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Bacterial Isolates Causing Septicemia and Their Antibiotic Susceptibility Pattern in a Tertiary Care Hospital.

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ABSTRACT

Blood stream infection is one of the major causes of mortality and morbidity worldwide. The aim of our study is to identify the bacterial organism causing septicemia and to analyse its antimicrobial susceptibility pattern in a tertiary care hospital. The study was conducted during April 2014 to Dec 2014 in a tertiary care hospital. 130 patients suspected to have septicemia were included in the study. Blood samples were collected from them and cultured in Microbiology laboratory. Isolates were identified using standard micorbiological methods and antibiotic susceptibility testing was perform using Kirby Bauer method. Out of 130 blood samples, 62(47.6%) showed growth, of which 35(56.4%) were Gram positive organisms and 27 (43.5%) were Gram negative organisms. Staphylococcus aureus 19(30.6%), Coagulase negative staphylococcus 16(25.8%) followed by Escherichia coli 9(14.5%) were the most common organisms isolated in the present study. Staphylococcus aureus was found to be highly susceptible to Vancomycin(100%) and Linezolid(100%). Escherichia coli was highly susceptible to Amikacin (88.8%), Imipenem(77.7%) and Cefipime(77.7%). Piperacillin+tazobactam showed good susceptibility pattern for both Gram positive and Gram negative organisms. Staphylococcus aureus and Escherichia coli were the most common organisms isolated from the blood cultures of the patients with septicemia. Appropriate drug therapy after antibiotic susceptibility testing may help in proper management of the septicemia cases and also to prevent or reduce the emergence of resistant organisms.

Keywords: septicemia, antibiotic, bacterial infection.

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INTRODUCTION

Septicemia is one of the major causes of mortality and morbidity in patients attending tertiary care hospitals. Therefore knowing the causative agents of the blood stream infections is necessary for prevention and treatment. Blood stream infections arise from infections of various sites of the body such as Intravenous lines, skin, lungs, abdomen, urinary tract, etc [1].

According to CDC (centers for Disease control)[1], a patient presenting with fever (temperature >38^{o} c) which is not connected with any other causes and whose blood culture are positive for a bacteria are considered to have septicemia. If signs and symptoms appear after 48 hours following hospital admission, the patients are considered to have hospital acquired septicemia. If the first blood culture which is obtained before or within 48 hours of hospitalization is positive, it is defined as community acquired bacteremia (CAB).

Individuals with bacteremia may develop septicemia, in which multiplying bacteria release toxins into bloodstream causing fever, chills, malaise with difficulty in breathing [2,3]. The circulating microorganism may lead to life threatening conditions like multiple organ failure, shock, DIC and Death. The common primary causes of septicemia in patients admitted in ICU are meningitis, Nosocomial Pneumonia, Infective Endocarditis and Uro-sepsis. Secondary infection can occur due to reasons like Urinary catheter insertion related sepsis, surgical sites infection like Intra-abdominal abscesses or necrotic gut in patient who had abdominal surgery, vascular catheter Insertion and infection arising out of hospital acquired or ventilator associated pneumonia [4]. The most common bacteria isolated from patients are Gram positive bacteria (*Staphylococcus aureus*, *Coagulase negative Staphylococcus*) and Gram negative bacteria (*Enterobacteriaceae, Pseudomonas aeruginosa*). The blood cultures are very useful method for diagnosing several important bacterial infection [5,6]. In common practice, antimicrobial therapy is initiated in almost all cases who have symptoms resembling bacteremia empirically with broad-spectrum of antibiotics prior to blood culture result are available [7].

The present study was undertaken in our institution to evaluate the prevalence of septicaemia in our hospital setup in relation to their source of infection and to analyse the antibiotic susceptibility pattern of the organisms isolated. This may be helpful for clinicians to give appropriate treatment or to initiate an empirical therapy for patients until the blood culture/sensitivity results are known.

MATERIAL AND METHODS

This study was conducted during April to December 2014 in a tertiary care hospital. A Total of 130 blood samples were included in this study. The Sample processing was done at the Microbiology laboratory. Blood sample was collected for culture under aseptic precautions after disinfecting the venepuncture site by applying 70% isopropyl alcohol in water with 1% iodine and allow to dry. For adults, 5ml of blood was taken and immediately inoculated into 50ml of 'Brain Heart Infusion' (BHI) broth. In children 1-2 ml of blood was taken and inoculated in 5-10 ml of BHI broth. After 48 hrs of incubation in BHI, the samples were sub cultured in Nutrient agar, Blood agar, MacConkey agar plates and incubated at 37 ºC for 24hours. Identification of positive growth was based on colony morphology, Gram staining, hanging drop, coagulase, catalase, oxidase tests and other biochemical reactions [8].

