Original Article

Bact. Profile & Antibiotic Susceptibility

Bacteriological Profile and Antibiotic Susceptibility of Blood Isolates in Blood Stream Infections

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ABSTRACT

Objective: The current study was aim to analyse Bacteriological Profile and Antibiotic Susceptibility of Blood Isolates in Blood Stream Infections.

Study Design: Experimental study

Place and Duration of Study: This study was conducted at Department of Pathology, Frontier Medical & Dental College, Abbottabad from January 2010 to August 2011.

Material and methods: 1056 blood samples were collected aseptically. The positive blood isolates were identified by standard biochemical tests and their antimicrobial resistance patterns were checked using modified Kirby-Bauer method.

Results: Blood cultures were positive in 152 **(**14.39%) cases. Gram negative isolates were predominant with 104 (68.42%) cases, consisting, in decreasing frequency, of Salmonella typhimurium (39, 37.5%), Pseudomonas aeruginosa (23, 22.1%), Escherichia coli (18, 17.3%) and Klebsiella pneumoniae (14, 13.4%). Staphylococcus aureus accounted for 30 (19.7%) cases followed by coagulase negative Staphylococcus aureus (CONS) in 11 (7.23%) cases among gram positive isolates. Gram positive bacteria were highly resistant to amoxicillin while they were sensitive to cefuroxime and aztreonam. Among gram negative organisms, Escherichia coli & Klebsiella pneumoniae were sensitive to ofloxacin while Pseudomonas aeruginosa to cefpirome and ceftazidime.

Conclusion: Our study provides important information about the bacteriological profile and antibiotic resistance pattern of blood isolates in blood stream infections. It will help clinicians to choose an empirical antibiotic therapy to treat such infections.

Key Words: Blood Stream Infection, Blood Culture, Bacteriological Profile, Antibiotic Susceptibility

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INTRODUCTION

Blood stream infections (BSIs) are associated with significant morbidity and mortality. They can cause illnesses which ranges from self-limiting infections to severe life-threatening diseases requiring admission to intensive care units [1, 2]. They are caused by wide variety of organisms and this pattern depends on geographical location [1,3]. Different foci within the body like respiratory, intra-abdominal and genitourinary areas, serves as a nidus for these infections [4, 5]. Incidence of these infections has considerably increased due to the use of indwelling medical devices, changing antibiotic resistance pattern of microorganisms and failure to follow infection control techniques by medical personnel [2, 5-8].

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Blood culture is the most important laboratory technique for the diagnosis of blood stream infections. It will help isolate the bacterial pathogens and determine their antibiotic sensitivities, which later helps in the formation of bacteriological profile and antibiotic resistance pattern of these pathogens which, subsequently, serves as a guide for the selection of appropriate treatment for these infections [4, 9]. Early initiation of treatment for blood stream infections significantly reduces the morbidity and mortality associated with these infections [6]. Therefore, blood culture is the mainstay of diagnosis and treatment of blood stream infections.

In most cases, empirical antibiotic therapy should be started to treat blood stream infections even before the results of blood cultures are available. This requires the knowledge of common bacterial pathogens prevalent in that area, based on blood culture results, to help clinician choose the right antibiotic therapy [1, 10]. Therefore, this study is carried out to analyze the frequency of various bacterial pathogens that are responsible for blood stream infections as identified by blood culture which would serve as a useful guide for

clinicians in deciding upon empirical antibiotic therapy for these infections.

MATERIALS AND METHODS

This study was performed at Department of Pathology, Frontier Medical & Dental College, Abbottabad, from January 2010 to August 2011. A total of 1056 blood samples were collected.

All indoor and outdoor patients who presented with symptoms of blood stream infection were included in this study. Using strict aseptic technique, 2 ml (children) and 5-10 ml (adults) of blood was collected. Blood sample was inoculated into culture bottles containing soybean-casein digest broth, for both aerobes and anaerobes (from Becton, Dickinson & Company, USA). They were incubated for seven days. Negative cultures were observed for seven more days before issuing a negative report. For positive blood cultures, growth was identified by gram staining, colony morphology and using standard biochemical tests [11].

