INTRODUCTION

In the intensive setting, Acinetobacter spp., increasingly causes nosocomial infections with mortality. In the clinical samples, the most commonly encountered opportunistic pathogen is Acinetobacter baumannii and because of its ability for colonization to the hospital setting and developing resistance, it leads to nosocomial infections that are difficult to treat. The most common and serious MDR pathogens take place in the abbreviation known as “ESKAPE” (E. faecium, S. aureus, K. pneumoniae, A. baumannii, P. aeruginosa, Enterobacter spp.). A. baumannii colonizes in the respiratory tract, skin, urinary system and gastrointestinal system, and frequently leads to pneumonia, surgical site infections, central catheter-related blood circulatory infection, probe-related urinary system infections and rarely community acquired...
pneumonia, meningitis, mediastinitis, osteomyelitis and cholangitis. Immunosuppression, use of wide spectrum antibiotics, respiratory tract interventions and intravascular interventions are predisposing factors for development of infections.

Because of the recently increasing resistance to carbapenems and studies reporting strains that are resistant to colistin, treatment is almost impossible in some cases. However, despite the developing resistance, combination of colistin and sulbactam seems to be the best treatment option in majority of the patients. Objective of this study was to evaluate changing antibiotics resistance in A. baumannii infections over years.

**METHODS**

**Bacterial Isolates:** In this study, the data of 56 inpatients diagnosed with nosocomial infection in which A. Baumannii was the agent according to CDC (Centers for Disease Control and Prevention) in Abant Izzet Baysal University Medical Faculty Hospital between January 2009 and December 2011 were retrospectively evaluated. Nosocomial isolate was defined as isolate grown from specimen that was sampled after 48 hours of hospitalization. A. baumannii strains which were considered as colonization were excluded from the study.

**Laboratory identification:** Patients information were obtained from laboratory records. Clinical samples collected from the patients were cultivated on 5% defibrinated sheep blood Colombia agar, Eosin Methylene Blue agar and Chocolate agar, and incubated at 37°C for 24 hours. Identification of the isolated microorganisms was carried out using conventional method and VITEK 2 automated system (bioMerieux Inc, Mercy L’etoil, Fransa).

**Antimicrobial Susceptibility Testing:** Antibiotic sensitivity testing was performed through VITEK 2 AST-N090 (bioMerieux Inc, Mercy L’etoil, Fransa) automated system for amikacin, amoxicillin-clavulanate, cefepime, ciprofloxacin, colistin, gentamicin, imipenem, meropenem, piperacillin-tazobactam, tetracycline, tigecycline and trimethoprim-sulfamethoxazole. Outcomes were interpreted according to CLSI (The Clinical and Laboratory Standards Institute) standards.

**Ethical considerations:** Ethical approval as obtained from the Ethical Committee of Faculty of Medicine, Abant Izzet Baysal University.

**Statistical Analysis:** Data analysis was done on Statistical Package for Social Sciences (SPSS), version 13.0. Data presented in the form of frequency and percentage.

**RESULTS**

Of the patients diagnosed with A.baumannii infection, 37 were males and 19 females with a mean age of 61.5 ± 19.1. Distribution of the samples in which A.baumannii strains were isolated is given in Table-I, while underlying diseases in the patients diagnosed with nosocomial infection and rate of device usage are shown in Table-II.

Forty-one (73.2%) patients were using wide spectrum antibiotic before the diagnosis. Mean duration between the hospitalization and diagnosis of infection was 23.1±21.5 days. Rate of mortality was 39.2% for all years, while this rate was found to be high as 46.1% in 2011. Distribution of nosocomial infections is presented in Table-III.

Evaluating all years, the most effective antibiotics on A.baumannii strains were found as colistin, tigecycline, imipenem and meropenem. However, a significant increase in antibiotic resistance against imipenem and meropenem was found in 2011. Colistin and tigecycline were studied only in 2011 and no resistant strain was found (Table-IV).

