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Original Article

Study of the Prevalence of Bacteremia and Antibiotic Sensitivity in Teaching Hospitals in Jiroft City

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A B S T R A C T

Introduction: Bacteremia is the presence of live bacteria in the bloodstream. Without treatment, bacteremia can progress to sepsis, organ failure, and death. The goal of this study was to identify the prevalence of bacteremia and the antimicrobial susceptibility profile of pathogens isolated from patients with bacteremia in teaching hospitals in Jiroft city.

Materials and Methods: All hospitalized patients suspected of bacteremia who had blood cultures were included in the study. Information was extracted from patient records. Data were analyzed using SPSS software, with descriptive statistics.

Results: The prevalence of bacteremia among 1518 patients in teaching hospitals in Jiroft city was 3.36%. The prevalence of bacteremia was 58.52% in men and 41.48% in women. *Escherichia coli* (23.53%), *Proteus* (3.92%), *Staphylococcus* (23.44%), *Acinetobacter* (13.73%), *Enterobacter* (13.73%), *Klebsiella* (11.76%), and *Streptococcus* Spp (9.8%) were the bacteria isolated from the patients. The isolated bacteria showed proper sensitivity to cotrimoxazole, amikacin, vancomycin, and imipenem, and partial resistance to ceftriaxone and cotrimoxazole.

Conclusions: Given the potential for changes in bacterial antibiotic susceptibility and the emergence of antibiotic resistance at different times, it is recommended that physicians avoid blind treatment and ensure antibiotic susceptibility testing in patients with candidemia.

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Introduction

Bacteremia refers to the presence of live bacteria in the blood. Asymptomatic bacteremia can occur during normal daily activities, such as oral hygiene and after minor medical procedures. In a healthy person, these infections are transient and do not cause further sequelae. However, when the immune system is compromised, bacteremia can develop into a broad spectrum of clinical conditions. Untreated, clinically significant bacteremia progresses to systemic inflammatory response syndrome, multiple organ dysfunction syndrome, sepsis, and septic shock [1]. Bacteremia is an important factor for morbidity and mortality in both developing and developed countries. The "gold standard" method for diagnosing bacteremia remains blood culture [2]. Blood culture can provide both definitive microbiological evidence of infection and serve as a vital tool for monitoring the serious global health threat posed by antimicrobial resistance [3]. Various studies have shown that the most important bacteria isolated from blood as infectious agents are *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas*, *Klebsiella*, and *Streptococcus*, and that their frequency varies depending on the geographical region [4-9]. Various organisms have different sensitivities to antibiotics, and successful treatment depends on identifying the pathogen and using the appropriate medication. Delays in treatment, inappropriate and unnecessary use, and sometimes the use of ineffective drugs have led to antibiotic resistance [10]. To reduce antibiotic resistance and to prescribe appropriate antibiotics for bacteremia, it is essential to report bacterial antibiotic resistance [11]. Knowledge of the common bacteria causing bacteremia in each region helps physicians choose appropriate antibiotics and guide patient treatment. Data on the prevalence of bacteremia, the use of blood cultures, and antibiotic susceptibility in Jiroft city are minimal. This study aimed to determine the prevalence of bacteremia and antibiotic susceptibility in teaching hospitals in Jiroft city.

Materials and Methods

This study was cross-sectional. The files of patients hospitalized in Jiroft teaching hospitals with suspected bacteremia from 21 March 2018 to 20 March 2019, for whom blood cultures were performed, were studied. Age, gender, blood culture results, isolated organism, and bacterial sensitivity were evaluated. The resulting data were organized and sorted according to the research objectives, then entered into SPSS and analyzed using descriptive statistics. In some cases, percentages were calculated manually. All hospitalized patients suspected of bacteremia who had blood cultures were included in the study, and the rest were excluded.

