Original Article

Medicine

Sensitivity Pattern of Causative Microorganisms in Septicemia

1. Babar Bashir 2. Akhtar Ali Baloch 3. Piyar Ali Fazel 4. Munir Hussain Siddiqui 5. Jawad-us-Salam 6. Uzma Majid 7. Muhammad Masroor 8. Syed Mohsin Turab

1. Asstt. Prof. 2. Assoc. Prof. 3. Asstt. Prof. 4. Asstt. Prof. Dept. of Medicine, DIMC, DUHS, Karachi 5. Asstt. Prof. of Neurology, DIMC, DUHS, Karachi 6. Asstt. Prof. of Medicine, DIMC, DUHS, Karachi 7. Prof. of Medicine, DIMC, DUHS, Karachi 8. Assoc. Prof. of Pharmacology & Therapeutics, HCM&D, Hamdard University, Karachi

ABSTRACT

Objective: The study was conducted to find out the various etiological organisms in septicemia and their sensitivity to different antimicrobial drugs.

Study Design: Observational study

Place and Duration of Study: This study was conducted in Medical units of Civil Hospital Karachi from January 2010 to December 2010.

Materials and Methods: A total of 90 patients between the ages of 15 years to 80 years, irrespective of gender with septicemia were included in this study.

Results: Total number of patients was 90. There were 47 (52%) male and 43 (48%) were female. Staphylococcus aureus and Salmonella Typhi were the most common organisms isolates in 26% cases. Regarding the sensitivity pattern of bacteria to different antimicrobial drugs, the results showed that Staph. Aureus had good sensitivity to Augmentin, lmipenem & Tazobactum and marked resistance to Ciprofloxacin. No MRSA was isolated in the study. Salmonella Typhi showed good sensitivity to Quinolones and Ceftriaxone and marked resistance to Chloramphenicol, Co-trimaxazole and amoxicillin (Table 4). Klebsiella showed good sensitivity to Amikacin, Ceftriaxone, Imepenem and marked resistance to Ampicillin and Carbencillin, Pseudomonas aeuroginosa had good sensitivity to Tazobactum, Amikacin & Ceftriaxone.

Conclusion: Septicemia is a major cause of death worldwide and the random use of antibiotics has considerably increased the resistance to commonly used antibiotics. Blood culture should be sent immediately to know the spectrum of microorganisms, and their sensitivity pattern, however this may not delay the empirical use of antibiotics to hasten recovery.

Key Words: Septicemia, Blood culture, staphylococcus aureus.

INTRODUCTION

Illness arising from blood born infections is called as septicemia[1]. Septicemia usually causes severe systemic symptoms including high fever, rigors, hypotension, myalgia and headache. Septicemia haw different clinical stages[2] (Table no:1) Patients presenting with symptoms and signs suggesting septicemia should be examined carefully for evidence of source of infection. Because of the potential severity of septicemia, treatment with antibiotics should be started empirically as soon as samples of blood cultures have been taken [3, 4]. In 2003 critical care and infections disease experts representing 11 international organizations developed management guidelines for severe sepsis and septic shock entitled the "Surviving sepsis campaign" [5]. Septicemia is the leading cause of death in developed as well as in developing countries[6]. Death rate from septicemia increased from 0.3 deaths/ 100,000 persons in 1950 to 4.2/ 100,000 people in 1997(5). Sepsis is the leading cause of death in United State. The mortality for patients with sepsis is 15% and pathogens are bacteria more often than fungi and viruses[7]. The death rate is even higher in developing countries due to over population, malnutrition, poor sanitation, and poor hygienic conditions in hospitals. Causative organisms are varied with respect to geographical distribution[6]. Almost all bacteria and fungi can cause septicemia. There have been many studies which investigated microbial cause of septicemia in different population in different parts of the world carried out in medical departments, of tertiary care hospitals.

MATERIALS AND METHODS

This study was conducted at DUHS from January 2010 to December 2010. Ninety (90) patients of either sex admitted in medical wards. The study design remained descriptive. The selection of patients was made with typical clinical features suggestive of septicemia from age 15 to 90 years. Patients who are already on antibiotics, pregnant patients & lactating mothers were excluded from study. Blood samples collected from peripheral veins after aseptic measure. Subcultures were made from respective broths after 24, 48 and 72 hours on blood agar and Mac Conky's agar

where colonies developed in plates. Colonies were processed for gram staining and biochemical tests for identification of individual organisms.

