

DRUG RESISTANCE PATTERN IN ISOLATED BACTERIA FROM BLOOD CULTURES

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Abstract- Bacteremia is an important infectious disease which may lead to death. Common bacteria and pattern of antibiotic resistance in different communities are different and understanding these differences is important. In the present study, relative frequency and pattern of drug resistance have been examined in bacteria isolated from blood cultures in Razi Hospital laboratory. The method of the study was descriptive. Data collection was carried out retrospectively. Total sample consisted of 311 positive blood cultures from 1999 to 2001. Variables under study were bacterial strains, antibiotics examined in antibiogram, microbial resistance, and patients' age and sex. The most common isolated bacteria were *Salmonella typhi* (22.2%) and the least common ones were *Citrobacter* (1.6%). The highest antibiotic resistance was seen against amoxicillin (88.4%). The proportion of males to females was 1:1 and the most common age group was 15-44 (47.3%). Common bacteria and pattern of antibiotic resistance were different in some areas and this subject requires further studies in the future.

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Key words: Blood culture, microbial drug resistance, antibiotics

INTRODUCTION

Despite important progresses in treatment and prevention of infectious diseases, they are considered as leading causes of death and disability and worsening life quality especially for millions of people in developing countries (1). Bacteriemia has an increasing trend in some regions of the world (2). The isolated bacteria are numerous (3-5) and their associated diseases need urgent and invasive management with antimicrobial drugs. Rational and correct use of these agents requires understanding of common pathogens and drug resistance pattern in the region (6). Nowadays, bacterial drug resistance is an important problem, and due to wide variations in bacterial drug resistance, results of studies and reports in one region or in a period of time are not necessarily true for other regions or periods of time. They are related with a series of social, environmental, and technological changes (3,6,7). We attempt to determine the common bacteria species isolated from blood culture, and their drug resistance in Guilan province.

MATERIALS AND METHODS

In a descriptive retrospective study, we reviewed records of patients referred to Razi Hospital laboratory between March 1999 to March 2001. Research population consisted of all positive blood culture reports (about 4800 cases of test samples during the study period) of patients older than 15 years and study instrument was laboratory report sheets of blood culture results and antibiograms.

The following variables were investigated: age and sex of patients, microbial species (as recorded in blood culture reports), and drug resistance (or sensitivity) as recorded in antibiograms forms. Drug resistance pattern was defined as relative frequency of differences in microbial resistances according to laboratory records. In this research, resistance is referred to cases that has been determined by the hospital lab.

RESULTS

There were 149 (47.9%) positive blood culture reports for males and 162 (52.1%) for females (male:female ratio 1:1.1). Relative frequency for bacteriemia for all examined samples was 6.5%. Table 1 shows relative frequencies for different bacteria in positive

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blood culture reports. There were 69 (22.2%) cases of *Salmonella typhi* (the most common) and 5 (1.6%) cases of *Citrobacteria* (least common) in isolated bacteria. For males, *S. typhi* (35 reports) and for females, *S. typhi* and *E.Coli* (each 34 reports) were the most common isolated bacteria and *Klebsiella* (two reports) and *Citrobacter/ascintobacter* (two reports each) were least frequent in males and females, respectively.

Table 2 shows relative frequencies for isolated

bacteria according to ages of patients. In 15 - 44 years age group, *Salmonella typhi* (62 reports, 42.2%), and *Ascintobacter / Citrobacteria* (each one report; 0.7%); in 45-64 years age group *E.Coli* (20 reports, 22.5%), and *Citrobacteria* (one report, 1.1%) had highest and lowest frequencies, respectively.

The highest resistance and sensitivity of bacteria against antibiotics and relative frequencies of resistances for isolated bacteria against antibiotics are shown in table 3 and figure 1.