Results

Considering the total number of blood cultures sent during one year (1518) and the number of positive cultures (51), the prevalence of bacteremia in teaching hospitals in Jiroft city was calculated as 3.36%. The mean age of patients with bacteremia was 36.7 years. The highest rate of bacteremia was in the age group under one year. The lowest rate of bacteremia was observed

in the 2-9-year age group (Table 1). The prevalence of bacteremia was 58.52% in men and 41.48% in women. The neonatal ward had the highest (33.33%), and the women's ward had the lowest (0%) prevalence of bacteremia. A significant portion of the bacteria grown were Gram-negative pathogens (66.67%). Gram-positive pathogens accounted for 33.33% of the bacteria grown. A total of 7 bacterial strains were isolated from the samples. *Escherichia coli* (23.53%) was the most frequently isolated bacterium, and *Proteus* (3.92%) was the least frequently isolated bacterium. *Staphylococcus* (23.44%), *Acinetobacter* (13.73%), *Enterobacter* (13.73%), *Klebsiella* (11.76%), and *Streptococcus* Spp (9.8%) were other isolated bacteria. In gram-negative bacteria, the highest antibiotic susceptibility rates were observed with cotrimoxazole, amikacin, and imipenem (41.17%), and the highest antibiotic resistance was observed against ceftriaxone (47.05%) (Tables 2, 3). In Gram-positive samples, the highest antibiotic sensitivity was observed to vancomycin (47%), and the highest antibiotic resistance was observed to co-trimoxazole (47%) (Tables 4, 5).

Discussion

In our study, the prevalence of bacteremia was 3.36%. The prevalence of bacteremia in patients referred to the intensive care unit has been reported to be 3.2% to 4.3%. Although our study was conducted across different hospital departments, the disease prevalence was within the same range and therefore similar to that reported in this study [12]. Several factors influence the outcome of patients with bacteremia, including the type and source of bacteremia (primary versus secondary) and the site of acquisition (community or hospital) [13, 14]. Secondary bacteremia with an abdominal or pulmonary source has been shown to have a higher mortality rate than primary bacteremia [14]. Similarly, studies have reported a higher mortality rate in hospital-acquired bacteremia than in community-acquired bacteremia [14-16]. In our study, the highest prevalence of bacteremia was observed in males (58.82%), consistent with the study by Orteja M. et al. conducted in Barcelona, Spain [17].

Table 1. Absolute and relative frequency of bacteremia based on different age groups

Age groups	Absolute frequency	Relative frequency (%)
0-1	17	33.33
2-9	1	1.96
10-17	3	5.88
18-35	7	13.73
36-50	3	5.88
51-70	8	15.69
> 70	12	23.53
Total	51	100

Table 2. Antibiotic susceptibility rates in gram-negative bacteria

Antibiotic	Absolute frequency	Relative frequency (%)
Cotrimoxazole	14	41.17
Amikacin	14	41.17
Imipenem	14	41.17
Ceftazidime	11	32.35
Ceftriaxone	10	29.41
Nitrofurantoin	9	26.47
Gentamicin	7	20.58
Ceftisoxim	6	17.64
Cefixime	6	17.64
Ciprofloxacin	5	14.70
Meropenem	3	8.82
Clistin	3	8.82
Cefepime	2	5.88
Cefazolin	2	5.88
Nalidixic Acid	1	2.94
Vancomycin	1	2.94
Novobiocin	1	2.94
Total number of samples	34	

Table 3. Antibiotic resistance rates in gram-negative bacteria

Antibiotic	Absolute frequency	Relative frequency (%)
Ceftriaxone	16	47.05
Cotrimoxazole	14	41.17
Cefixime	13	38.23
Gentamicin	11	32.35
Cefazolin	10	29.41
Cefazidime	10	29.41
Ciprofloxacin	10	29.41
Cefepime	8	23.52
Ampicillin	7	20.58
Nalidixic Acid	5	14.70
Amikacin	5	14.70
Nitrofurantoin	4	11.76
Imipenem	4	11.76
Cephalexin	3	8.82
Erythromycin	2	5.88
Colistin	1	2.94
Tetracycline	1	2.94
Total number of samples	34	

Table 4. Antibiotic susceptibility rates in Gram-positive bacteria

Antibiotic	Absolute frequency	Relative frequency (%)
Vancomycin	8	47.05
Gentamicin	6	35.29
Cotrimoxazole	6	35.29
Clindamycin	4	23.52
Ciprofloxacin	3	17.64
Erythromycin	2	11.76
Ceftriaxone	2	11.76
Ampicillin	2	11.76
Nitrofurantoin	2	11.76
Novobiocin	2	11.76
Tetracycline	2	11.76
Cefazolin	2	11.76
Azithromycin	1	5.88
Cefazidime	1	5.88
Cefixime	1	5.88
Total number of samples	17	