Antibiotic susceptibility pattern of the organisms were done by Kirby-Bauer's disc diffusion method according to Clinical and Laboratory Standards Institute (CLSI) guidelines. The antibiotics discs used were Gentamicin(30µg),Erythromycin(15µg),Ciprofloxacin(5µg),Cotrimoxazole,Amoxycillin/Clavulanicacid(30µg),Ampicillin(10µg),Linezolid(30µg),Vancomycin(30µg),piperacillin/Tazobactam(100/10µg),Amikacin(30µg),Imipenem(10µg),Cefotaxime(30 µg), Ceftazidime (30µg), Ceftriaxone(30µg), Cefipime(30µg) and interpreted as per the standard protocol [9].

RESULTS

A total 130 blood culture sample was taken in this study out of which 62(47.6%) were identified as culture positive samples. The sex distribution of positive culture sample was found to be 39(62.9%) Males and 23(37.0%) Females. The incidence of septicaemia was high in Infants (48.3%) followed by Children(16.1%)and Adults(35.4%).

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The Gram positive organism is high (56.4%) when compared to the Gram negative organisms (43.5%). The most common organism identified in positive blood cultures were Staphylococcus aureus 19(30.6%) followed by Coagulase negative staphylococci 16(25.8%), Escherichia coli 9(14.5%), Klebsiella spp 7(11.2%), Pseudomonas spp 6(9.67%), Salmonella typhi 3(4.83%) and Acinetobacter 2(3.22%)

Table 1: Incidence and distribution of the pathogens

S.No	Microorganism	No of Isolates(n=62)	
		No.	Percentage %
1	Staphylococcus aureus	19	30.6%
2	Coagulase Negative Staphylococcus	16	25.8%
3	Escherichia coli	9	14.5%
4	Klebsiella Spp	7	11.2%
5	Pseudomonas Spp	6	9.67%
6	Salmonella typhi	3	4.83%
7	Acinetobacter	2	3.22%

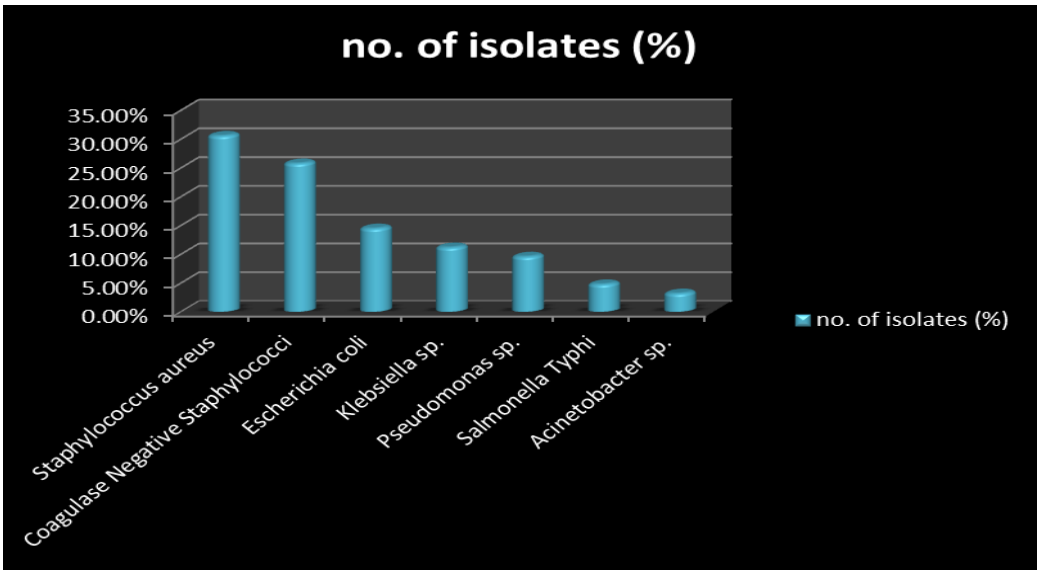

Figure 1: Order of prevalence of various gram positive and gram negative isolates

Table 2: Percentage of antimicrobial susceptibility pattern of gram positive isolates

ANTIBIOTICS	STAPH. AUREUS (n=19) S	STAPH. AUREUS (n=19) R	CONS (n=16) S	CONS (n=16) R
Vancomycin	100%	0	100%	0
Gentamycin	42.1%	57.8%	56.2%	43.7%
Erythromycin	36.8%	63%	37.5%	62.5%
Ciprofloxacin	57.8%	42.1%	56.2%	43.7%
Linezolid	100%	0	93.7%	6.25%
Cotrimoxazole	52.6%	47.3%	50%	50%
Amoxycillin-Clavulanic acid	63.1%	36.8%	68.7%	31.2%
Ampicillin	26.3%	73.6%	18.7%	81.2%
Piperacillin- Tazobactam	84.2%	15.7%	75%	25%

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Table 3: Percentage of antimicrobial susceptibility pattern of gram negative isolates

