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Investigation of bloodstream infections in tertiary hospitals' intensive care units: A prospective cross-sectional study

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Abstract

Objective: One of the most frequent complications and main causes of morbidity and death in critically ill patients are bloodstream infections. Reducing mortality and improving clinical outcomes require the early start of an effective antibiotic therapy.

Materials and Methods: The Department of Pathology at Sree Balaji Medical College and Hospital, Chennai, Tamil Nadu, India conducted this prospective cross-sectional study. The study was conducted from Feb 2019 to Jan 2020 following informed consent from the patients and institutional ethical committee approval, the trial was initiated.

Results: Patients in intensive care units are at heightened risk for complications and mortality due to bloodstream infections. The significant disparity in BSI incidence reports can be ascribed to the diverse institutions, patient demographics, comorbidities, and durations of hospitalization that present varying risks to individuals. Thirty-eight out of fifty blood culture samples yielded good results. Various factors, including the microorganisms responsible for the infection in the intensive care unit, pre-existing risk factors, the speed of medicine administration, and the efficacy of the intervention, may contribute to bloodstream infection.

Conclusion: Clinicians must possess knowledge of common resistance mechanisms, risk factors for bloodstream infections caused by resistant bacteria, and optimal strategies for antibiotic treatment, source control, and surveillance as part of their comprehensive care for critically ill patients.

Keywords: Bloodstream infections, intensive care unit, tertiary hospitals

Introduction

A lot of people get bloodstream diseases in hospitals, and some of them can be fatal. About 7% of all patients in Intensive Care get a bloodstream infection (BSI) in the first month of staying there. This number is higher for patients who are very sick ^[1, 2]. During this situation, BSIs are linked too much higher death rates, between 40% and 60%, and three times as many people dying while they are in the hospital. When a BSI starts, the length of stay in the ICU and the costs of care related with it go up ^[1-3].

Quickly starting effective antibiotic treatment has been shown to improve health outcomes and lower death rates, especially in cases of septic shock or severe sepsis. Despite this, the most common empirical regimens are often ineffective and linked to higher ^[2-4] rates of illness and death because of the broad spread of multi-drug resistance (MDR) infections. This essay will look at the clinical and demographic features of bloodstream infections (BSIs) that happen in intensive care units (ICUs), with a focus on antibiotic resistance and treatment plans for both standard and targeted antibiotic therapy ^[3-5].

ICU-BSI can be called primary if the source of the infection is unknown or secondary if pathogens spread from a main infection site to the bloodstream. Secondary ICU bloodstream infections most often happen in the respiratory, gastrointestinal, and urinary systems ^[4-6]. Several studies have looked at the prevalence and prognostic importance of ICU-BSI. However, it would be much more useful to see if microorganisms isolated from ICU-BSI are similar to those found in clinical site samples that are indicative of HCAI. This was done over a four-year period ^[5-7]. The aim and objective of this study was investigation of bloodstream infections in tertiary hospitals' intensive care units.

Methodology

This prospective cross-sectional study was conducted at the Department of Pathology, Sree Balaji Medical College and Hospital, Chennai, Tamil Nadu, India

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The research was conducted from April 2017 to March 2018. The trial commenced with the patients' informed consent and the permission of the institutional ethics committee.

Inclusion Criteria

- Patients older than 18 yrs.
- Symptoms of bloodstream infection include fever, heavy perspiration
- Low WBC

Exclusion Criteria

- Patients who declined the trial.
- Patients are under 18 years old.

Results

The purpose of this study was to investigate bloodstream infections in the intensive care units at tertiary hospitals.

Table 1: Patients Age

Sr. No.	Age (In years)	Total	Percent
1	18-20	4	8
2	21-30	8	16
3	31-40	11	22
4	41-50	12	24
5	51-60	07	14
6	>61	08	16
7	Total	50	100

Table 1 and figure 1 presents the age distribution of the patients. Among 50 patients, the age group with the highest proportion is 41–50, succeeded by 31–40.