Table 5. Antibiotic resistance rates in Gram-positive bacteria

Antibiotic	Absolute frequency	Relative frequency (%)
Cotrimoxazole	8	47.05
Penicillin	6	35.29
Cefixime	6	35.29
Azithromycin	6	35.29
Erythromycin	6	35.29
Ciprofloxacin	5	29.41
Clindamycin	4	23.52
Gentamicin	3	17.64
Ceftriaxone	3	17.64
Amikacin	3	17.64
Cefazimide	2	11.76
Ampicillin	2	11.76
Meropenem	2	11.76
Imipenem	1	5.88
Tetracycline	1	5.88
Novobiocin	1	5.88
Vancomycin	1	5.88
Nitrofurantoin	1	5.88
Total number of samples	17	

In the present study, the mean age of patients with bacteremia was 36.7 years, whereas in Ma's study, the average age was 39 years. Ma's study was conducted in adult patients, whereas our study included infants and children, which may explain the lower average age in our study. In our study, Gram-positive bacteria were isolated more frequently than Gram-negative bacteria [18]. This result was in agreement with the study by Shorr et al. in the United States [15] and opposed to the study conducted by Nasa et al. in India [14]. In our study, the most common microbial family in all samples was Enterobacteriaceae (49.02%), followed by Staphylococci (33.33%). These results were consistent with those of Orteja et al. [17]. In the present study, *Escherichia coli* was the most commonly isolated bacterium. This result was similar to those of the study conducted by Nasa et al. in India, but there was a slight difference in the isolated bacterial genus [14]. The differences in some results may be due to age, gender, geographical region, hospital department studied, and underlying disease of the patients. In our study, the highest antibiotic sensitivity rate among Gram-positive bacteria was to vancomycin (47.05%), consistent with the findings of Mozaffari et al. [19]. In our study, the highest antibiotic resistance in gram-positive bacteria was observed with co-trimoxazole (47.05%), whereas in the study by Mozaffari et al. [19], gram-positive bacteria showed the highest resistance to cloxacillin (65.5%). The discrepancy in this result may be due to the fact that the cloxacillin antibiogram disk was not used in our study; therefore, we cannot provide information on the resistance of isolated bacteria to this drug. In our study, the highest antibiotic sensitivity rate in Gram-negative bacteria was to co-trimoxazole, amikacin, and imipenem (41.17%). In the study, the highest antibiotic resistance in gram-negative bacteria was related to co- ceftriaxone (47.05%). Diseases such as diabetes mellitus, human immunodeficiency virus, liver cirrhosis, chronic lung disease, alcoholism, frequent injections, and use of corticosteroids are risk factors for bacteremia [20]; however, in this study, risk factors were not examined due to a lack of access.

Conclusion

We presented blood culture findings from patients suspected of bacteremia from two large hospitals in Jiroft city. The pathogens isolated from patients were mainly *Escherichia coli* and *Staphylococcus* Spp. Blood cultures may be positive in only a small number of suspected patients admitted to the intensive care unit. However, the prognosis of those patients with positive blood cultures is worse, especially if the cultures are positive despite antibiotic therapy. The present study also reported the antibiotic resistance status of patients with positive blood cultures. Although the effects of antibiotics in the laboratory environment differ from those in the human body, the data obtained raise serious concerns about antibiotic resistance among common bacteria in Jiroft city.

Ethical Considerations

This study was conducted after obtaining ethical approval from the Ethics Committee of Jiroft University of Medical Sciences (IR.JMU.REC.1398.27), and the results were reported without naming the individuals.

Funding Statement
None.

Conflict of Interest
The authors declared no conflict of interest.

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Data Availability Statement
The data presented in this study are available on request from the corresponding author.

Authors' Contributions
M.T.S: was responsible for designing the review protocol, conducting the literature review, providing feedback on the manuscripts, writing the manuscript and improving the interpretation of the results. E.E: was responsible for writing the manuscript, assembling data, analyzing data, and interpreting analyses.