**Table-I: Distribution of A.baumannii strains according to the departments.**

| Departments               | n (%) |
|---------------------------|-------|
| Reanimation ICU           | 27 (48.4) |
| Emergency Department ICU  | 4 (7.2)  |
| Cardiovascular surgery ICU| 1 (1.7)  |
| Coronary ICU              | 1 (1.7)  |
| Intensive care units      | 33 (59)  |
| Cardiovascular surgery    | 8 (14.5) |
| Internal medicine         | 5 (8.9)  |
| Urology                   | 3 (5.5)  |
| General surgery           | 2 (3.5)  |
| Neurosurgery              | 2 (3.5)  |
| Plastic surgery           | 1 (1.7)  |
| Orthopedics and Traumatology | 1 (1.7) |
| Neurology                 | 1 (1.7)  |
| Non-intensive care unit   | 23 (41)  |
| Total units               | 56 (100) |

**Table-II: Underlying diseases and rate of device usage.**

| Underlying disease                  | n (%) |
|-------------------------------------|-------|
| Cardiac disease                     | 26 (46.4) |
| Surgical operation                  | 24 (42.9) |
| Diabetes mellitus                   | 22 (39.2) |
| Cerebrovascular disease             | 16 (28.6) |
| Renal failure                       | 14 (25)  |
| Chronic obstructive pulmonary disease| 11 (19.6) |
| Trauma                              | 8 (14.2) |
| Device usage rates                  | n (%)  |
| Urinary catheter                    | 43 (76.8) |
| Central venous catheter             | 40 (71.4) |
| Mechanical ventilation              | 33 (58.9) |
DISCUSSION

Multidrug resistant (MDR) *A. baumannii* is an opportunistic pathogen developing especially in the intensive care settings leading to infections such as bacteremia, Nosocomial Pneumonia, VAP, meningitis, CAUTI, central venous CRBSI and wound infection. Incidence of *A. baumannii* infections have increased in a number of regions in the world in the last decade and have caused to epidemics depending on the ability of this organism. In general, antibiotics effective against *A. baumannii* infections are carbapenems, polymyxins, sulbactam, tigecycline, and aminoglycosides.8,9 *A. baumannii* is the most commonly isolated from the respiratory tract, blood culture, wound and urine samples.10 That patients hospitalized in ICU mostly received wide spectrum antibiotic treatment leads to isolation of *A. baumannii* strains frequently from these units.11 It is reported to be the most commonly isolated agent in Reanimation ICU.12 In this study, 59% of *A. baumannii* strains were isolated from ICU (Reanimation 48%).

In the antibiotic sensitivity studies conducted in our country, resistance rates of *A. baumannii* are reported as 32-100% against ciprofloxacin, 91-100% against cefepime, 90-92% against piperacillin-tazobactam, 24-94% against amikacin and 18-85% against gentamicin.13 In this study, we found the resistance rates as 84.9 against ciprofloxacin, 95.5% against cefepime, 89.2% against piperacillin-tazobactam, 86.3% against amikacin and 76.5% against gentamicin and these results will remove these drugs from being an option for treatment.

The most important problem in treatment of *A. baumannii* infections is the increase of isolated strains resistant against multiple drugs together with the narrowing of the options in antibiotics to be used in the treatment. Carbapenem resistance rates are increasing to such an extent to threaten the world and this situation is gradually becoming a routine phenotype for the microorganism. Therefore, in order to take the microorganism under control, infection control strategies must be focused on besides the treatment options.14 Increasing carbapenem resistance in the *A. baumannii* isolates has resulted from expansion of certain carbapenem-resistant clones.15 Carbapenems (imipenem, meropenem) remain valuable among the treatment options in combination therapies in the MDR strains. In 2011 report by National Hospital Infections Surveillance Network, carbapenem resistance was reported as 57-83% in *A. baumannii* strains isolated in the hospital infections.16 Iraz et al reported a high rate of carbapenem resistance by 92%.12 In our study, rates of resistance to carbapenems had been 0% for imipenem and 20% for meropenem in 2009, while these rates raised to very high values with 88.4% for imipenem and 93.7% for meropenem in 2011.

