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ANTIBIOTIC RESISTANCE RATIO OF *ACINETOBACTER BAUMANNII* AGAINST TO TEN ANTIBIOTICS AND MULTIDRUG RESISTANCE INDEX

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ABSTRACT

To assignation the grade of resistance to the widely used antibiotics in 50 clinical isolates of *Acinetobacter baumannii* were collected from special hospital in Muğla and recorded at specimens. The new BD PHOENIX automated microbiology system (Becton Dickinson Diagnostic Systems, Sparks, Md.) is designed for automated rapid antimicrobial susceptibility testing and identification of clinically relevant bacteria. MIC results previously obtained in recent clinical isolates with well-defined in isolates with well-characterized resistance mechanisms with the microdilution method were re-interpreted for the susceptible, intermediate and resistant categories using the 2012 EUCAST breakpoints. Clinical samples are most commonly isolated from tracheal aspirates, wound site, blood, mucus, abscess, catheter, urine samples, throat and nose cultures. All isolates were defined as Cefoperazone/Sulbactam and Colistin resistant. The resistance rates for Meropenem, Imipenem, Ampicillin/Sulbactam, and Ciprofloxacin were 96%, 96%, 94% and 94% respectively. All of 50 isolates (100%) isolates showed Multiple Antibiotic Resistance (MAR) four to ten antibiotics. These resistance rates are considered indicators of a gradual increase in difficulties treating *Acinetobacter* infections. This would facilitate the active monitoring of resistance frequency and distinguish antibiotic resistance trends and prevalence, all of which would be effective tools in antibiotic treatment programs.

KEYWORDS:
Acinetobacter baumannii, antibiotic resistance, Multiple Antibiotic Resistance (MAR)

INTRODUCTION

Acinetobacter species, non-fermenting gram-negative bacilli that are ubiquitous in the environment, have emerged as important nosocomial pathogens [1]. Resistance to drying and to many commonly used antimicrobial agents are the key factors that enable these organisms to survive and spread in nosocomial environments [2]. Its ability to form biofilm and survive in the environment for extended periods in adverse conditions and in the presence of antibiotics are the factors contributing to its successful colonization in hospital environment and on medical devices [3]. Chromosomally encoded cephalosporinase, high level of efflux pump expression combined with a minimally permeable cell membrane confer intrinsic resistance to several commonly used antimicrobial agents [4]. It can cause different infection such as respiratory tract, bloodstream, urinary tract infections, meningitis, endocarditis, and wound infections [5]. *A. baumannii* often associated with epidemic outbreaks of infections. These infections are becoming harder to treat due to the rising number of nosocomial infections having the ability to resist all antimicrobials in use including Colistin [6]. Several studies also demonstrated in Turkey that *A. baumannii* have a high resistance to most antibiotics [7-12].

The aim of this study was to determine the characteristics and patterns of antibiotic resistance among isolates of *A. baumannii* recovered from clinical specimens in Muğla.

MATERIALS AND METHODS

Bacterial Isolates. Fifty *A. baumannii* were isolated from clinical samples in Muğla. Bacterial isolates were identified to level of species and subspecies by using the morphological and traditional biochemical tests and automatic diagnostic systems currently present in the market and commonly used for AST (Antimicrobial Susceptibility Testing) in clinical laboratories will therefore have to incorporate these criteria in their instruments to meet the needs of European microbiology laboratories according to standard methods [13]. All isolates were obtained from patients at intensive care units. In total, 50 *A. baumannii* were isolated from various clinical samples and detected by the PHOENIX (Becton Dickinson, USA) at the microbiology laboratory of our hospital between from January to December 2015. The PhoenixTM Automated Microbiology

System (BD Diagnostics, Sparks, MD, USA) is designed for the rapid bacterial identification at the species level and determination of AST of clinically significant human bacterial pathogens [14].

Antibiogram Profile of *A. baumannii*. MIC results previously obtained in recent clinical isolates with well-defined in isolates with well-characterized resistance mechanisms with microdilution method were re-interpreted for the susceptible, intermediate and resistant categories using the 2012 EUCAST breakpoints. Ten different antibiotics were used [15].

Multiple Antibiotic Resistance Index (MAR Index). For all isolates, we calculated the MAR index values (a/b, where a represents the number of antibiotics the isolate was resistant to, b represents the total number of antibiotics the isolate tested against). A MAR index value ≥ 0.2 is observed when isolates are exposed to high risk sources of human or animal contamination, where antibiotics use is common; in contrast a MAR index value <or = 0.2 observed when antibiotics are seldom or never used [16, 17].

RESULTS AND DISCUSSION

Nowadays antibiotic resistance of microorganisms is the most important problem in the infectious diseases [18, 19, 20]. *Acinetobacter* infections are isolated from various samples. Acinetobacter infections are most commonly isolated from tracheal aspirates, wound site, blood and urine samples [21]. Aral and his friends reported tracheal aspirate 30%, wound site 29% and blood 25% [22]. Kurtoğlu and his friends have determined tracheal aspirate 42%, wound site 28%, urine 12% and blood 10% [23]. Similarly, in our study, the bacteria was most commonly isolated in tracheal aspirate blood and mucus samples.

The results of the antibiotic susceptibility of the isolates are shown in Table 1. The numbers of isolates are shown in Table 1.

All of the *A. baumannii* strains, 50 (100%) isolates showed Multiple Antibiotic Resistance four to ten antibiotics (Table 2).

TABLE 1
Antibiotic suspectibility pattern of *A. baumannii i*solated from clinical samples.