Table 1. Relative frequency for different bacteria in positive blood culture reports by sex of patients*

Bacteria	Sex		Total
	Male	Female	
<i>Salmonella typhi</i>	35(23.5)	34(21)	69(22.2)
<i>Staphylococcus aureus</i>	29(19.5)	24(14.8)	53(17)
<i>E.Coli</i>	15(10.1)	34(21)	49(15.8)
<i>Coagulase negative Staph.</i>	27(18.1)	22(13.6)	49(15.8)
<i>Pseudomonas aeruginosa</i>	12(8.1)	8(5)	20(6.4)
<i>Entrobacteriace</i>	7(4.7)	10(6.2)	17(5.5)
<i>Klebsiella</i>	2(1.3)	13(8)	15(4.8)
<i>Streptococcus</i>	8(1.3)	6(3.7)	14(4.5)
<i>Proteus spp.</i>	5(3.3)	7(4.3)	12(3.8)
<i>Ascintobacter</i>	6(4)	2(1.2)	8(2.6)
<i>Citrobacteria</i>	3(2)	2(1.2)	5(1.6)
Total	149(100)	162(100)	311(100)

*Data are given as number (percentage)

Table2. Relative frequencies of drug resistances according to the type of the organisms and age-groups*

Age group (year)	Organisms											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
15-44	62 (42.2)	20 (13.6)	8 (5.4)	24 (16.3)	3 (2)	7 (4.8)	5 (3.4)	9 (6.1)	7 (4.8)	1 (0.7)	1 (0.7)	147 (100)
45-64	5 (5.6)	18 (20.2)	20 (22.5)	18 (20.2)	9 (10.2)	5 (5.6)	4 (4.5)	2 (2.2)	4 (4.5)	3 (3.4)	1 (1.1)	89 (100)
65-74	1 (1.8)	11 (19.6)	14 (25)	6 (10.8)	7 (12.5)	3 (5.3)	6 (10.8)	3 (5.3)	0 (0)	3 (5.3)	2 (3.6)	56 (100)
> 75	1 (5.3)	4 (21)	7 (36.8)	1 (5.3)	1 (5.3)	2 (10.4)	0 (0)	0 (0)	1 (5.3)	1 (5.3)	1 (5.3)	19 (100)
Total	69 (22.2)	53 (17)	49 (15.8)	49 (15.8)	20 (6.4)	17 (5.5)	15 (4.8)	14 (4.5)	12 (3.8)	8 (2.6)	5 (1.6)	311 (100)

Key: (1), *Salmonella typhi*; (2), *Staphylococcus*; (3), *E. Coli* ;(4),Coagulase Negative Staph; (5),*Pseudomonas Aeruginosa*;(6), *Entrobacteria*; (7),*Klebsiella*; (8), *Streptococcus* ;(9),*Proteus* ; (10), *Ascintobacter*; (11),*Citrobacteria*;(12), Total.

*Data are given as number (percentage).

Table 3. The highest resistance and sensitivity for some bacteria against antibiotics

Bacteria	Highest resistance (%)	Highest sensitivity (%)
<i>Salmonella typhi</i>	Amoxicillin (88.4)	Chloramphenicol (97.2)
<i>Staphylococcus Aureus</i>	Amoxicillin (100)	Chloramphenicol (90.60)
<i>E.Coli</i>	Amoxicillin (91.8)	Ceptizoxim (83.7)
<i>Pseudomonas Aeroginosa</i>	Amoxicillin (95), Cephalotin (95)	Ciprofloxacin (90)
<i>Entrobacteria</i>	Ampicillin (82.3)	Ciprofloxacin (88.2)
<i>Klebsiella</i>	Ampicillin, Amoxicillin (100)	Ceptizoxim (93.3)
<i>Streptococcus</i>	Amoxicillin (85.7)	Doxycyclin (78.6)
<i>Ascintobacter</i>	Ampicillin (100)	Amikacin, Ciprofloxacin (87.5)
<i>Citrobacteria</i>	Amoxicillin (100)	Amikacin, Ciprofloxacin (80)
All bacteria	Amoxicillin (92)	Ciprofloxacin (80.7)

