Original article

Incidence of Bacteremia and Septicemia in patients attending in tertiary care center, Nepal

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Abstract

Introduction: Bacteremia and septicemia is life threatening condition resulting in major cause of mortality and morbidity.The aim of study was to determine the etiology of bacteremia and septicemia with antibiotic sensitivity profile of those organisms.

Methods: A prospective study was carried out among the suspected cases from both inpatient and outpatient of TUTH from October 2009 –March 2010. Blood samples were collected and processed according to standard methodology.

Results: Out of 2259 samples only 237 (10.49 %) showed bacterial growth. The most common isolates among Salmonella group was Salmonella enterica serotype typhi 71(29.95%) followed by Salmonella enterica serotype Paratyphi A 45(18.98%). Among non Salmonella group Pseudomonas aeruginosa 34(14.34%), Klebsiella pneumoniae 22(9.28%), Acinetobacter spp 15 (6.32%), Citrobacter spp 5(2.10%), Escherichia coli 3(1.26%) while Staphylococcus aureus 34 (14.3%) was most common followed by Enterococcus spp 3(1.26%), Streptococcus spp 2(0.84%), Coagulase Negative Staphylococcus 2(0.84%) and Listeria spp 1(0.42%) among Gram Positive organisms. Antibiogram revealed Cefotaxime, Ceftazidime, Azithromycin and Chloramphenicol for Salmonella group while for non Salmonella Imipenem, Meropenem and Amikacin as most effective antibiotics while Clindamycin, Ciprofloxacin and Ofloxacin for gram positive.

Conclusion: Gram negative bacteria was the predominant organism causing bacteremia and septicemia. Among them salmonella typhi and salmonella paratyphi were the leading aetiology.

Keywords: Bacteremia, Septicemia,

Introduction

Continuous or transient presence of microorganism within the blood stream is Bacteremia. While its dissemination throughout the body with evidence of systemic responses towards microorganism with variable severity is Septicemia. Though the term Bacteremia and Septicemia are interchangeably being used. Whatever may be the definition of Bacteremia and Septicemia both are always threat to every organ of the body and even affecting the function of the implanted foreign bodies like heart valve, joints, shunts etc[1].

Bloodstream infection are an important cause of serious morbidity and leading cause of mortality and among the most common healthcare associated infection[2,3].Study in United States shows it as 10th leading cause of death[4].They are associated with the syndrome requiring admission to intensive care unit such as sepsis and septic shock[5-7] .They are not only considered as leading cause of death also

causing disability ,worsening of quality of life especially for millions of people in developing countries [8-10] .Study carried out in United States shows mortality rates as 14 days mortality averaged 26%,28days mortality 42% [11] . It has impact on economy of nation as well again study in US, shows during management of Bacteraemia & Septicaemia they found expense of cost around US$16 billion per year [11].

Culturing the blood sample to reveal the presence of microorganism is a highly specific indicator of bloodstream infection and the results of antimicrobial susceptibility testing may assist in the choice of appropriate antimicrobial therapy for such patient. Furthermore early and rapid administration of antimicrobial therapy to such patient shown to reduce mortality and morbidity [12, 13]. Nowadays bacterial drug resistance is an important problem and due to wide variation in bacteria drug resistance study and report in one region or in a period of time necessarily not true for other region or period of time [14] .The resistance pattern are related with series of social, environmental and technological changes [15] .

The surveillance of bloodstream pathogen in a hospital is important in monitoring the spectrum of microorganism that invade the bloodstream and the type of organism associated with a particular clinical discipline .Such data is often used to determine empiric antibiotic therapy and also to alert clinician the emerging pathogen that may be threat to the community.

Methods

Prospective type of study was done in Bacteriology Laboratory of TUTH, from October 2009-March 2010. All the suspected cases of bacteremia and septicemia from both outpatient and inpatient were included. Of total 2259 blood and bone marrow samples were processed. During processing 5ml of blood was mixed with 45ml brain heart infusion broth for adult and 1ml blood with 9ml infusion for children. After 24 hours blind subculture was done then subsequent subculture was done after viewing turbidity. The broths were kept till 7 days then discarded after blind subculture.

Antibiotic susceptibility testing[16]

Antibiotic susceptibility testing was done using Muller Hinton Agar (MHA) by standard disk diffusion technique of Kirby-Bauer method as recommended by CLSI (Clinical Laboratory Standards Institute). Antibiotic tested were Amoxicillin, Azithromycin, Amikacin, Ampicillin+Sulbactum, Amoxicillin+Clavulunic Acid, Co-timoxazole, Chloramphenical, Ciprofloxacin, Cefotaxime, Ceftazidime, Clindamycin Erythromycin Gentamycin, Imipenem, Meropenem, Ofloxacin Piperacillin, Vancomycin.

Results

A total of 2259 specimens from blood and bone marrow were received in the Microbiology Laboratory for culture and sensitivity from October 2009 to March 2010.

