive organisms was better to commonly used drugs such as Amikacin (84.8%), Gentamicin (76.1%), and Piperacillin + Tazobactam (78.3%). [Table 4] Data shows low resistance to quinolones and cephalosporins. (*P* value<0.05) This is comparable to studies done by Vaniya *et al*.[23] The antibiotics with sensitivity pattern greater than 50% in CoNS were Ciprofloxacin (60.0%), Levofloxacin (56.7%), Amikacin (83.3%), Cloxacillin (83.3%) while in *Staphyloccus aureus* were Levofloxacin

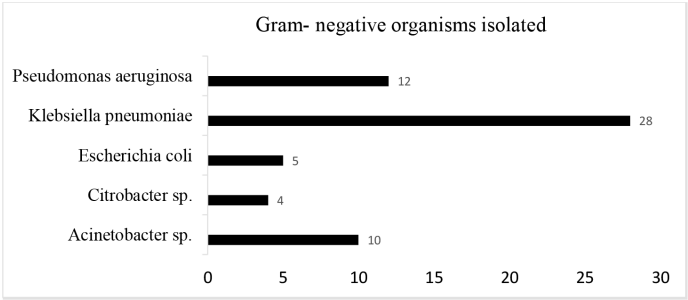

Figure 1: Bacteriological profile of gram -negative organisms.

(88.8%), Gentamicin (77.7%), Cloxacillin (77.7%). Whereas, antibiotics like Polymixin B, ceftriaxone and Colisitin sulphate showed 100% sensitivity towards *Staphyloccus aureus*. The antibiotics with sensitivity less than 50% towards CoNS were Ampicillin/Amoxycillin (33.3%), Erythromycin (10%), Polymixin B (6.67%). Similar findings were observed for CoNS and *Staphyloccus aureus* in another study.[24]

Among gram-negative organism

Table 5 the sensitivity of gram-negative organisms was better to commonly used antibiotics like Piperacillin + Tazobactam (86.5%), Levofloxacin (72.8%) and Ciprofloxacin (69.5%). Similarly, Polymixin B and Colistin sulphate showed 100% sensitivity for gram-negative organism. Whereas Ampicillin/Amoxycillin (79.7%) and Cephalexin (62.7%) were resistant in comparison to others drugs. [Table 5] (*P* value<0.05)

In our study, Amikacin showed low sensitivity (28.5%) and Ampicillin/Amoxycillin showed 100% resistance. The antibiotic sensitivity tests of different isolated pathogen from the study provide insight for the selection of appropriate drug therapy to control sepsis.[25]

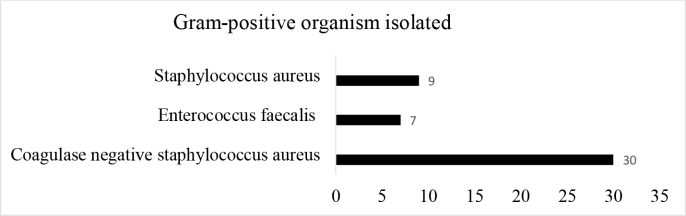

Figure 2: Bacteriological profile of gram -positive organisms.

Antimicrobial drug utilization pattern in sepsis patients

Table 6 majority of the sepsis patients were prescribed with 2 to 4 antibiotics. Among which most of the patients were prescribed with 3 antibiotics and average number of antibiotics prescribed per encounter was 3.07. All the antibiotics were given via parenteral route in neonates whereas in other age groups mostly via parenteral route followed by oral route was used.

Most commonly prescribed antibiotics were Amikacin (63.8%), Ceftriaxone (45.7%), Ciprofloxacin (43.8%), Piperacillin + Tazobactam (37.1%), Vancomycin (21.9%) and Meropenem (20.0%). Amikacin, Ciprofloxacin Ceftriaxone and Ampicillin were mostly prescribed drugs empirically in treatment of septicemia having different source of infection [Table 7] Before Antibiotic sensitivity testing, Amikacin (11.42%) was used in treatment of pneumonia and after the blood was cultured having suspected case of sepsis patients, again Amikacin (23.8%) was used. Besides Amikacin, Piperacillin+Tazobactam was also frequently used antibiotic in treatment of pneumonia which was 1.9% empirically and 19.1% after culture. In treatment of urinary tract infection, Ceftriaxone (10.5%), Piperacillin+Tazobactam (8.5%) followed by Meropenem, Polymixin B were most commonly prescribed drugs. Similarly, Amikacin, Ciprofloxacin and Ceftriaxone were mostly used drugs in treatment of intra-abdominal infection and meningitis. Whereas, Azithromycin, Cloxacillin, Cefazolin, Cefixime and Chloramphenicol were the antibiotics which were prescribed in fewer cases empirically and after the antibiotic sensitivity testing has been done. [Table 7]

Table 4: Culture Sensitivity of Gram-positive isolates.