Antimicrobial susceptibility testing: Approximately 4-5 similar looking colonies were picked up and inoculated on Muller Hinton agar. Sensitivity discs were placed on the inoculated Muller Hinton plate and incubated at 37°C for 24 hours. Zone of inhibition of growth around the discs were measured and interpreted as sensitive (> 18mm zone diameter) intermediate (13-17mm zone diameter) and resistant (< 13mm diameter).

RESULTS

Total no. of patients were 90.There were 47 (52%) male and 43 (48%) were female. Staphylococcus aureus and Salmonella Typhi were the most common organisms isolates in 27 patients respectively .Regarding the sensitivity pattern of bacteria to different antimicrobial drugs, the results showed that Staph.

Table No.1:Five stages of sepsis

Stage 1	The infectious insult
Stage 2	Preliminary systemic response
Stage 3	Overwhelming systemic
Stage 4	The compensatory anti-
Stage 5	Immunomodulatory failure

Aureus had good sensitivity to Augmentin, lmipenem & Tazobactum and marked resistance to Ciprofloxacin. No MRSA was isolated in the study. Salmonella Typhi showed good sensitivity to Quinolones and Ceftriaxone and marked resistance to Chloramphenicol, Co-trimaxazole and amoxicillin. Klebsiella showed good sensitivity to Amikacin, Ceftriaxone, Imepenem and marked resistance to Ampicillin and Carbencillin. Pseudomonas aeuroginosa had good sensitivity to Tazobactum, Amikacin & Ceftriaxone. The sensitivity of Staph. Epidermidis was found to be good with Augmentin, Ceftriaxone. E. coli again showed good sensitivity to lmipenem and Tazobactum and resistance to Amikacin, Cephradine, Ceftriaxone, Cefuroxime and Quinolones. Serratia showed good sensitivity to Ceftriaxone. Salmonella paratyphi showed good sensitivity to Amoxicillin, Ceftriaxone, and Quinolones. Streptococci pneumonie showed good sensitivity to Ceftriaxone, Fluroquinolones and resistance to Macrolides, Trimethoprim- sulfamthaxozole and Chloramphenicol.

Table No.2: Age Distribution

Age Group	No. of Patients
15-20	3
21-30	6
31-40	10
41-50	12
51-60	21
61-70	19
71-80	15
81-90	4
Total	90

Table No: 3 Bacterial Distribution (total n= 90)

S. No	Name of organism	No.of patients
1	Staph.auerus	27
2	Salmonella Typhi	27
3	Klebsiella	11
4	Pseudomonas	10
5	E. Coli	8
6	Strep. Pneumonia	3
7	Strep. Epidemidis	2
8	Salmonella paratyphi	1
9	Serratia	1

Table No.4:

Drugs	Staph. Auerus	Salmonela typhi	Kleb-silla Kle.b Si e 00	Pseu-domonas	Staph. Epidermidis$_i$	E. Coil	Serratia	Salmonella paratyphiaa faratyphi	Strep: pneumo nieeeee
Augmentin	S	-	-		S	-			-
Amoxycillin	..	-	-		.	-		S	-
Cephradine	-		-	_	R	R		-	-
Cefuroxime	S		-		R	R	-	-	-
Ceftriaxone	S	S	S	S	S	R	S	S	S
Amikaycin	S	R	S	S	-	R		-	-
Gentamycin	_		R					,	-
Ciprofloxacin	R	S	_	-	-	R	-	S	-
Chloramphenicol	-	R	_	-	-	-	-		R
Co-trimoxazole	-	R	_	-	-		-	-	
Lmipenem	S	-			-	S			
Tazobactam	S			S		S			
Fluroquinolones									S

