DIAGNOSTIC YIELD OF BLOOD CULTURES AMONG PATIENTS ADMITTED WITH NON -FOCAL PYREXIAS

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https://doi.org/10.37762/jgmds.11-1.486

ABSTRACT
OBJECTIVES
To establish the diagnostic yield of blood cultures among patients admitted with non-focal pyrexias.
METHODOLOGY
This descriptive cross-sectional study was conducted in the Department of Medicine, Khyber Teaching Hospital, Peshawar, from August 2020 to April 2021. One hundred ninety-seven patients with non-focal pyrexia were recruited. Data about age, gender, presence of other illnesses like diabetes and hypertension, history of smoking and duration of fever were noted. A thorough clinical evaluation was done. Under aseptic conditions, 2 blood culture sets were taken. The final blood culture report was collected after 5 days of incubation in culture media. The culture was labelled positive if any organism was isolated from the sample. All data was entered in specially designed proforma. Patients with positive blood cultures were managed as per hospital protocols. Confidentiality of data was ensured.
RESULTS
Our study shows that among 197 patients, 18(9%) had positive cultures, while 179(91%) did not yield any pathogen on blood culture. Escherichia coli was the most commonly grown organism among the positive blood cultures.
CONCLUSION
The yield of blood culture was 9% in febrile patients admitted to the medical ward of a tertiary care hospital.
KEYWORDS: *Blood Culture; Non-Focal Pyrexias; Incubation; Escherichia Coli*

INTRODUCTION

acteremia is the continual or sporadic presence of bacteria in the bloodstream, whereas septicemia is the widespread presence of microorganisms throughout the body with signs of systemic reactions that might vary in severity. Contamination has been ruled out in such cases. These patients exhibit feverish symptoms at the outset.[1,2] Coupled with clinical, laboratory or microbiological proof of infection at a specific body site, these illnesses are frequently categorized as primary (no focus) or secondary. Additionally, they have historically been divided into community- and hospital-acquired.[3] An essential part of the evaluation of febrile patients is the use of blood cultures. They are the source of identifying bacteremia in unwell patients with fever.[4] Healthcare professionals are encouraged to collect blood samples from patients with fever, especially non-focal fevers. There are approximately 200,000 occurrences of bacteremia annually, with an associated death risk of 40%-50%.[5,6] The clinical outlook of a patient is not enough to qualify for the presence of bacteremia. Multiple indications exist for carrying out blood cultures and sensitivity testing on patients. The current approach mainly relies on traditional microbiological procedures, such as isolation of the pathogen, susceptibility testing, microorganism culture in enriched broth, and pathogen isolation.[7,8,9] The blood culture yield in a sizable retrospective investigation by Chinnappan was 6.7%.[6] This research aims to assess the yield of blood cultures in patients presenting with non-focal pyrexia. When the focus of infection is evident, it is usually easier to prescribe antibiotic therapy because of available literature on the antibiotic treatment of focal pyrexias. However, non-focal pyrexia has its trends in different parts of the world. If the culture yield is low, we might need to consider initiating empirical antibiotic therapy for febrile patients. This may warrant the need for an antibiogram for the respective hospital. Early use of appropriate therapy according to hospital antibiogram will reduce complications and hence lower fever-related morbidity and mortality. This will prove to be a significant step in preventing antibiotic resistance.

METHODOLOGY

This descriptive cross-sectional study was conducted in the Department of Medicine at Khyber Teaching Hospital, Peshawar, from August 2020 to April 2021.

Using a 95% confidence interval, a margin of error of 3.5%, and an expected frequency of 6.7%, the sample size was 197 patients. Non-probability consecutive sampling was used. The study recruited febrile patients of both genders with no focus on infection identified on clinical and laboratory data, aged between 20 and 50. Patients with an axillary temperature of over 100°F for more than 48 hours were considered febrile. Patients receiving antibiotics before obtaining culture, patients having immunosuppression determined on history and medical record and those with an absolute neutrophil count of <500 cells/mm^3 determined from medical record were not included to avoid bias in the study results. Approval for the study was given by the hospital ethical committee with approval number 625/ADR/KMC. Written informed consent was taken from all recruited patients. Demographic data including age, gender, diabetes (Random blood sugar more than 126mg/dl on at least 2 occasions), hypertension (blood pressure > 130/90mmHg on more than two occasions), history of smoking (consuming more than 5 cigarettes per day for last 6 months) and duration of fever were noted. A brief history and examination were done. Under aseptic conditions, 2 blood culture sets were taken from all febrile patients. For each set, 5 ml of blood was drawn in a culture bottle containing 15 ml of culture media. The sample was sent immediately to the pathology laboratory and kept in refrigeration until it was shifted to the culture disc. The initial report was obtained after 24 hours of incubation, and the final report was collected after 5 days of incubation in culture media. The culture was labelled positive if any organism was isolated from the sample. All data was entered in specially designed proforma. Patients having positive blood cultures were managed as per hospital protocols. All data was entered and analyzed using SPSS 22. Numerical variables like age and duration of fever were presented as mean and standard deviation. Qualitative variables like gender, yield of blood culture, organism/s grown on blood culture, DM, HTN, and history of smoking were presented as frequency and percentages. Data was stratified for age, gender, diabetes, smoking, hypertension, different organisms and duration of fever.