References

[1]. Smith DA, Nehring SM. Bacteremia. 2023. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025.
[2]. Soedarmono P, Diana A, Tauran P, Lokida D, Aman AT, Alisjahbana B, et al. The characteristics of bacteremia among patients with acute febrile illness requiring hospitalization in Indonesia. PLoS One. 2022; 17(9): 273414.
[3]. Prestinaci F, Pezzotti P, Pantosti A. Antimicrobial resistance: a global multifaceted phenomenon. Pathog Glob Health. 2015; 109(7): 309-318.
[4]. Erfani Y, Safdari R, Rasti A. Susceptibility of enterobacteriaceae isolated from blood cultures in patients of Shariati Hospital in 2003. J Payavard Salamat. 2006; 1(1): 17-23.
[5]. Karlowsky JA, Jones ME, Draghi DC, Thornsberry C, Sahm DF, Volturo GA. Prevalence and antimicrobial susceptibilities of bacteria isolated from blood cultures of hospitalized patients in the United States in 2002. Ann Clin Microbiol Antimicrob. 2004; 3: 7.
[6]. Asrat D, Amanuel YW. Prevalence and antibiotic susceptibility pattern of bacterial isolates from blood culture in Tikur Anbassa Hospital, Addis Ababa, Ethiopia. Ethiop Med J. 2001; 39(2): 97-104.
[7]. Kumhar GD, Ramachandran VG, Gupta P. Population, nutrition. bacteriological analysis of blood culture isolates from neonates in a tertiary care hospital in India. J Health Popul Nutr. 2002; 20(4): 343-47.
[8]. Hadziyannis AS, Stephanou I, Dimarogona K, Pantazatou A, Fourkas D, Filiagouridis D, et al. Blood culture results during the period 1995-2002 in a Greek tertiary care hospital. Clin Microbiol Infect. 2004; 10(7): 667-70.
[9]. Mohammadi F, Moshirpanahi Aliabad D, Razzaghi M, Hoseinzadeh E, Doosti Irani A. Frequency and pattern of bacterial antibiotic resistance in blood culture samples of hospitalized patients in besat hospital in Hamadan (2010-2020). Avicenna J Clin Med. 2022; 29(2): 102-109.
[10]. Nimri LF, Rawashdeh M, Meqdam MM. Bacteremia in children: Etiologic agents, focal sites, and risk factors. J Trop Pediatr. 2001; 47(6): 356-60.
[11]. Eacher MH, Shah A, Livermore DM, Wale MC, Graham C, Johnson AP, et al. Bacteraemia and antibiotic resistance of its pathogens reported in England and Wales between 1990 and 1998: trend analysis. BMJ. 2000; 320(7229): 213-16.
[12]. Hugonnet S, Harbarth S, Ferrière K, Ricou B, Suter P, Pittet D. Bacteremic sepsis in intensive care: Temporal trends in incidence, organ dysfunction, and prognosis. Crit Care Med. 2003; 31(2): 390‑94.
[13]. Friedman ND, Kaye KS, Stout JE, McGarry SA, Trivette SL, Briggs JP, et al. Health care‑associated bloodstream infections in adults: A reason to change the accepted definition of community acquired infections. Ann Intern Med. 2002; 137(10): 791‑97.
[14]. Nasa P, Juneja D, Singh O, Dang R, Arora V, Saxena S. Incidence of bacteremia at the time of ICU admission and its impact on outcome. Indian J Anaesth. 2011; 55(6): 594-98.
[15]. Shorr AF, Tabak YP, Killian AD, Gupta V, Liu LZ, Kollef MH. Healthcare‑associated

bloodstream infection: A distinct entity? Insights from a large U.S. database. Crit Care Med. 2006; 34(10): 2588-595.

[16]. Vallés J, Calbo E, Anoro E, Fontanals D, Xercavins M, Espejo E, et al. Bloodstream infections in adults: Importance of healthcare associated infections. J Infect. 2008; 56(1): 27-34.

[17]. Ortega M, Almela M, Martinez JA, Marco F, Soriano A, López J, et al. Epidemiology and outcome of primary community-acquired bacteremia in adult patients. Eur J Clin Microbiol Infect Dis. 2007; 26(7): 453-57.

[18]. Ma J, Li N, Liu Y, Wang C, Liu X, Chen S, et al. Antimicrobial resistance patterns, clinical features, and risk factors for septic shock and death of nosocomial E coli bacteremia in adult patients with hematological disease: A monocenter retrospective study in China. Medicine (Baltimore). 2017; 96(21): 6959.

[19]. Mozafari A, Asghari F, Hosseini SZ. Bacterial etiology and antibiotic resistance of neonotal sepsis. Med J Tabriz Uni Med Sciences 2006; 27(4): 107-110.

[20]. Naber CK. Staphylococcus aureus bacteremia: epidemiology, pathophysiology, and management strategies. Clin Infect Dis. 2009; 48 (S 4): 231-37.