

Acinetobacter baumannii antibiotics resistance in Iran

Abstract

One of the causes of nosocomial infection is *Acinetobacter baumannii* that is a gram-negative coccobacillus bacteria, especially in intensive care units (ICUs), which can produce various types of infections. The recent emergence of Multiple drug resistance (MDR) *A. baumannii* has become serious trouble and these MDR strains are quickly distributed among hospitalized patients. We performed a literature review published on antibiotic-resistant clinical *A. baumannii* isolates reported in Iran from 2012 to 2017. There was an increase in resistance to gentamicin, imipenem, meropenem, piperacillin, ampicillin/sulbactam, ticarcillin, tobramycin, aztreonam. This study indicates that drug-resistance against several antibiotics is occurring for *A. baumannii* in Iran. Traveling to high prevalence countries and overuse of antimicrobial agents could be the factors contributing to the high prevalence of resistance. To stop occurring this phenomenon, suitable solutions and accurate preventions must be taken.

Keywords: *acinetobacter baumannii*, Iran, antibiotic resistance

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Objectives

One of the causes of nosocomial infection is *A. baumannii* that is a gram-negative coccobacillus bacteria, especially in intensive care units (ICUs). It causes ventilator-associated pneumonia, bacteremia, surgical-site infections, secondary meningitis, and urinary tract infections.¹⁻³ Several factors may contribute to the virulence potential of *A. baumannii* such as OmpA, Pili, biofilm-associated protein (BAP) and phospholipase D and C.⁴⁻⁶ The recent emergence of MDR *A. baumannii* has become serious trouble and these MDR strains are quickly distributed among hospitalized patients. Three main mechanisms of antibiotics resistance involve disabling antibiotics with enzymes, decline entrance antibiotics into the target site of bacteria and alteration of the target or cellular functions.^{7,8} The World Health Organization (WHO) has published a list of priority pathogens that are resistant to antibiotics for research and development about new antibiotics, including *A. baumannii*, this shows the importance of antibiotic resistance of this bacterium.⁹ Therefore, to investigate the development of antibiotic resistance of this bacterium in Iran, we reviewed articles published in this regard in the years 2012 to 2017.

Methods

To gather the necessary information from published articles from national and international journals, research in various databases was

reviewed, including *PubMed*, *Google Scholar*, *Scopus*, *SID* from 2012 to 2017. Keywords for searching articles, inclusive “antibiotic, drug or antimicrobial resistance” with different combinations of other key text words such as *A. baumannii* and Iran. After analyzing the related articles, were categorized according to year and antibiotic for a better conclusion. Antibiotics investigated included Aminoglycoside, Fluoroquinolones, Penicillin, Carbapenem, Cephalosporin, Miscellaneous and Macrolide.

Results

We reviewed Thirty-six related articles that included 3011 *A. baumannii* clinical isolates and 25 antibiotics from 2012 to 2017.¹⁰⁻⁴⁵ Antibiotic resistance effect methods in investigated articles include disc diffusion assay (Kirby-Bauer) and molecular method (PCR). The data of antibiotic resistance of 3011 *A. baumannii* isolates are presented in Table 1. This information demonstrates that the resistance to amikacin, ciprofloxacin, levofloxacin, piperacillin, ticarcillin, ceftazidime, ceftriaxone, cefotaxime, cefepime, trimethoprim/sulfamethoxazole were high, the resistance to gentamicin, tetracycline, tobramycin, ampicillin/sulbactam, aztreonam, meropenem, imipenem were increased in these years and resistance to polymyxin B & colistin was less or decreased.

Table 1 Percentage of antibiotic resistance in clinical *Acinetobacter baumannii* isolates in Iran from 2012 to 2017

Antibiotic agents	Mean resistance rate (%) in studies reviewed		
	2016-2017	2014-2015	2012-2013
	n =467	n =992	n =1552
	(%)	(%)	(%)
Amikacin	76.5	76.88	83.93
Gentamicin	87.62	77.16	75.43
Tetracycline	89.5	78.3	73

Table continue

Antibiotic agents	Mean resistance rate (%) in studies reviewed		
	2016-2017	2014-2015	2012-2013
	n =467	n =992	n =1552
	(%)	(%)	(%)
Tobramycin	83	64.44	48.6
Tigecycline	15	-	48
Ciprofloxacin	99.83	86.56	92.88
Levofloxacin	99.75	61.8	96.13
Piperacillin	100	97.73	95.17
Pip/tazo	86.6	96.48	90.89
Ampi/sulba	95.5	80.47	73.45
Ticarcillin	100	-	97.63
Aztreonam	100	-	76.63
Imipenem	86.62	76.88	76.4
Meropenem	99.75	77.8	78.62
Ceftazidime	92.5	86.69	94.97
Ceftriaxone	76	85.72	97.23
Cefotaxime	100	99.8	95.76
Cefepime	-	94.04	95.83
Polymyxin B	0	6.39	3.54
Colistin	6	8.31	22.84
Trim/sulfa	-	81.34	84.5

Discussion and conclusion

A. baumannii colonization is important in patients with intubation who have multiple intravenous lines or surveillance devices, surgical drainage, or in vivo urinary catheters.⁴⁴ Controlling of *A. baumannii* infection is very difficult because of its resistance to different antimicrobial agents, despite resistance to imipenem, it is still the drug to selection.⁴⁵ The reports also showed that carbapenem-resistant isolates are increasing worldwide.⁴⁶⁻⁴⁸ Currently, lipopeptides antibiotics such as polymyxin B and colistin are used to treat MDR *A. baumannii*.^{22,49} According to studies in Iran, the average is 71%.⁵⁰ This prevalence is 67% in Iraq, 83% in the United Arab Emirates, 85% in Kuwait, 100% Pakistan, 74.2% in India, 98.9% in Turkey,³³ so one of the reasons for the high prevalence in Iran could be traveling to these countries. The overuse of antimicrobial agents is also effective. This study indicates that the antibiotic resistance of *A. baumannii* is high in Iran. Therefore, it is necessary to implement appropriate solutions and preventive programs.

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Conflicts of interest

The author declares no conflict of interest.

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