Increase of carbapenem resistance raises the fact that the re-use of old antibiotics like polymyxin B. Colistin has a lower rate of mortality than carbapenems in treatment of MDR infections. It is recommended to be combined with rifampicin, sulbactam and carbapenems.17 However, recently colistin resistance is reported worldwide, especially in Europe.18 In our country, a resistance has not yet been seen at a high level. Ergin et al. reported colistin re-

### Table-III: Distribution of nosocomial infection types.

| Nosocomial infection types                              | n (%) |
|---------------------------------------------------------|-------|
| Ventilator-Associated pneumonia (VAP)                   | 11 (19.6) |
| Nosocomial Pneumonia (NP); including VAP                | 24 (42.8) |
| Central Venous Catheter-Related                          | 11 (19.6) |
| Bloodstream Infection (CRBSI)                           |       |
| Surgical Site Infection (SSI)                           | 11 (19.6) |
| Catheter-Associated Urinary                             | 8 (14.2) |
| Tract Infection (CAUTI)                                 |       |
| Mediastinitis                                           | 1 (1.8) |
| Soft tissue infection                                   | 1 (1.8) |

### Table-IV: Resistance rates of nosocomial A. baumannii strains between 2009 and 2011.

| Antibiotics                        | 2009 (n:14) | 2010 (n:16) | 2011 (n:26) | 2009-2011 (n:56) |
|------------------------------------|-------------|-------------|-------------|-----------------|
| Amikacin                           | 12 (83.3)   | 16 (93.7)   | 16 (81.2)   | 44 (86.3)       |
| Amoxicillin-clavulanate            | 14 (85.7)   | 7 (100)     | 19 (89.4)   | 40 (90)         |
| Cefepime                           | 14 (100)    | 11 (100)    | 20 (90)     | 45 (95.5)       |
| Ciprofloxacin                      | 14 (85.7)   | 15 (86.6)   | 24 (83.3)   | 53 (84.9)       |
| Colistin                           | 14 (85.7)   | 15 (86.6)   | 24 (83.3)   | 53 (84.9)       |
| Gentamicin                         | 14 (85.7)   | 15 (86.6)   | 24 (83.3)   | 53 (84.9)       |
| Imipenem                           | 10 (0)      | 16 (12.5)   | 26 (88.4)   | 52 (48.1)       |
| Meropenem                          | 10 (0)      | 6 (0)       | 16 (93.7)   | 32 (53.1)       |
| Piperacillin-tazobactam            | 10 (0)      | 7 (100)     | 15 (93.3)   | 28 (89.2)       |
| Tetracycline                       | 13 (23.1)   | 15 (40)     | 18 (72)     | 53 (50.9)       |
| Tigecycline                        | 13 (23.1)   | 15 (72)     | 18 (72)     | 53 (50.9)       |
| Trimethoprim-sulfamethoxazole      | 14 (78.5)   | 16 (93.7)   | 25 (76)     | 55 (81.8)       |
sistance as 2% in *A. baumannii*. In our study, all the 13 strains were found to be colistin sensitive.19

Tigecycline is a glycyclcline derived antibiotic which is in vitro effective on MDR *A. baumannii*. Baadani et al20 found tigecycline resistance as 4.7-20.5% in the *A. baumannii* isolates in two different hospitals. Studies conducted in our country reported tigecycline resistance as 0-12%.13 No tigecycline-resistant strain was detected in our study.

Inappropriate treatment administrations directly affect mortality.21 In this study, rate of mortality in *A. baumannii* infections is reported to between 22-44%.22 Lee et al demonstrated that in serious cases having *A. baumannii* bacteremia, 14-day mortality decreased to 13% from 29% with a proper antimicrobial treatment.23

It is inevitable for clinicians to develop a road map about the approaches to resistant *Acinetobacter* infections, including trainings on the infection control and proper antibiotic use based on the antibiotic sensitivity status in their regions. We believe that this approach will reduce the rates of resistant infections.

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INH, conceived, designed, editing of manuscript and manuscript writing
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HA did review and final approval of manuscript.