Modified Kirby-Bauer method was used to check the antibiotic susceptibility of isolated microorganisms as per CLSI guidelines [12]. The antibiotics used were; amoxicillin (25µg), cefuroxime (10µg), cefpirome (30µg), cotrimoxazole (1.25/23.75µg), ofloxacin (20µg), aztreonam (30µg), ceftazidime (30µg) and imipenem (10µg).

RESULTS

Total 1056 blood samples were collected. Out of which, bacterial growth was present in 152 (14.39%) cases as shown in Figure 1. Therefore, blood culture positivity was 14.39%.

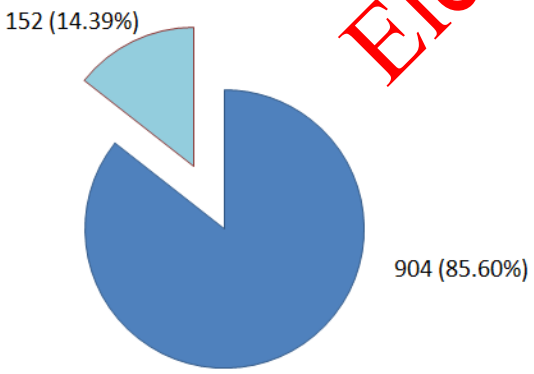

Figure 1: Frequency of blood isolates in the study sample

Bacterial isolates were present in 152 cases. Their prevalence according to gram staining was shown in Figure 2. Gram negative isolates were observed in 104 (68.42%) cases while gram positive isolates in 48 (31.57%) cases.

Distribution of the bacterial isolates is shown in Figure 3. Among gram positive isolates, Staphylococcus aureus was isolated in 30 (19.7%) cases followed by coagulase negative Staphylococcus aureus (CONS) and Streptococcus viridans which were isolated in 11 (7.23%) and 7 (4.6%) cases respectively. Among gram negative bacteria, Salmonella typhimurium was isolated in 39 (37.5%) cases followed by Pseudomonas aeruginosa, Escherichia coli and Klebsiella pneumoniae which were isolated in 23 (22.1%), 18 (17.3%) and 14 (13.4%) cases respectively.

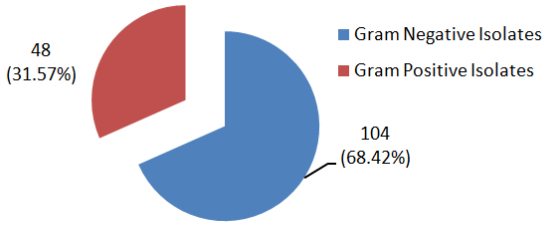

Figure No.2: Bacterial isolates in study sample based on gram staining.

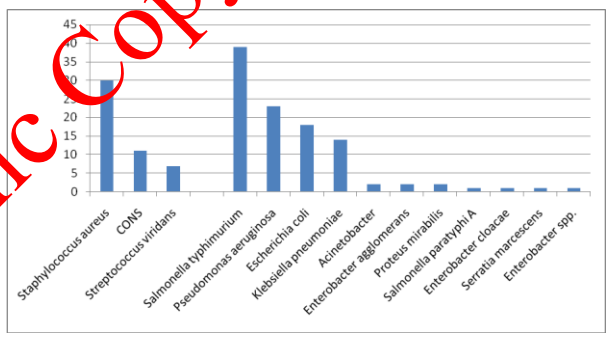

Figure No.3: Distribution of gram positive & gram negative bacterial isolates

The antibiotic susceptibility of different microorganisms is shown in Table 1 & Table 2. Gram positive bacteria were fully resistant to amoxicillin while they were sensitive to cefuroxime and aztreonam as shown in Table 1.