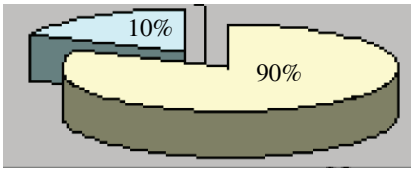

Fig. 1: Pattern of growth in blood and bone marrow (n=2259)

Fig.1 shows that only 10% of blood and bone marrow specimens showed significant bacterial growth.

Table 1 shows that Salmonella enterica serotype Typhi (36.41%) was the most predominant organism followed by Salmonella enterica serotype Paratyphi A (23.07%), Pseudomonas aeruginosa (17.43%), Staphylococcus aureus (17.43%).

Table 1: Distribution of bacterial isolates (n=237)

Name of organisms	Number	(Percent)
Salmonella enterica serotype Typhi	71	(29.95%)
Salmonella enterica serotype Paratyphi A	45	(18.98%)
Pseudomonas aeruginosa	34	(14.34%)
Staphylococcus aureus	34	(14.34%)
Klebsiella peumoniae	22	(9.28%)
Acinetobacter spp	15	(6.3%)
Citrobacter freundii	5	(2.1%)
Enterococcus spp	3	(1.26%)
Eschrichia coli	3	(1.26%)
Streptococcus spp	2	(0.84%)
Cogulase Negative Staphylococcus spp	2	(0.84%)
Listeria spp	1	(0.42%)

Table 2 shows distribution of Gram negative and Gram positive bacterial isolates. Gram negative (82%) bacteria were significantly predominant than Gram positive (18%) with P value >0.01%.

Table 2: Comparison of Gram negative and Gram positive bacterial isolates

Gram negative bacterial isolates	N (%)	Gram positive bacterial isolates	N (%)
Salmonella enterica serotype Typhi	71 (29.95%)	Staphylococcus aureus	34(14.34%)
Salmonella enterica serotype Paratyphi A	45 (18.98%)	Enterococcus spp	03(1.26%)
Pseudomonas aeruginosa	34 (14.34%)	Streptococcus spp	02(0.84%)
Klebsiella pneumoniae	22 (9.28%)	Coagulase negative Staphylococcus	02(0.84%)
Acinetobacter spp	15 (6.3%)	Listeria spp	01 (0.42%)
Citrobacter freundii	05 (2.1%)		
Escherichia coli	03 (1.26%)		
Total number of Gram negative isolates	195 (82%)	Total number of Gram positive isolates	42 (18%)

Table 3 shows sensitivity pattern of Salmonella enterica serotype Typhi, majority of Salmonella typhi showed susceptibility towards Azithromycin(100%), Cefotaxime (100%) and Ofloxacin (100%) followed by Ciprofloxacin (97%) and Chloramphencal (92%). Amoxicillin (83%) found out to be least sensitive.

Table 3: Sensitivity pattern of Salmonella enterica serotype Typhi (n=71)

Antibiotics	Sensitive%
Amoxicillin	83%
Azithromycin	100%
Co-trimoxazole	90%
Chloramphenical	92%
Cefotaxime	100%
Ciprofloxacin	97%
Nalidixic Acid	21%
Ofloxacin	100%

Table 4 shows the sensitivity pattern of Salmonella enterica Paratyphi A, the majority of Salmonella typhi isolates showed susceptibility towards Azithromycin (100%), Cefotaxime (100%) and Ofloxacin (100%) followed by Chloramphenical (98%) and Co trimoxazole (98%). Amoxicillin (74%) found out to be least sensitive among the tested antibiotic.

Table 4: Sensitivity pattern of Salmonella enterica serotype Paratyphi A (n=45)

Antibiotics	Sensitive%
Amoxicillin	74%
Azithromycin	100%
Co-tromoxazole	98%
Chloramphenical	98%
Cefotaxime	100%
Ciprofloxacin	89%
Nalidixic Acid	13%
Ofloxacin	100%

Table 5 shows the sensitivity pattern of the Pseudomonas aeruginosa, majority of the isolates showed susceptibility towards Imipenem (97%), Meropenem (97%), Amikacin (94%) and Piperacillin(94%) followed by Chloramphenical (91%) and Cefipme (80%). Ceftazidime (76%) and Ciprofloxacin (59%) found out to be least sensitive.

Table 5: Sensitivity pattern of Pseudomonas aeruginosa (n=34)

Antibiotics	Sensitive%
Amikacin	94%
Ceftazidime	76%
Ciprofloxacin	59%
Chloramphenical	91%
Cefipime	80%
Imipenem	97%
Meropenem	97%
Ofloxacin	59%
Piperacillin	94%

Table 6 shows sensitivity pattern of Klebsiella pneumonia, majority of the isolates showed sensitivity towards Imipenem (91%), Meropenem(91%) followed by Amikacin (64%). Ceftazidime (18%) and Ciprofloxacin (14%) were found to be least sensitive.