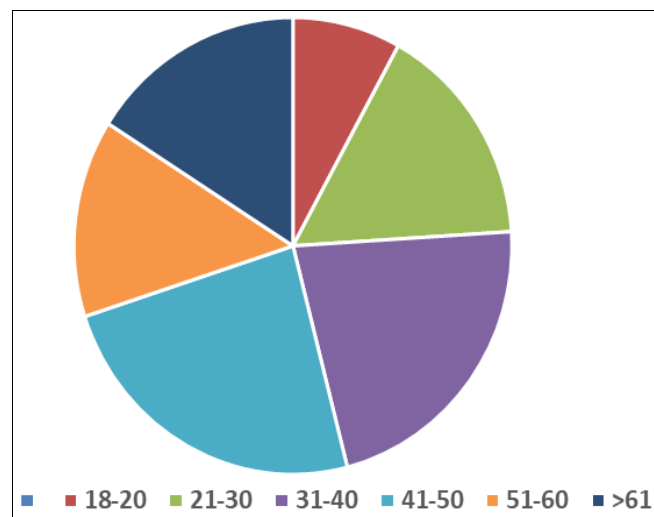


Fig 1: Patients Age

Table 2: Gender distribution

Sr. No.	Sex	Patients	%
1	Male	26	52%
2	Female	24	48%
3	Total	50	100%

As can be observed in Table 2 and figure 2, the gender breakdown of the patients is as follows: 52% of them are male, while 48% constitute the female population. A greater number of males than females participated in this survey.

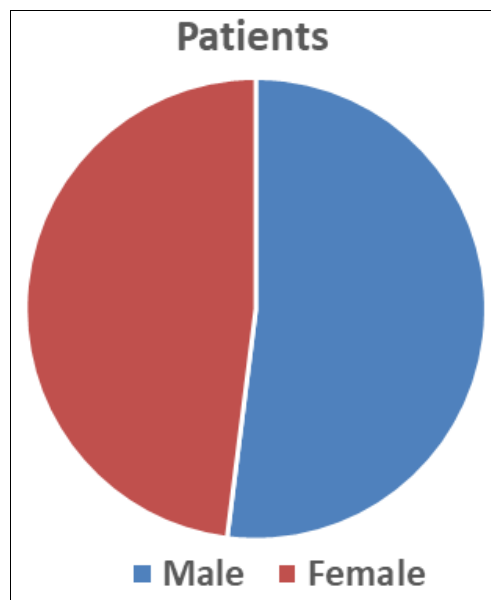


Fig 2: Gender distribution

Table 3: Blood culture results

Sr. No.	Blood Culture	Patients	Percent
1	Positive	10	20%
2	Negative	40	80%
	Total	50	100%

During the blood culture, twenty percent of the fifty samples tested positive, while eighty percent tested negative. There is a display of the findings in Table 3 and figure 3.

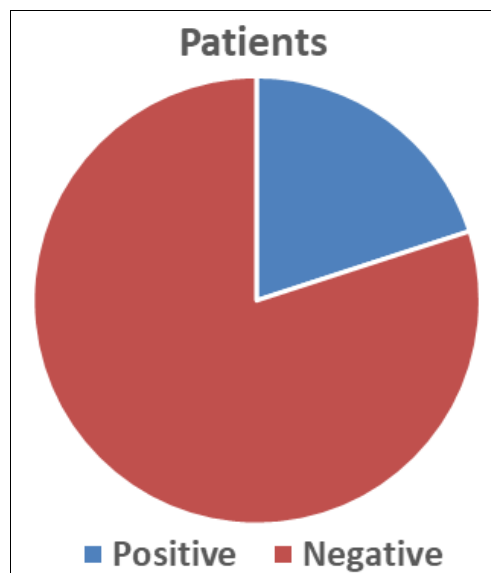


Fig 3: Blood culture results

Table 4: Prognosis for bloodstream infection patients

Sr. No.	Outcome	Number	%
1	Recovered	46	92%
2	Expired	04	08%

The clinical outcomes of patients who tested positive for BSI are presented in Table 4. This table shows that 92% of these patients recovered adequately, while 8% of them went away.

