**Open Journal of Medical Microbiology, 2015, 5, 85-89**
Published Online June 2015 in SciRes. http://www.scirp.org/journal/ojmm
http://dx.doi.org/10.4236/ojmm.2015.52010

# Antimicrobial Susceptibility of Multidrug-Resistant *Acinetobacter baumanii* in a Teaching Hospital: A Two-Year Observation

**Cucunawangsih[1], Veronica Wiwing[1], Nata Pratama Hardjo Lugito[2]**

[1]Department of Microbiology, Faculty of Medicine, University of PelitaHarapan, Tangerang, Indonesia
[2]Department of Internal Medicine, Faculty of Medicine, University of PelitaHarapan, Tangerang, Indonesia
Email: cucunawangsih.fk@uph.edu, veronica.wiwing@uph.edu, nata.lugito@uph.edu

Received 22 April 2015; accepted 2 June 2015; published 5 June 2015



## Abstract

**Multidrug-resistant (MDR) *Acinetobacter baumanii* (*A. baumanii*) caused hospital acquired infection, typically in critical-ill patients with medical devices. This is a retrospective descriptive study on epidemiology and microbiology data to determine the antimicrobial susceptibility pattern of MDR-*Acinetobacter baumanii* isolates from a teaching hospital in Tangerang, Indonesia from Januari 2013 to December 2014. A total of 84 *A. baumanii* were collected. Patients suffering from respiratory tract infection had the highest number (41.7%) of *A. baumanii* isolate. There were 39 (46.6%) patients admitted in critical care. *A. baumanii* isolates in this study mostly were multidrug-resistant organisms with low susceptibility level to 11 antibiotic tested, 44% - 69% in 2013 and 26% - 67% in 2014. A high susceptibility level was observed to amikacin (80% and 79% in 2013, 2014 consecutively) and trimethoprim-sulfamethoxazole (73% and 72% in 2013, 2014 consecutively). *A. baumanii* is a hospital acquired pathogen in critically-ill patients. The susceptibility pattern of this study result showed MDR organism. There was a sharp decrease of susceptibility in all antibiotics studied from 2013 to 2014 except amikacin and trimethoprim-sulfamethoxazole.**

## Keywords

**Multidrug-Resistant *Acinetobacter baumanii*, Antimicrobial Susceptibility, Amikacin**

## 1. Introduction

*Acinetobacter baumnaii* (*A. baumanii*) is an opportunistic Gram-negative pathogen which has implicated in a

**How to cite this paper:** Cucunawangsih, Wiwing, V. and Lugito, N.P.H. (2015) Antimicrobial Susceptibility of Multidrug-Resistant *Acinetobacter baumanii* in a Teaching Hospital: A Two-Year Observation. *Open Journal of Medical Microbiology*, **5**, 85-89. http://dx.doi.org/10.4236/ojmm.2015.52010

wide range of infections, particularly in critically-ill patients with impaired immune response [1] [2]. The major characteristics of this infection include pneumonia, bacteriemia, meningitis, urinary tract infection, and surgical site infection [2] [3]. The usages of medical devices, such as vascular catheters or endotracheal tube for airway failure become the most frequent sources of *Acinetobacter* infections [4] [5]. In last decades, the emergence and rapid spread of Multidrug-resistant (MDR) *A. baumanii* causing a serious clinical problem in hospital acquired infection which is leading to an increased mortality with crude mortality rates parallel those attributed to other gram-negative bacilli (28% - 32%) [6] [7]. The susceptibility level of major group antibiotics used for treatment decreased rapidly and implicated in limited selection of empirical antibiotic therapy [8]. The information of these organisms and antibiotic susceptibility pattern among hospitalized patients in Indonesia is hard to find. This study was designed to determine the prevalence of MDR-*A. baumanii* and its antibiotic susceptibility pattern from a teaching hospital in Tangerang, Indonesia from January 2013 to December 2014.

## 2. Materials and Methods

This study was conducted in Siloam General Hospital, a new teaching hospital with 200 beds located in Tangerang, Indonesia. This was a retrospective descriptive study on epidemiology and microbiology data. The epidemiology data were collected from medical records of admitted patients with *A. baumanii* infection/colonization from January 2013 to December 2014. Microbiology and antimicrobial susceptibility results were extracted from laboratory data system and converted into a format which used for data analysis. The categorical data and antimicrobial susceptibility were presented as number and percentage. Identification and antibiotic susceptibility testing of all isolates was performed by an automated method from VITEX-2 Compact® (Biomérieux, France). The Interpretation of breakpoints was defined by guideline from Clinical and Laboratory Standard Institute (CLSI) [9]. *Escherichia coli* ATCC® 25922 and *Pseudomonas aeruginosa* ATCC 27853® were used as control isolate for susceptibility testing.