Table 6: Sensitivity pattern of Klebsiella pneumoniae(n=22)

Antibiotics	Sensitive %
Amikacin	64%
Co-trimoxazole	14%
Ceftazidime	18%
Ciprofloxacin	14%
Chloramphenical	18%
Imipenem	91%
Meropenem	91%
Ofloxacin	27%

Table 7.shows sensitivity pattern of Staphylococcus aureus, majority of the isolates showed sensitivity towards Amikacin (100%), Clindamycin (100%) and Cefotaxime (100%) followed by Ciprofloxacin (97%), Vancomycin (94%) and Co trimoxazole (82%). Amoxicillin (62%) and Amoxicillin +Clavulonic acid (65%) had least sensitivity.

Table 7: Sensitivity pattern of Staphylococcus aureus (n=34)

Antibiotics	Sensitive%
Amoxicillin	62%
Amoxicillin+Clavulonic Acid	65%
Amikacin	100%
Co-trimoxazole	82%
Ciprofloxacin	97%
Clindamycin	100%
Cefoxitin	88%
Cefotaxime	100%
Erythromycin	79%
Vancomycin	94%

Table 8. shows sensitivity pattern of Acinetobacter spp, majority of the isolates showed sensitivity towards Co trimoxazole (100%), Chloramphenical (100%) followed by Amikacin (93%), Imipenem (93%) and Meropenem (93%). Amoxicillin (73%) showed least activity.

Table 8: Sensitivity pattern of Acinetobacter spp (n=15)

Antibiotics	Sensitive %
Amoxicillin	73%
Amikacin	93%
Ampicillin+Sulbactum	80%
Co-trimoxazole	100%
Chloramphenical	100%
Ciprofloxacin	80%
Cefotaxime	87%
Imipenem	93%
Meropenem	93%

Discussions

In this study out of 2259 processed samples only 237 (10%) of showed growth. This result was quite similar with the previous study done by Banjara[19] in the same laboratory in1999 with the positivity of 15 percent. But it was lower than the study result of Kathmandu model hospital by Amatya et al[2] in 2005 who recovered 23% of growth positive, similarly study done by Karki et al[21] at Kanti Hospital in 2007- 2008 recovered 4.2% of growth positive.

In this study, Gram negative bacteria constituted the major group of isolates comprising 82 percent. This was similar with the results reported by Mehdinejad et al [22]as 86.5% and by Mehta et.al[23] as 80.96%.

According to the present study, S.enterica serotype Typhi found out to be major cause of bacteraemia and

septicaemia, which accounted for 30% of all isolates. This had a similarity with the previous study in this Hospital in 1999 by Banjara[19] who reported 38.5 percent.

Present study demonstrated that 100% of isolates were sensitive to Ofloxacin and Azithromycin with the least activity for Amoxicillin of 83 percent.

Present Study showed Salmonella enterica serotype Paratyphi A contributed second major cause of bacteraemia & septicaemia in this particular Hospital and accounted 19% of all isolates. This result was higher than previous study done in 1999 by Banjara[19], who reported as 11.4percent. But it was lower than study in Model Hospital by Amatya et al2/ 35.8 percent.

Present study showed Staphylococcus aureus as 14.3% of all isolates. This result had similarity with study by Mehta et al[23] who reported 13.86% of isolates of S. aureus. But it was lower than previous study by Banjara[19], who reported only 42.1% in 1999 from same Hospital.

In this study, 100% of Staphylococcus aureus were sensitivity to Clindamycin and Cefotaxime, 97% of isolates were sensitive to Ciprofloxacin& Ofloxacin with the least sensitivity of 62 percent against Ampicillin.

The present study revealed 9.28% of total isolates as Klebsiella pneumoniae This results was in accordance to SENTRY [34] surveillance reported 7.3% from US & Canada in 1999. In this study, none of the antibiotics were found to be 100% sensitive among the isolates of K.pneumoniae. 91% of K. pneumoniae were sensitivity to Imipenem & Meropenem followed by 64% of isolates were sensitive to Amikacin and least sensitivity to Cephlosporine group of antibiotics like Cefotaxime Cefipime & Ceftazidime ranging from 14 to 27 percent.

Acinetobacter spp have been implicated in recent years as important nosocomial pathogen, especially in intensive care setting. Despite their low pathogenic potential they are being reported increasingly as the causal organism of numerous hospitals outbreaks in several countries. In a recent international multicenter study, Acinetobacter spp were ranked amongst 10 organisms most commonly causing septicaemia in 18 of 44 large European hospitals36. Therefore, this study was not the exception and showed 6.32% growth for Acinetobacter spp

Conclusion

From this study, it becomes clear that Gram negative bacteria were the main causative organisms for the bacteremia and septicemia. Among them Salmonella Typhi were the leading cause followed by Salmonella Paratyphi A. Sensitivity pattern is constantly changing even in same set up and even geographical & ethnical variation undoughtably showed change in pattern of sensitivity. Therefore, it emphasized on the need for such type of study at regular interval.

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