Antibiotics	Escherichia coli (n=9)		Klebsiella sp. (n=7)		Pseudomonas sp. (n=6)		Salmonella sp. (n=3)		Acinetobacter sp. (n=2)	
	S	R	S	R	S	R	S	R	S	R
Amikacin	88.8%	11.1%	71.4%	28.5%	83.3%	16.6%	66.6%	33.3%	100%	0
Ciprofloxacin	33.3%	66.6%	42.8%	57.1%	66.6%	33.3%	100%	0	50%	50%
Gentamicin	22.2%	77.7%	28.5%	71.4%	16.6%	83.3%	33.3%	66.6%	0	100%
Imipenem	77.7%	22.2%	71.4%	28.5%	50%	50%	66.6%	33.3%	50%	50%
Ampicillin	22.2%	77.7%	14.2%	85.7%	16.6%	83.3%	66.6%	33.3%	0	100%
Ceftazidime	33.3%	66.6%	28.5%	71.4%	33.3%	66.6%	33.3%	66.6%	0	100%
Cefotaxime	66.6%	33.3%	57.1%	42.8%	66.6%	33.3%	66.6%	33.3%	50%	50%
Ceftriaxone	55.5%	44.4%	57.1%	42.8%	50%	50%	66.6%	33.3%	50%	50%
Cefipime	77.7%	22.2%	57.1%	42.8%	83.3%	16.6%	66.6%	33.3%	50%	50%
Piperacillin-Tazobactam	88.8%	11.1%	71.4%	28.5%	83.3%	16.6%	100%	0	50%	50%

DISCUSSION

Septicemia is one of the most common blood stream infections in the world. The present study showed the bacteriological profile and antimicrobial susceptibility pattern of septicaemic cases in our tertiary care hospital. A total 130 blood culture samples were taken out of which 62(47.6%) were blood culture positive which is comparable to the previous studies (44.9%),[10](44%). [11]While in other studies the incidence of microbial recovery is comparatively low,(20.2%),[12](22%),[13](24.5%) [14]. In the present study the incidence of septicaemia was high in infants (48.3%) followed by children (16.1%) and >60yrs(35.4%)

In 62 positive blood cultures, Gram positive organisms 35(56.4%) are more compared to Gram negative organisms 27(43.5%) which is in accordance with previous studies [15]. Staphylococcus aureus 19(30.6%) and Coagulase negative Staphylococcus 16(25.8%) being the most common gram positive organisms isolated in this study. In the present study Gram negative organism isolated were Escherichia coli(14.5%), Klebsiella spp(11.2%),Pseudomonas aeroginosa(9.67%) being the most commonest microbs.

In gram positive bacteria most common isolated was staphylococcus aureus(30.6%) to be the leading organisms in the blood stream infection its organizes a most important part of the nosocomial infection.[16]In other study staphylococcus aureus cause septicaemia in neonates [17 18].

In our study the gram negative organisms isolation is(43.5%)in which more dominant bacteria is Escherichia coli(14.5%)followed by Klebsiella spp(11.2%) it is in accordance with the study of other workers (Iregbu KC et al;2006)[13]. In this study Pseudomonas aeroginosa is an non-lactose fermenter was isolated in (9.6%)it is agreed with the other study(9.8%)[19] salmonella species were reported(4.8%) in this study was relatively low compared to previous studies(14.2%)[20](VANITHA RANI N et al;2012) (25.7%) [21]. The present observation the incidence of Salmonella species was(4.83%)which is correlates well with the previous study [22]. Acinetobacter was isolated(3.22%)in this study it was comparable with the other studies [7]. In some studies Acinetobacter isolates were(12.2%)[21] and(32%)[23].

The antibiotic sensitivity patterns of gram positive organisms vancomycine showed to highest antimicrobial activity in this study (100%) this was in accordance with other studies (Pavani Nimmala et al) (100%)[15], (87%)[13] and (86.1%)[24] The present study Linezolid showed highly effective drug(100%) against gram positive organism followed by Piperacillin/Tazobactam (84.2%) and Amoxyclac(63.1%) This can be compared to the results of other study (100%) and (82%) [15]. In this present analysis all the antimicrobial is used for gram negative isolates Amikacin, showed highly effective drug against gram negative organism especially Escherichia coli(88.8%) this is correlate with the other workers(73.5%) [7] and (78.9%) [25]. In our study showed highly sensitivity drug for (Non fermenter)bacteria including pseudomonas, salmonella species and Acintobacter. Ciprofloxacin showed highest antimicrobial activity. Ampicillin and Erythromycin showed highly resistant drug against gram positive organism.

In the current study showed Cefotaxime and Ceftriaxone were highly effective drug against gram negative organism. Imipenem and cefipime showed low rates of resistance against Gram negative bacteria. Piperacillin/tazobactam was highly sensitivity for both Gram positive and Gram negative organisms.

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CONCLUSION

The most common microorganism isolated from this study is Staphylococcus aureus, Coagulase Negative Staphylococcus followed by Escherichia coli and other gram negative bacteria. Amikacin, Imipenem and Piperacillin/tazobactam is suggested to be the drug of choice for treating Gram negative organisms and Vancomycine and Linezolid for Gram positive organisms. Regular antimicrobial susceptibility surveillance is necessary to improve empirical therapy.

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