## 3. Results

The total number of isolates was 84, consisted of 45 and 39 in 2013 and 2014 consecutively. The highest number isolate of MDR-*A. baumanii* infection was observed in patients suffering from respiratory tract infection who were using endotracheal tube and admitted in critical care (41.7%).

Urinary tract infection caused by MDR-*A.baumnaii* (1.2%) while blood stream infection (8.3%). Source of MDR-*A. baumanii* isolate according to the specimen type was shown in **Table 1**. The characteristic of *A. baumanii* infected patient were shown in **Table 2**. The majority of patients were male (56%) with their age ranged between 14 to 65 year-old (73.8%). The patients with 0 to 14 years age range had the fewest number (7.2%), followed by >65 years (19%). A total of 39 (46.6%) patients were suffering from *A. baumanii* infection when admitted in critical care, and there were 1 (1.1%) patients admitted in pediatric department.

The frequency of MDR-*A. baumanii* which fluctuates during two-year observation was shown in **Figure 1**. The highest prevalence was in April 2013 and followed in May 2014. In accordance with this result, the number of *A. baumanii* isolates tested was higher in 2013 with 45 incidence and decline in 2014 with 39 incidences.

The antibiotic susceptibility level of MDR-*A. baumanii* to 11 antibiotic regimens was shown in **Figure 2**. Mostly *A. baumanii* isolate were multi-drug resistant. The susceptibility level was low to some antibiotic tested,

**Table 1.** Source of MDR-*A. baumanii* isolate according to the specimen type.

| Actual site of infection | Specimen type | MDR-*A. baumanii*n (%) |
|---|---|---|
| Respiratory tract | Sputum | 24 (28.5) |
| | Endotracheal tube secretion | 35 (41.7) |
| | Bronchial lavage | 2 (2.4) |
| Wound | Abscess aspirate/swab | 19 (22.6) |
| Urinary tract | Urine | 1 (1.2) |
| Blood stream | Blood | 3 (3.6) |

**Table 2.** General characteristic of MDR-*A. baumanii* from all patients.

| MDR-*A. baumanii* characteristic | 2013 (n = 45) | 2014 (n = 39) | Total (n = 84) |
|---|---|---|---|
| Sex | | | |
| Male | 28 (62.2%) | 28 (71.8%) | 56 (66.7%) |
| Female | 17 (37.8%) | 11 (28.2%) | 28 (33.3%) |
| Age | | | |
| 0 - 1 year | 2 (4.4%) | 1 (2.6%) | 3 (3.6%) |
| 1 - 14 year | 3 (6.7%) | 0 (0.0%) | 3 (3.6%) |
| 14 - 65 year | 30 (66.7%) | 32 (82%) | 62 (73.8%) |
| >65 year | 10 (22.2%) | 6 (15.4%) | 16 (19%) |
| Ward | | | |
| Critical care | 19 (42.2%) | 20 (51.3%) | 39 (46.6%) |
| General | 21 (46.7%) | 17 (43.6%) | 38 (45.3%) |
| Surgical | 4 (8.9%) | 0 (0.0%) | 4 (4.8%) |
| Pediatric | 1 (2.2%) | 0 (0.0%) | 1 (1.1%) |
| Maternity | 0 (0.0%) | 2 (5.1%) | 2 (2.2%) |