Table No.1: Sensitivity of gram positive blood isolates to different antibiotics

Antibiotic	Sensitivity
Amoxicillin	0.00%
Cefuroxime	70%
Aztreonam	60%
Co-trimoxazole	45%

Among gram negative organisms, Escherichia coli & Klebsiella pneumoniae were highly sensitive to ofloxacin while Pseudomonas aeruginosa to cefpirome and ceftazidime as shown in Table 2.

TableNo.2: Sensitivity of gram negative blood isolates to different antibiotics

	Amoxicillin	Ceftazidime	Aztreonam	Cefpirome	Ofloxacin	Imipenem
Escherichia coli	60%	54%	62%	-	80%	40%
Klebsiella pneumoniae	28%	30%	40%	65%	80%	-
Pseudomonas aeruginosa	-	84%	81%	90%	54%	94%

DISCUSSION

Blood culture positivity rate was 14.39% in our study. Studies conducted in India by Garg et al, and Gohel et al have reported culture positivity to be 20.5%, and 9.2% respectively [1, 3]. Pandey et al have shown this rate to be 12.6% in their study which was conducted in Nepal [4]. In Pakistan, according to Chaudhry et al and Latif et al, blood culture positivity rate was quite high, > 20% [13, 14]. This difference in the isolation rates was multi-factorial: many patients have used antimicrobials before visiting the hospital, some of them have acquired infections while their stay in hospitals and after surgery and they have used antibiotics before collection of blood samples for culture [1, 4].

Our study has shown the higher incidence of gram negative organisms. There were 104 (68.42%) cases of gram negative organisms while 48 (31.57%) cases of gram positive organisms. This is in accordance with other studies from the subcontinent which have shown the concurrent results [2, 4, 15]. Mahmood A has shown the same result in his study which was conducted in Pakistan [16].

There were 30 (19.7%) cases of Staphylococcus aureus followed by 11 (7.23%) cases of coagulase negative Staphylococcus aureus (CONS) and 7 (4.6%) cases of Streptococcus viridans respectively. This is in accordance with Diekema et al who have reported the incidence of Staphylococcus aureus to be 20% in their study [17]. Pandey et al have reported the incidence of Staphylococcus aureus to be 15.94% in their study while Mehta et al have shown its incidence to be 13.86% in their study [2, 4]. Contrary to our study, Garg et al have reported a higher incidence of CONS which is about 20.7% and much lower incidence of Staphylococcus aureus which was about 8.3% [3]. CONS is a skin contaminant and because of highly aseptic technique used in sample collection, its incidence is low in our study [1].

In our study, Salmonella typhimurium was present in majority of cases (37.5%) among gram negative isolates, followed by Pseudomonas aeruginosa in 22.1%, Escherichia coli in 17.3% and Klebsiella pneumoniae 13.4% cases. This is comparable to Pandey et al who have reported a higher incidence of Salmonella spp. in their study while the incidence of Klebsiella pneumoniae was 19.56% [4]. Garg et al also reported the incidence of Pseudomonas aeruginosa, Escherichia coli and Klebsiella pneumoniae to be 16%, 11% and 7.3% respectively [3]. Types of antibiotics used as well as the bacteriological profile of blood isolates are different among different hospitals which could be responsible for this variation in the incidence of different microorganisms.

Our study has shown that gram positive organisms were highly resistant to amoxicillin (100%) while they were sensitive to aztreonam and cotrimoxazole. This is in accordance with Pandey et al and Garg et al who have shown in their study that the resistance of gram positive organisms to penicillin was 100% and 80.5% respectively [3,4]. In our study, ofloxacin has shown highest activity against Escherichia coli & Klebsiella pneumoniae. Pandey et al and Ayobola et al have reported the same finding in their study [4, 10].

Epidemiology of blood isolates and their antibiotic resistance pattern will be helpful for clinicians to decide upon empirical antibiotic therapy, which has to be initiated early in the course of blood stream infections for the treatment to be successful.

CONCLUSION

Our study provides important information about the bacteriological profile and antibiotic resistance pattern of blood isolates in blood stream infections. It will help clinicians to choose an empirical antibiotic therapy to treat such infections.

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