



BLOOD CULTURE CONTAMINATION : ROLE OF REPEAT CULTURES IN DIFFERENTIATING SIGNIFICANT VERSUS PSEUDO BACTEREMIA

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ABSTRACT

Presence of microbes in blood i.e. bacteremia carries high risk of morbidity and mortality. Blood cultures form a critical part of evaluation of patients with suspected sepsis. The present study was undertaken to study the effect of duration of incubation for obtaining positive cultures. A total of 220 samples from 107 pediatric patients presenting with suspected bacteraemia were processed aerobically. Cultures were positive in 24.3% of the samples. But, following repeat cultures, only 18.7% were identified as true or persistent bacteremias. Blood cultures positive for isolates having doubtful pathogenicity have to be confirmed by repeat cultures or isolation from other sets to confirm the true bacteremias.

KEYWORDS

Blood cultures; contaminants; pseudobacteremia

INTRODUCTION

Blood cultures provide essential information for the evaluation of a variety of diseases like endocarditis, pneumonia, and pyrexia of unknown origin and particularly, in patients with suspected sepsis.^[1] Presence of microbes in blood i.e. bacteremia carries high risk of morbidity and mortality. The detection of microorganisms in a patient's blood has great diagnostic and prognostic significance. Blood culture is the essential investigation for the management of sepsis. Many infections in neonatal and pediatric age group can only be established on the basis of etiological agent recovered from blood. One key determinant in the ultimate outcome of patients with sepsis is institution of early and appropriate antimicrobial therapy.

However, contaminants pose a great problem in the interpretation of blood cultures. Particularly, isolation of Coagulase negative staphylococci pose a significant interpretative difficulties. Coagulase-negative staphylococci (CoNS), the most frequent blood culture isolates, are predominantly blood culture contaminants, but they are also a significant cause of bacteremia.^{2,3} Failure to differentiate the pseudobacteremia can result in unnecessary usage of antibiotics and consequent development of drug resistant strains as well as increase in the hospital stay. Several studies and authors published guidelines for Clinical and microbiologic guidelines for the differentiation of true bacteremia from pseudobacteremia or contamination. Suggested laboratory criteria for true bacteremia include growth within 48 h and multiple blood cultures positive for the same organism. In contrast, increased duration of time before positivity, polymicrobial growth of skin organisms, or growth during antibiotic treatment suggest contamination.^{4,5,6} Keeping this in mind, we tried to know the percentage of recovery of organisms in two or more sets of blood cultures by conventional methods of blood cultures and identify the contaminants and true bacteremias.

MATERIALS AND METHODS:

A total of 107 paediatric in-patients (less than 18 years of age) including 22 neonates admitted in a tertiary care hospital in Hyderabad were included in the study. Patients presented with prolonged fever or clinical impression of septicaemia. Patients having prolonged fever in the postoperative period, despite antibiotic coverage were also included in the study. Detailed history was taken to identify the possible risk factors. History of antibiotic usage empirically either before or after admission was also obtained.

Blood samples for culture were collected following strict aseptic precautions. If empirical antibiotics were already started, the collection was timed before the next dose of antibiotic was due or about half an hour before the predicted peak of temperature. A second set was also collected in all patients about an hour later from a different venipuncture site. Three sets were collected in cases of suspected or sonographically diagnosed congenital heart disease. About 1 mL of blood in case of neonates and about 5 mL in case of children was collected in each set. Immediately after collection, the blood was inoculated into brain heart infusion (BHI) broth without switching needles. The bottles containing 10 mL of BHI broth were used in case

of neonates and 50 mL were used for other children to allow 1:10 dilution. The culture bottles were incubated at 37°C aerobically.

After overnight incubation, the samples were subcultured onto blood agar, MacConkey's agar, and chocolate agar. If there was no growth observed on the plates by the next day, subcultures were again repeated from the broth on day 3, day 4 and finally on day 7. If there was any growth, it was identified and antibiotic susceptibility tests were performed according to the standard methods.⁷⁻¹⁰

RESULTS AND DISCUSSION:

A total of 220 samples from 107 children were processed. Cultures were positive in 26 (24.30%) cases. Cultures were positive in 26 (24.30%) in single set, but repeated isolation from second and/or third set confirmed only 19 (17.75%). Coagulase negative staphylococci was isolated in four of the first set of blood cultures but on repeated isolation from multiple sets, it was found positive in only one case. In the same way, *Acinetobacter*, which is commonly found in the hospital environment but can cause severe blood stream infections was isolated from two of the blood culture bottles but repeat isolation confirmed only one of these two. Another contaminant found was, *Alkaligenes faecalis*. It was isolated in two blood culture samples but we failed to isolate the same in the second and third sets of the blood cultures (table 1).

Table 1 : Various isolates in blood cultures and their positivity in one or multiple sets

Sl No	Isolate	One set	Two or three sets
1	<i>Klebsiella</i> sp	7	7
2	<i>Citrobacter</i> sp.	6	6
3	<i>Staphylococcus aureus</i>	3	2
4	Coagulase negative staphylococci	4	1
5	<i>Acinetobacter</i>	2	1
6	<i>Escherichia coli</i>	1	1
7.	<i>Alkaligenes faecalis</i>	2	0
8.	<i>Candida</i> sp.	1	1
	Total	26 (24.30%)	19 (17.75%)

One patient showed positive cultures for CoNS from multiple sets. He is a case of peritonitis due to appendicular perforation was admitted and the patient underwent surgery. The patient was having long standing central venous catheter and also developed post-operative wound infection, thus having multiple risk factors. CoNS was also isolated from the wound swab as a predominant growth, with similar antibiogram.

Acinetobacter, which occurs in the hospital environment can occur in various samples including blood cultures as a contaminant but it can cause septicaemia as well. We isolated *Acinetobacter* spp. from a case who presented with protein energy malnutrition and gastroenteritis. This isolate was also confirmed by repeat isolation from the second set from a different venipuncture site. We could not

confirm the *Acinetobacter* in the second case. Isolation of *S. aureus* from blood usually signifies infection, but persistent bacteraemia has been observed only two of three cases in the present study, who were having derlying cardiac pathology. According to one study, up to 57% of cases where *S. aureus* was repeatedly lated will have a cardiac pathology and all such patients with *S. aureus* bacteraemia should be thoroughly evaluated the presence of any cardiac pathology as the cardiac vegetations serve as an important source of persistant *S. aureus* teraemia.¹¹

CONCLUSIONS

Blood cultures provide a valuable guide to the clinician in Identifying the etiological agent and selecting an appropriate Antibiotic. The isolates of doubtful pathogenicity have to be Confirmed by repeated isolation for better clinical correlation. Isolates like Coagulase negative Staphylococci (CoNS), *Alkaligenes faecalis*, *Acinetobacter* from blood cultuers have to be isolated from multiple sets before assigning any clinical significance.

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