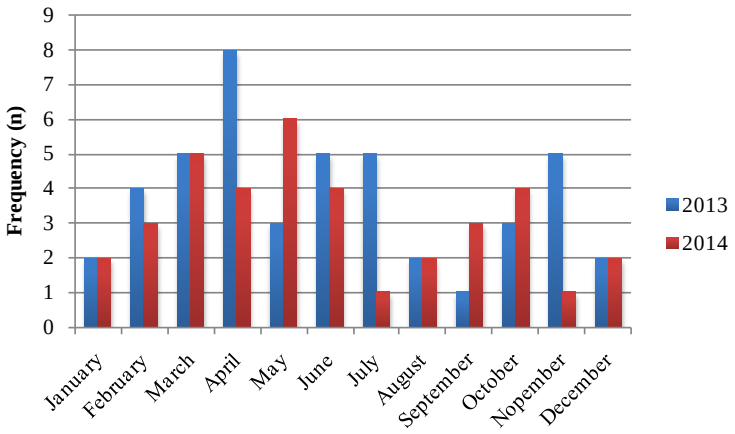


**Figure 1.** Frequency of MDR-*A. baumanii* in 2013-2014.

such as ampicillin/sulbactam69% and 38% in 2013 and 2014; ceftazidime 51% and 26% in 2013 and 2014; meropenem 69% and 41% in 2013 and 2014; levofloxacin 47% and 33% in 2013 and 2014. The highest susceptibility level was shown by amikacin (80% and 80% in 2013 and 2014) and trimethoprim-sulfamethoxazole (73% and 72% in 2013 and 2014). The other antibiotic also had moderate susceptibility level was tigecycline (78% and 67% in 2013 and 2014). In general, this study found out a sharp decreased of antibiotic susceptibility in all antibiotics studied from 2013 to 2014 except amikacin and trimethoprim-sulfamethoxazole.

## 4. Discussion

MDR-*A. baumanii* is a serious hospital acquired pathogen that has wide clinical spectrum, such as pneumonia, bacteriemia, urinary tract infection, surgical site infection especially in patients with medical devises, long duration of hospitalization, impaired immune response [10] [11]. Therefore, 46.6% patients who were admitted in intensive care in this study had high risk to acquired *A. baumanii* infection. Several studies have found that patients with co-morbidities and severe ill easily infected/colonized with this organism. However, the relationship

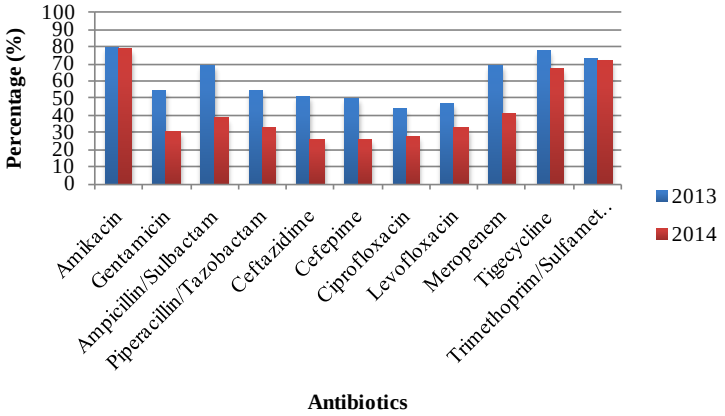


**Figure 2.** Changing trend of antimicrobial susceptibility in MDR-*A. baumanii* in 2013-2014.

between MDR-*A. baumanii* infection/colonization with co-morbidities did not significantly affect mortality but responsible for poor clinical outcome, need for mechanical ventilation and reduce functional status [12]. *Acinetobacter baumanii* can affected in any age group, from 0 year up to above 65 years, but most cases in this study were found in the aged group 14 - 65 year-old (73.8%), followed by elderly patients 19%. These results were similar with other study that shown MDR-*A. baumanii* infection was responsible for infection in patients aged group 0 - 80 year-old followed by the frequently affected in the age group above 60 years [4] [13].

*A. baumanii* in this study mainly isolated from lower respiratory tract (72.6%). These findings were similar with other result where *A. baumanii* was recovered from 45% - 50% patients [8] [13]. This organism also responsible for wound infection in 22.6% which much the same with the study that conducted in Saudi Arabia and Turkey, where the isolation rate was 22.3% and 27.5% [13] [14]. Bacteriemia caused by *A. baumanii* was found in 3.6% isolates and much alike with the previous study [13]. The last decades, there were increase hospital acquired infections by MDR-*A. baumanii* globally including Indonesia [11]. All isolates in this study were resistant to almost antibiotic classes and only susceptible to amikacin and trimethoprim-sulfamethoxazole. The growing prevalence of carbapenem resistance in this study was accordance with the other study in Turkey [15] [16]. This situation is also in line with the increased of inappropriate antibiotic consumption or overuse of ciprofloxacin and carbapenems in the hospital [13] [17] [18].

## 5. Conclusion

*A. baumanii* is a hospital acquired pathogen in critically-ill patients. The susceptibility pattern of this study result showed MDR organism. There was a sharp decrease of susceptibility in all antibiotics studied from 2013 to 2014 except amikacin and trimethoprim-sulfamethoxazole.

## Conflict of Interests

The authors declare that they have no conflict of interests regarding the publication of this paper.

## Acknowledgements

The authors would like to thank Siloam Teaching Hospital in Lippo Village, Tangerang, Indonesia who made this work possible. This study was supported by Faculty of Medicine, University of PelitaHarapan University. The funders had no role in study design, analysis and interpretation of data, writing of the manuscript, and in decision to submit the manuscript for publication.

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