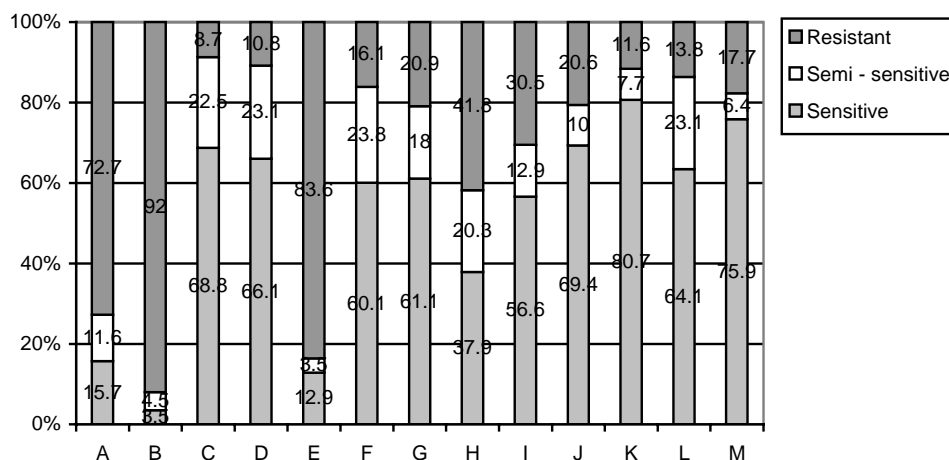


Fig. 1. Relative frequencies of resistances for isolated bacteria against antibiotics.

Key : A, Ampicillin; B, Amoxicillin; C, Amikacin; D, Tobramycin; E, Penicillin; F, Ceptizoxim; G, Doxycyclin; H, Cephalixin; I, Cephalotin; J, Cotrimoxazol; K, Ciprofloxacin; L, Kanamycin; M, Chloramphenicol.

DISCUSSION

Bacteremia is an important and frequent condition with increasing mortality (2). The purpose of this study was to determine common types and drug resistance pattern of bacteria isolated from blood culture. In this study, relative frequency of bacteremia was 6.5, with the most common bacteria being *S. typhi* (22.2%) and the least frequent, *Citrobacter* (1.6%). In a British study, the most frequent bacteria was *E.Coli* (21-23%) and the least frequent ones were *Entrobacter* and *Pseudomonas* (1-3%). Furthermore, an study in California indicated that the most frequent bacteria were *Staphylococcus*, *E.Coli*, and *Streptococcus*, in decreasing order of frequency. The reason for such a discrepancy is that typhoid is probably an

endemic disease in the region. In a similar study in Kerman province, Iran, it is reported that *Salmonella* spp. with 5.58% frequency was the 6th ranked bacteria isolated from blood cultures (8) which requires further studies to determine the reasons for this discrepancy.

In our study, bacteria showed highest and lowest resistance against amoxicillin and amikacin (92% and 8.7%), respectively. In a study in Ahvaz, south of Iran, there were 66.6 percent resistance against penicillin and cephalosporin (9). In a study in England, microbial resistance was most frequent in age group older than 75 years, and least in 10-14 years age group (437.3 and 14.51 per 100000, respectively) (3). Our study showed that it is most frequent in 15-44 years group (47.3%) and least frequent in age group older than 75 years (6.1%). Because we didn't include

the age group of 15 years and lower in our study and because of frequency of *S.typhi* in our study, we can explain these obvious differences.

There was at least 14.7 % of antibiotic resistance for one *S.typhi* spp. in our study (highest resistance for amoxicillin 88.4% and highest sensitivity for chloramphenicol 97.2%). We found no evidence in literature reviews abroad, probably because there are no *S.typhi* infections in industrially developed countries (3,4). *Staphylococcus* spp. Resistances are reported 71.42% and 90% (3,4) against penicillin and 0.4% for gentamycin (10). In our study, it was 100% and 17% for amoxicillin and gentamycin, respectively. For other antibiotics as mentioned earlier, these differences may be due to different samples or differences in drugs pattern uses (10). In one report (from England) *E.Coli* showed totally 2.2% resistance against gentamycin (3). In our study *E.Coli* has shown at least one antibiotic resistance pattern in 33% of its cultures. Its gentamycin resistance cases were 4.1%; this is probably because of different patterns of antibiotics' uses, especially for urinary infections. In many centers, antibiotics are used empirically as prophylactic treatment (4). In our study, coagulase negative *Staphylococcus* spp. showed resistance at least for one antibiotic drug. The highest resistance against amoxicillin was 96% and the highest sensitivity for ampicillin was 92%. In above-mentioned report (3) of England, streptococcus spp. has shown penicillin resistances in 3.6% of cases, but it is not comparable with our study because of different methods in detecting resistances. Our study suggests that the common isolated bacteria of blood cultures in Guilan Province (Rasht) especially in young adults are *S.typhi*; and common bacterial resistances are for amoxicillin. Finally, we suggest in all bacteremia forms the use of amoxicillin be avoided and for treatment, the highest sensitivity as mentioned in tables above would be considered. Also because of continuous changes in trends of resistance and its patterns, we suggest similar studies be carried out periodically for appropriate antibiotics.

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