RESULTS

Among 197 patients, 100(51%) were in the 20-30-year age group, and 97(49%) were in the 31-50-year age group. The mean age was 33 years with SD ± 10.71. 87(44%) patients were male and 110(56%) patients were female. 77(39%) patients had duration of fever <4 days and 120(61%) patients had duration of fever >4 days. 65(33%) patients had diabetes, 75(38%) patients had history of active smoking and 93(47%) patients had hypertension. The status of different organisms among

197 patients was analyzed and shown in Table 1. Stratification of positive culture concerning age, gender, diabetes, smoking, hypertension, different organisms and duration of fever is mentioned in Table 2.

Table 1: Yield of different Organisms on Blood Culture (n=197)

Different Organisms	Frequency	%age
Staphylococcus Aureus	04	02
Escherichia coli	08	04
Pseudomonas Aeruginosa	04	02
Klebsiella Pneumonia	02	01
Total	18	09

Table 2: Stratification of Positive Culture W.R.T Age Distribution

Stratification of Positive Culture W.R.T Age Distribution (n=197)			
Positive Culture	20-30 Years	31-50 Years	Total
Yes	09	09	18
No	95	88	179
The Chi-square test was applied in which the P value was 0.9459			
Stratification of Positive Culture W.R.T Gender Distribution			
Positive Culture	Male	Female	Total
Yes	08	10	18
No	79	100	179
The Chi-square test was applied in which the P value was 0.9798			
Stratification of Positive Culture W.R.T Duration of Fever (n=197)			
Positive Culture	≤4 days	>days	Total
Yes	07	11	18
No	70	109	179
A chi-square test was applied in which the P value was 0.9856			
Stratification of Positive Culture W.R.T Diabetes Mellitus (n=197)			
Positive Culture	Diabetic	Non Diabetic	Total
Yes	06	12	18
No	59	120	179
A chi-square test was applied in which the P value was 0.9744			
Stratification of Positive Culture W.R.T Smoking (n=197)			
Positive Culture	Smokers	Non Smokers	Total
Yes	07	11	18
No	68	111	179
A chi-square test was applied in which the P value was 0.9402			
Stratification of Positive Culture W.R.T Hypertension (n=197)			
Positive Culture	Hypertensive	Non-Hypertensive	Total
Yes	08	10	18
No	85	94	179
A chi-square test was applied in which the P-value was 0.8053			

DISCUSSION

The mean age of our study sample was 33 years, with an SD of 10.71 years. 110 patients (56%) were female and 87 (44%) were male. 179 patients (91%) lacked a positive culture, compared to 18 (9%) who yielded growth on blood culture. Similar findings were seen by

Kee P et al., where 6.7% of blood cultures were positive, with 35% of those cultures containing pathogens.[7] In the 12 hours before or after sample collection, 79% of cases and 67.1% of controls had a fever. In neonatal or paediatric patients, fever 2–6 hours before a blood culture was neither sensitive nor specific for predicting bacteremia and modestly predictive in oncology patients (AUC, i.e. Area Under the Curve 0.59-0.63). In neonates, cultures taken 2-6 hours before fever were nonpredictive (AUC 0.5–0.59), only slightly predictive (AUC 0.6–0.67) in paediatric patients, and modestly predictive (AUC 0.6-0.7) in patients with cancer (AUC 0.70). In newborns, C-reactive protein was only sporadically predictive (AUC 0.60). In certain groups, hematologic indices were not reliable predictors. In 16 of 145 patients during the first episode of fever, or 11% of patients, the preliminary blood culture was positive, according to research by Serody JS et al.[8] Five individuals (4.6% of the total 109 patients) who had sampling done for blood cultures within 48 hours of fever had blood tests reported back with pathogens. After analyzing the outcomes in the initial 105 patients, we adjusted the time we took to collect blood cultures. In 49 patients who received this type of care, we discovered that the average number of blood cultures per patient fell from 9.2 to 4.7. Our study results might differ because patients present to tertiary care hospitals after having consulted basic health units and hospitals in the periphery where blood cultures are usually not sent or the facilities for blood culture processing and reporting are unavailable. When patients present to tertiary care hospitals, it is already after a minimum of a week; hence, the yield has already been reduced.[9,10] Blood cultures must be sent periodically, and a physician should not rely on a single blood culture result. It is always advisable to carry out multiple blood cultures for better yield. These could be the reasons our study results were different from other studies.[11] A different study by Riedel S et al. found that 54.1% of the IPBCs produced gram-positive bacteria, while 38.2% produced gram-negative bacteria, 2.6% produced anaerobes, and 5.0% produced yeast. Staphylococcus aureus, coagulase-negative staphylococci, Enterococcus spp., Escherichia coli, Pseudomonas aeruginosa, and Klebsiella pneumoniae were the most frequently recovered microorganisms.[9,12] Incorrect or ineffective blood culture collection methods may be to blame for the 9% yield of blood cultures in feverish patients in our study.[13,14] These were the conclusions of a significant European study that demonstrated how ineffective blood cultures are at identifying bacteremia.[15,16] Samples taken within the first 24 hours of admission were more likely to produce positive results than samples taken after that time.[17] For blood culture epidemiology and efficiency, it is necessary to set uniform criteria and put them into practice for each speciality. Young physicians, phlebotomists, and nurses can benefit from educational initiatives to improve the yield of this crucial test used to diagnose febrile patients.[18]

LIMITATIONS

This was a single-centre study. A study conducted on patients with non-focal pyrexia in multiple tertiary care hospitals would yield better results that would be more descriptive of the local trends of bacterial infections.

CONCLUSIONS

Blood culture reports are positive in 9% of febrile patients presenting to the hospital. We should not rely on a single blood culture for our febrile patients with non-focal pyrexia. Sensitivities and resistance patterns for locally prevalent diseases and organisms should all be checked for better yield.

CONFLICT OF INTEREST: None

FUNDING SOURCES: None

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