S = Sensitive R= Resistant

DISCUSSION

Septicemia is the major cause of death in under-developed countries. In Pakistan it is also a major health problem, mainly due to over population, malnutrition, poor sanitation and poor hygienic conditions in our hospitals. The etiology of septicemia differs from one
geographic area to another[2]. This study showed the big chunk of patients were ranging
from 50 to 80years of age where as the study conducted by MC Bean M' also showed elderly patients mainly invovled[8].Regarding the type of micro-organisms,gram negative organisms .in our study on higher side (Table 3) results are near to a study done by Zafar A[9]. Salmonella showed the highest yield in 27patiens which is quite compatible with the study of lzhar Z[10]. These results reflect the poor sanitation in our setup. However the incidence of Salmonella Typhi is quite in low western societies due to improved hygienic conditions. The rise in the patients of water born diseases is due to use of contaminated water, unhygeinic food. Out of total population only 53% people have access to safe water[11].Staphylococcus aureus was the another major micro-orgainsm found in our study in 27 patiens compared with the study done by Burnie J [12,13]. Klebsiella was third most common organism isolated in 11 patients . The study conducted by Pena C[14] showed the incidence of Klebsiella bacterium was 18% in patients in intensive care units.The other organisms found in our study were Pseudomonas aeuroginosa10 patients, E.coli 7 patients, strptococcus pneumonie in 4 patients, streptococcus epidermidis2, Salmonella paratyphi and Serratia in patients respectively(8)

Regarding the sensitivity pattern, Staph. aureus showed good sensitivity to Augmentin, lmipenem and Tazobactum and marked resistance to Ciprofloxacin, resistance of Staph. aureus to Quinolones in Methicillin sensitive and Methicillin resistant strains and has become major epidemiologic problem [15,16]. In our study Salmonella Typhi showed good sensitivity to Quinolones and Ceftriaxone & marked resistance to Chloramphenicol, co-triamaxazole and amoxicillin. This pattern of sensitivity is fairly compatible to the study done by Parry etal[17], in which salmonella Typhi were found resistant mainly to Co-triamaxazole, Chloramphenicol and amoxicillin but highly sensitive to third generation cephalosporin and Quinolones. In our study klebsiella showed good sensitivity to Amikacin, ceftriaxone, imepenem and resitance to Ampicillin and Carbencillin[18].

In our study Pseudomonas showed good sensitivity to Tazobactum, Amikacin Gentamicin, Ceftazidime and Imipenem, while a study byPizzo PA [19]stated that Ceftazidime was used successfully as initial therapy. Staph. Epidermidis showed sensitivity to Augmentin and Cefuroxime. In a study conducted by Kotilainen P [20] showed that antibiotics to which most staph. Aureus were susceptible in-vitro were useful for Staph. Epidermidis i.e Vancomycin, Rifampicin and Ciprofloxacin. In the study E.Coli was quite sensitive to Imipenem and Tazobactum and resistant to Gentamicin, Ceftriaxone and Quinolones[18]. In other study by Young LS [21] showed that third generation Cephalosporins, Imipenem and Aztroenam had marked augmented activity against E. Coil. Serratia showed good sensitivity to ciprofloxacin and Tazobactum and resistance to Amikacin and Ceftriaxone in this study. Streptococcus pneumonie showed good sensitivity to Ceftriaxone, Fluroquinolones and resistance to Macrolides, Chloramphenicol and Trimehtoprim-sulfamethaxozole in our study which quite compatible with the studies by Mandell LA et al [22] and Tleyjeh IM et al [23]

CONCLUSION

Since septicemia is a major cause of death worldwide especially in underdeveloped countries so this condition must be recognized and treated immediately. Random use of antibiotics has considerably increased the resistance of commonly used antibiotics. Empirical use of antibiotics with knowledge of appropriate organisms seems to be appropriate to hasten the recovery. However, culture of blood & appropriate specimens soon be sent to know the exact spectrum of organisms and their relative sensitivity.