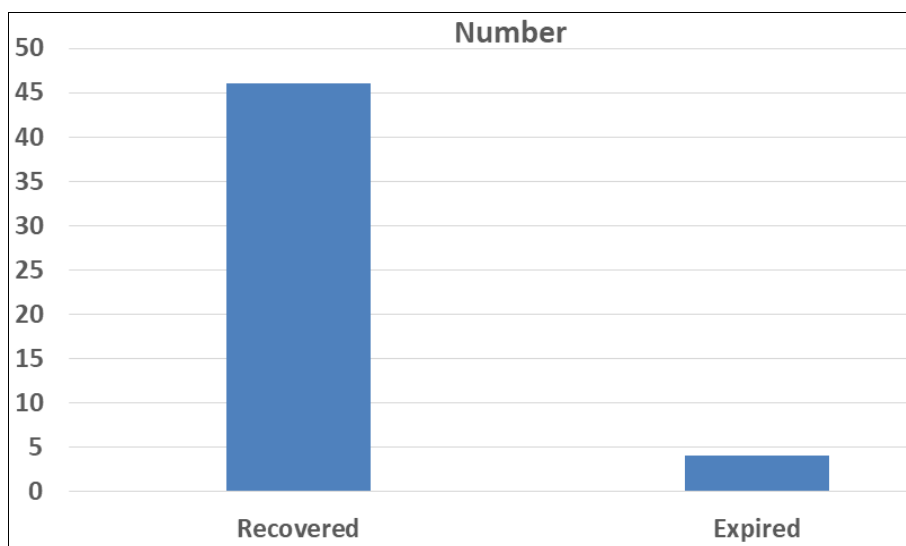


Fig 4: Prognosis for bloodstream infection patients

Discussion

Patients in urgent care units are more likely to have complications and die from bloodstream infections. The big difference in BSI reports is due to the different organizations, patient groups, comorbidities, and lengths of stay, all of which pose different risks to different people. Only 38 of the fifty blood cultures that were tested showed positive results. Bloodstream infection may be caused by a number of things, such as the germs that caused the infection in the ICU, pre-existing risk factors, the speed at which medicine is given, and how well the intervention works [6-8].

The main goals of this study were to find the bacteria that were causing these infections, find out how common bacteremia was in intensive care units, and look at the trends of antibiotic susceptibility seen in blood culture isolates. The participants in this study who were aged 41 to 50 had the highest rate of sepsis signs among those admitted to the intensive care unit. The results of the study matched what the subjects, whose ages ranged from 24 to 54, had experienced [7-9]. Most of the people in the study were between the ages of 49 and 73, with an average age of 41. In this study, cirrhosis, lung problems, and kidney disease were all listed as co-occurring disorders. Diabetes mellitus and high blood pressure have been named as separate risk factors. 36% of the people in the study had diabetes mellitus, which was the most common co-occurring disease. According to one study, diabetes is the most common disease that happens at the same time as BSI. It was found that 58% of people with this disease also have diabetes [10-12].

As shown by culture, intravenous catheters were found to be the main source of bloodstream illnesses that affected the urinary, gastrointestinal, respiratory, and biliary systems. The outbreaks happened at the same time that the patients were in the hospital. The results of a study that compared RTI, UTI, and IVC were mostly the same [13-15]. It was possible to identify 39 Gram-negative isolates and 9 Gram-positive isolates. The most common Gram-negative bacteria found are *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Escherichia coli*, *Acinetobacter baumannii*, and *Pseudomonas aeruginosa*. Methicillin-sensitive coagulase-negative staphylococci, Methicillin-resistant *Staphylococcus*

aureus, *Enterococcus* species, and Methicillin-sensitive *Staphylococcus aureus* were the most common Gram-positive bacteria. Studies show that *Staphylococcus aureus* is the most common Gram-positive bacteria [16-18].

Antimicrobial susceptibility tests on nine different strains of Gram-positive bacteria showed that Tetracycline, Vancomycin, and Linezolid were all completely effective against MS-CoNS. Erythromycin and Cotrimoxazole, on the other hand, were about as effective. Vancomycin, Linezolid, and High-Level Gentamicin did not work at all against any type of *Enterococcus* [19-21]. A type of *Enterococcus* spp. isolate was completely susceptible to high amounts of gentamicin, vancomycin, and linezolid, but completely resistant to erythromycin and penicillin. Out of the fourteen *Klebsiella pneumoniae* strains, three made a wider range of bacterial toxins. When it comes to Gram-negative bacteria, imipenem had a sensitivity rate of 71.4%, piperacillin-tazobactam and gentamicin had a sensitivity rate of 64.2%, imidacloprid had a sensitivity rate of 78.5%, and cefotaxime had a sensitivity rate of 28.5%. Out of these, 21.4% were sensitive to cotrimoxazole and 7.1% were sensitive to ciprofloxacin [22-25].

Conclusion

One of the most potentially life-threatening conditions that patients in critical care units can be suffering from is an infection of the basal system. It is becoming increasingly common for bacteria that are resistant to antibiotics to be the cause of bloodstream infections in intensive care units. Clinical practitioners should have a comprehensive understanding of the following topics in order to provide comprehensive care for critically ill patients: common mechanisms of resistance, bloodstream infection risk factors that are caused by bacteria that are resistant, and optimal methods for antibiotic treatment, source control, and surveillance.

Funding source

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Conflict of interest

None

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