Gram- positive isolates					
	CoNS N (%)	***Enterococcus faecalis* N (%)**	***Staphyloccus aureus* N (%)**	**Total sensitive N (%)**	**Total resistant N (%)**
Antimicrobial drugs					
Ampicillin/Amoxycillin	10(33.3)	5(71.1)	0(0.0)	12(26.1)	34(73.9)
Cotrimoxazole	14(46.6)	7(100)	7(77.7)	28(60.8)	18(39.2)
Ciprofloxacin	18(60.0)	2(28.9)	4(44.4)	24(52.2)	22(47.8)
Levofloxacin	17(56.7)	4(57.1)	8(88.8)	29(63.1)	17(36.9)
Gentamicin	23(76.7)	5(71.1)	7(77.7)	35(76.1)	11(23.9)
Amikacin	25(83.3)	7(100)	7(77.7)	39(84.8)	7(15.2)
Cephalexin	14(46.7)	0(0.0)	9(100)	23(50.0)	23(50.0)
`Ceftriaxone	30(100)	NT	NT	30(65.2)	16(34.8)
Ceftazidime	NT	NT	9(100)	9(19.5)	-
Cefixime	NT	NT	NT	-	-
Cloxacillin	25(83.3)	2(28.9)	7(77.7)	34(73.9)	12(26.1)
Erythromycin	3(10.0)	5(71.1)	2(0.3)	10(21.7)	36(78.3)
Meropenem	NT	NT	NT	-	
Piperacillin+Tazobactam	30(100)	6(85.7)	NT	36(78.3)	10(21.7)
Polymixin B	2(6.67)	NT	9(100)	11(23.9)	35(76.1)
Colisitin sulphate	NT	NT	9(100)	9(19.5)	37(80.6)
Vancomycin	28(93.3)	NT	NT	28(60.8)	18(39.1)
Chloramphenicol	NT	7(100)	9(100)	16(34.8.)	30(65.2)
Total	30	7	9	46	

Table 5: Culture Sensitivity of Gram-negative isolates.

Gram–negative isolates							
Antimicrobials drugs	***Acineto-bacter* sp. N (%)**	***Citrobacter* sp. N (%)**	***E.coli* N (%)**	***Klebsiella* N (%)**	***Pseudomonas* N (%)**	**Total sensitive N (%)**	**Total resistant N (%)**
Ampicillin/Amoxycillin	0(0.0)	0(0.0)	0(0.0)	0(0.0)	12(100)	12(20.3)	47(79.7)
Cotrimoxazole	6(60)	3(75)	3(75)	8(28.6)	12(100)	32(62.3)	27(37.7)
Ciprofloxacin	7(70)	3(75)	0(0.0)	21(75.0)	10(83.3)	41(69.5)	18(30.5)
Levofloxacin	7(70)	4(100)	5(0.0)	16(57.1)	11(91.7)	43(72.8)	16(27.2)
Gentamicin	3(33.3)	3(75)	5(100)	6(21.5)	9(75.0)	26(44.1)	33(55.9)
Amikacin	6(60)	3(75)	5(100)	8(28.5)	7(58.3)	29(49.1)	18(50.9)
Cephalexin	10(100)	NT	NT	NT	12(100)	22(37.3)	37(62.7)
`Ceftriaxone	4(40.0)	3(75)	NT	16(57.1)	12(100)	35(59.3)	24(40.7)
Ceftazidime	NT	NT	NT	NT	12(100)	12(20.3)	47(79.7)
Cefotaxime	3(30)	2(50.0)	NT	NT	12(100)	17(28.8)	42(71.2)
Cloxacillin	NT	NT	NT	NT	NT	-	-
Erythromycin	NT	NT	NT	NT	NT	-	-
Meropenem	6(60)	3(75)	5(100)	20(71.4)	12(100)	46(77.9)	13(22.1)
Piperacillin+Tazobactam	6(60)	4(100)	5(100)	24(85.7)	12(100)	51(86.5)	8(13.5)
Polymixin B	10(100)	4(100)	5(100)	28(100)	12(100)	59(100)	0(0.0)
Colisitin sulphate	10(100)	4(100)	5(100)	28(100)	12(100)	59(100)	0(0.0)
Vancomycin	NT	NT	NT	NT	12(100)	12(20.3)	47(79.7)
Chloramphenicol	2(20)	0(0.0)	5(100)	16(57.1)	12(100)	35(59.3)	24(40.7)
Total	10	4	5	28	12	59	

Table 6: Total number of antibiotics per encounter.