REFERENCES

1. Munford RS. Septicemia and Septic shock. In: Faucy SA, Baund. Wald E, Kasper DL, Hanser SL, Longo DL, Jameson JL, editors. Harrison's Principals of Internal medicine, 15th ed. New York: McGraw Hill; 2001.p.799.
2. Zgliniec S, Balk RA. Severe sepsis and septic shock. Rakland Bope. Connscurrent therapy 2006.
3. Gullo A, Bianco N, Berlot G. Management of septic shock. Challenges and outcomes. Crit Care Care 2006; 22:489-501.
4. Paolucci M, Lamdini MP, Sambri V. Conventional & molecular techniques for the early diagnosis of bacteremia. Int J Antimicrob Agents 2010;36:6-16.
5. Dellinger RP, Carlet JM, Masur H, et al. Surviving sepsis campaign Guidelines for management of severe sepsis and septic shock. Critical care Med 2004; 32(3).858-873.
6. Lever A, Mackenzie I. Sepsis definition, epidemiology & diagnosis. BMJ 2007; 335: 879-883.
7. M Hotchkiss RS, Karl IE. The pathophysiology and treatment of sepsis. N Engl J Med 2003;348: 138-150.

8. McBean M, Rajamani S. Increasing rate of Hospitalizations due to septicemia in the US elderly population 1986-1997. J Infectious Disease 2001;183:596-603.
9. Zafar A. Therapy of Septicemia. Infect Disease of Pakistan 1997;4(3):23-4.
10. lzhar Z, Abdullah M, Haseeb O, Abass J, Ahmed A, Hamid. Salmonellosis among Karachities. A local experience spectrum 1998; 19 (3):60-1.
11. Sheikh MR, Azhar S, Sheikh D. Portability of water obtained through boring in Karachi. JPMA 1994; 44 (12):286-2.
12. Persistent Staphylococcus bacteremia, an analysis of risk factors & outcomes. Arch Intern Med 2007;167(17):1861-7.
13. Burnie J, Mathews R, Jiman Fatami A, Gottardello P, Hodgetts S, D'arey S. Analysis of 42 cases of septicemia caused by an epidemic stain of methicillin-resistant staphylococcus aureus: Evidence of resistance to vancomycin. Clin Infect Dis 2000;31(3):684-9.
14. Pena C, Pnjol M, Ardanery C, Ricar A, Pallases R, Linares J, et al. An outbreak of hospital acquired Klebsiella Pneumonia bacteremia, including strains producing extended spectrum beta-lactamase. J Hops Infect 2001;47(1): 53-9.
15. Backowski E, Wey SB, Servolo EA. Risk factors for Bacteremia & predictors of mortality of patients with blood stream infection with methicillin resistant staphylococcus aureus. Am J Infect Dis 2008; 4: 262-66.
16. Cosgrove SE, et al. Management of methicillin resistant staph: aureus bacteremia. Clin Infect Dis 2008; 46 Suppl 5:386-93.
17. Parry M, et al. A randomazed controlled comparison of levofloaxacin, azithromycin & oflaxacin- azithromycon combination for treatment of multidrug resistance & nalidixic acid resistance typhoid fever. Antimicrob Agents chemother 2007;51(3): 819-25.
18. Almas AS, Pillai KS, Kapur P, Pillai KK. Resistant pattern of bactremia isolated from blood stream infections at University hospital Delhi. J Pharm Bioall Sci 2011;3:525-30.
19. Pizzo PA, Hathorn JW, Heimenz J. A randomized trial comparing ceflazidime alone, with combination antibiotic therapy in cancer patients with fever and neutropenia. N Engl J Med 1986; 315: 552-8.
20. Kotilainen D, Nikoskclaien J, Huovinen P. Emergence of Ciprofloxacin resistant coagulate negative staphylococcal skin in immune-compramised patients receiving Ciprofloxacin.1 Infect Dis 1990;161:41-4.
21. Young LS. Sepsis Syndrome Principles and practice of infectious diseases. 5th ed. New York: Cherchill Livingstone; 2000.p.814.
22. Mandell A, et al. Infectious disease society of America/ American thoracic society consensus guidelines on the management of community acquired pneumonia in adults. Clin Infect Dis 2007;44(suppl 2): 27-72.
23. Tleyjeh IM, et al. The impact of penicillin reisstance in short term mortality in hospitalized adults with pneumococcus pneumonia: a systemic review & meta analysis. Clin Inf Dis 2006; 42(6):88-97.

Address for Corresponding Author:
Dr. Babar Bashir
Assistant Professor of Medicine,
Dow International Medical College,
Dow University of Health Sciences, Karachi.