Antibiotics	Resistance	Intermediate	Sensitive
SCP	50(100%)	0(0%)	0(0%)
CL	50(100%)	0(0%)	0(0%)
MEM	48(96%)	0(0%)	2(4%)
IPM	48(96%)	0(0%)	2(4%)
SAM	47(%94)	1(%2)	2(4%)
CIP	47(%94)	1(%2)	2(4%)
TZP	46(92%)	0(0%)	4(8%)
GM	43(86%)	0(0%)	7(14%)
AN	41(82%)	7(14%)	2(4%)
TGC	0(0%)	6(12%)	44(88%)

Abbreviation; SCP: Cefoperazone/Sulbactam CL: Colistin, MEM: Meropenem, IPM: Imipenem, SAM: Ampicillin/Sulbactam, CIP: Ciprofloxacin, TZP: Piperacillin tazobactam, GM: Gentamicin, AN; Amikacin, TGC: Tigecyline

TABLE 2
Number of clinical samples and Multiple Antibiotic Resistance Index 50 *A. baumannii* strains.

Source of isolates	Number of isolates and Percentage	Multiple Antibiotic Resistance Index (MAR)
Tracheal aspirate	17(34%)	0.7 (3isl), 0.8(13 isl), 1(1isl)
Blood	12(24%)	0.7(4isl), 0,8(6isl) 0,6(1isl) 1(1isl)
Wound	3(6%)	0.8(3isl)
Mucus	6(12%)	0.8(5isl), 1(1isl)
Urine	4(%8)	0,7(1 isl) 0,8(3isl)
Throat Cultures	3(6%)	0,4(1 isl) 0,8(2isl)
Catheter	2(4%)	0.7(1 isl), 0.8(1 isl)
Nose Cultures	1(2%)	0,8(1isl)
Abscess	2(4%)	0,8(1isl) 1(1isl)
Total	50	

Cefoperazone/Sulbactam (SCP) resistance was seen in 100% isolates in our study. Some researchers have reported SCP resistance rate to *A. baumannii* in clinical samples% [12,22, 23]. Our results were similar to El-Kholy et al. (2015) who also reported resistance to SCP was 100% [24].

Our rate of Colistin (CL) resistance was 100%. Dogan and his friends determined a resistance rate of 1.4%[25]. Advance of resistance to CL is probably connected to changes in *A. baumannii* lipopolysaccharide (e.g. acidification, acylation or the existence of intermediary antigens in connecting antibiotic to cell membrane [26].

We found that 96% isolates were resistance to Meropenem (MEM) in our study. Several investigators have informed MEM resistance rate to *A. baumannii* in clinical samples [9, 10, 12, 13, 27, 28]. Our results were similar to Evren and his friends who also reported resistance to MEM was 96% [29].

Our rate of Imipenem (IPM) resistance was 96%. Some scientists have notified IPM resistance rate to *A. baumannii* in different specimens [9, 10, 11, 12, 27, 28, 29, 30]. Similarly, the results of Sanal and Kilic (2014), who also reported resistance to IPM was 94% [31].

The rate of Ampicillin/Sulbactam (SAM) resistance was 94%. The other studies have reported (SAM) resistance rate to *A. baumannii* [10, 11, 27]. The results of Guven and his friends who also declared resistance to Ampicillin/Sulbactam resistance was 95,7% [10].

Ciprofloxacin (CIP) resistance was seen 94%. Several searchers have reported CIP resistance rate to *A. baumannii* in medical specimens [8, 9, 10, 13, 27, 30]. The data of our work were similiar to Guven et al. (2014), who also reported resistance to CIP resistance was 96,2% [10].

Our rate of Piperacillin/Tazobactam (TZP) resistance was 92%. In other studies, it declared TZP resistance rate to *A. baumannii* in clinical samples [10, 11, 12, 27, 28]. Similarly, the data of Direkel and his friens who also reported resistance to TZP was 92,8% [11].

We found that 86% isolates were Gentamycin (GM) resistance to in our study. Some scientists have informed GM resistance rate to *A. baumannii* [10, 11, 12, 27, 28]. The GM resistance rate was also in line with the results from Islamic Republic of Iran and India [29]. Our results were similar to Safari and his friends who also notified resistance to GM was 88% [33].

Amikacin (AN) resistance was seen 82%. Several searchers have reported AN resistance rate to *A. baumannii* in different clinical materials [12, 13, 15-19, 31, 34, 38]. Our results were similar to Safari et al. (2013) who also declared resistance to AN was 84% [33].

The rate of Tigecyline (TGC) resistance was 0%. In other works, it has been reported TGC resistance rate to *A. baumannii* in clinical samples [10, 11, 13, 28]. TGC is effective against *Acinetobacter* sp. [34, 35, 36], but the rates of resistance continue to increase [34].

It is commonly known that MDR (Multidrug Resistance) and PDR (Pan Drug Resistance) strain rates are high in nosocomial *A. baumannii* infections [38]. Some researchers have informed MDR and PDR from 4.7% to 15.5% [39, 40, 41].

CONCLUSION

In conclusion, results of this study demonstrate the need for effective surveillance of antimicrobial resistance in *A. baumannii* in Turkey and suggest that it is essential to use antibiotics with the most caution to prevent the emergence of drug-resistant strains. According to our results, TGC is used for *A. baumannii* infections. Furthermore, these findings indicate that the prevalence of antibiotic-resistant *A. baumannii* is high in Turkey, especially for the antibiotics of choice. This is an emerging concern to public health, particularly in the clinical management of persons with life-threatening *A. baumannii* infections. We strongly suggest the implementation of a countrywide surveillance system.

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