No of Drugs used	No of encounters	Percentage (%)
1	7	6.7
2	29	27.6
3	35	33.4
4	22	20.9
5	9	8.6
6	1	0.9
7	2	1.9
Total	105	100

During the treatment the inappropriate activity of empirical antibiotic therapy can lead to high level of mortality and use of correct empirical antimicrobial therapy for serious infection can lead to decrease in mortality rate, shorter duration of hospitalization and lower health cost.[26]

CONCLUSION

The study shows that the disease affects all age groups but it is more noticeable in neonates than in other age groups patients. Sepsis is more common in male than in female. It has been observed that gram-negative bacteria isolations are more than gram-positive bacteria isolations. The most common source of infection for septic patients was found to be pneumonia followed by urinary tract infection and intra-abdominal infection. Coagulase negative *Staphyloccus aureus, Enterococcus faecalis* and *Staphyloccus aureus* were the isolated gram-positive bacterial pathogen causing sepsis whereas *Acinetobacter sp, Citrobacter sp, Escherichia coli, Klebsiellae pneumoniae, Pseudomonas aeruginosa* were isolated gram-negative organism. Gram-negative bacteria were predominant causative agent and individually the most commonly isolated pathogens were Coagulase negative *Staphyloccus aureus* (28.6%) and *Klebsiella pneumoniae* (26.7%). The isolated gram-negative organisms were mostly sensitive to Ciprofloxacin, Levofloxacin, Piperacillin +Tazobactam, Meropenem. Similarly, antibiotics like Polymixin B and Colisitin sulphate showed 100% sensitivity towards all isolated gram-negative pathogens. Antibiotics with good sensitivity towards the isolated gram-positive organism were Amikacin, Gentamicin, and Ciprofloxacin. Aminoglycosides whereas Penicillin, Ampicillin, quinolones drugs used as empirical therapy were the most common antibiotic in our study. The average number of antibiotics per encounter in septic patients was 3.07. The antibiotic sensitivity test of different isolated pathogens from the study provides insight for the selection of appropriate drug therapy to control sepsis. Thus, sepsis is a life threatening emergency condition and its rapid treatment with antibiotics empirically as well as after culture is essential.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

AST: Antibiotic Susceptibility Test; **CLSI:** Clinical and Laboratory Standards Institute; **CoNS:** Coagulase negative *Staphylococcus aureus*; **ICU:** Intensive Care Unit; **TUTH:** Tribhuvan University Teaching Hospital; **UTI:** Urinary Tract Infection

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Table 7: Antimicrobial drugs used empirically and after culture.

Source of infection													
	Pneumonia (N)		UTI (N)		Intra-abdominal infection(N)		Meningitis (N)		Unknown (N)		Wound infection (N)		Total (N=E+A)
Antimicrobial drugs	E	A	E	A	E	A	E	A	E	A	E	A	
Amikacin	12	25	2	5	5	11	2	3	-	2	-	-	67
Ciprofloxacin	6	11	1	1	11	10	4	1	1	-	-	-	46
Piperacillin+Tazobactam	2	20	1	9	2	5			-	-	-	-	39
Vancomycin	2	9	-	4	2	5	-	-	-	1	-	-	23
Ceftriaxone	3	12	5	6	-	9	5	7	-	-	-	1	48
Cefixime	-	2	-	2	-	-	-	-	-	-	-	-	4
Cefazolin	-	-	-	1	-	-	-	-	-	-	-	-	1
Cefotaxime	2	3	1	-	-	1	-	-	-	-	-	-	7
Azithromycin	-	2	-	-	-	-	-	-	-	-	-	-	2
cloxacillin	-	2	-	-	-	-	-	-	-	-	-	-	2
Meropenem	-	3	5	8	3	2	-	-	-	-	-	-	21
Polymixin B	-	9	-	4	-	-	-	-	-	-	-	-	13
Colisitin sulphate	-	7	-	-	-	1	-	-	-	-	-	-	8
Ampicillin	5	2	-	1	-	-	-	-	-	-	-	-	8
Chloramphenicol	-	1	-	-	-	-	-	-	-	-	-	-	1

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