International Journal of Sciences & Applied Research

www.ijsar.in

The Multi-Antibiotics Resistance of *Acinetobacter baumannii* isolated from patients in ICU/Jordan

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Abstract

Acinetobacter baumannii is opportunistic organism despite of this causes a wide range of serious infections and is a major cause of bacteremia, pneumonia (particularly ventilator-associated pneumonia), meningitis and urinary tract infections and associated with increased morbidity and mortality rates. *A. baumannii* exhibits a level of intrinsic antibiotic resistance afforded by its decreased membrane permeability and robust efflux systems. in addition to genetic conjugation, some form of natural transformation may contribute to its additional ability to acquire foreign DNA under conditions of selective pressure in the antibiotic-rich hospital setting, which presents a major healthcare challenge. This study carried out in Al-basheir Hospital in Jordan. The main aim of this study will elucidate the Multi-Antibiotics Resistance of *Acinetobacter baumannii* which isolated from patients in ICU in al-basheir hospital /Jordan. The results appear that there is increase in patients whose suffer from *Acinetobacter* from OCT-2018 TO MAR -2019 and increase resistance of *Acinetobacter* to all antibiotic except (Tigacycline) for adult and (COLISTIN) for children and adult , and there is no difference between male and female

Keywords: *Acinetobacter baumannii, Diagnosis techniques and multi-Drug resistance*

1. Introduction: *Acinetobacter baumannii* is a typically short almost round, rod-shaped (coccobacillus) Gram-negative bacterium that is aerobic, pleomorphic , non-fermentative and non-motile [1]. It can be an opportunistic pathogen in humans, With respect to playing a role in causing disease in immunocompromised patients, *A. baumannii* exemplifies many parallels with the epidemiological observations made for *P. aeruginosa*; both organisms were initially thought to be of limited virulence and both have demonstrated a remarkable array of both intrinsic and acquired antibiotic-resistance genes.[2]There are 32 *Acinetobacter* named and unnamed species, which have been identified [3]. The *Acinetobacter species* cause infections, which are associated with increased morbidity and mortality rates [4, 5].*A. baumannii* is tolerant to wide ranges of temperature, pH, and humidity. Studies have shown that this bacterium can survive on dry surfaces for 5 months, posing a challenge to hospital infection control measures [4]; therefore, this pathogen is considered as

progressively important nosocomial pathogen, which can cause outbreak of serious infections. Despite the fact that the organism is often nosocomial, initial infection can be transmitted by patients, admitted from other hospitals [6, 7].The nature of modern intensive care probably favors the acquisition of antibiotic resistance in *A. baumannii* and the spread of this organism among patients, since its propensity for infection is characterized by multiple patients in close proximity with increasing use of invasive or indwelling treatments, high antibiotic use, an aging patient population and the potential for patient-to-patient spread via colonized or contaminated healthcare workers and surfaces.[8] Indeed, risk factors for MDR infection are invasive procedures, mechanical ventilation, central venous or urinary catheters, prolonged ICU stay and the use of broad-spectrum antibiotics[9,10]. The increasing development of multiple antimicrobial resistances in this pathogen has severely restricted the therapeutic options available for infected patients, and increased the length of stay in ICUs and mortality .[11] Despite intensive efforts, nosocomial acquisition of multi- resistant antibiotic or multi-drug resistant (MDR) AB is still a problem due to the great ability of AB to disseminate from and colonize human and environmental reservoirs.[12]. Recently, major endemic and epidemic outbreaks of MDR AB have developed in critically ill patients throughout the world; aggressive control measures to prevent the transmission and colonization of this pathogen are currently limited. [13]The incidence of MDR AB bacteremia has increased; thus, efforts to identify factors that influence the survival of patients with this pathology have been made. It is known that mortality increases with each hour that appropriate antimicrobial therapy is delayed in patients with septic shock. [18]In several studies, inappropriate, empirical, antimicrobial therapy was independently associated with poor clinical outcome, and early, appropriate, antimicrobial therapy was shown to improve survival in patients with an MDR AB bloodstream infection [19].

2. Methods: *Acinetobacter baumanaii* isolated from October 2018 to March 2019 from patient inICU in AL –Bushierhospitals at Amman capital of Jordan.

2.1.Samples: Blood, urine, CSF, sputum, endotracial tube, wound skin and other body fluids samples were collected to identify the presence of *Acinetobacter baumannii*.

2.2. Bacterial culture: inoculums of the samples were cultured according of the sample, for example, blood samples inoculated in blood, chocolate, MacConkeyagar, stool samples inoculated in SS. and so on.

2.3. Biochemical tests: Kligler Iron Agar (KIA) test: a pure colony was stabbed in the center of medium then inoculated on the surface of the slant followed by incubation for 24 hours at 35ºC. Citrate test: a gram –ve, non-fermenter colony was inoculated on Simmons citrate agar and incubated overnight at 37oC. Motility IndoleOrithine (MIO) test: colonies are stabbed in MIO medium and incubated for 24 hours at 35°C. CHROMagar test: the sample is inoculated onto the CHROMagar plate and incubated overnight at 37°C, CHROMagar test is used to differentiate between the *Acinetobacter species.* The appearance of red color colonies indicates that the sample is *Acinetobacter baumannii*

2.4. Automated identification of the bacteria: a pure gram –ve colony that was isolated from Kligler Iron Agar must be prepared to be read on VITEK by re-suspension in 3 ml of normal saline with a MIC value of 0.5-0.63 McF. Identification (ID) cards

2.5. Sucuptiplity testing: The standard methods using culture and antimicrobial susceptibility testing and accurate

susceptibility test (AST) cards are used to determine the identity and the sensitivity of the bacteria to various antibiotics.

2.6. Statistical analysis was carried out using ANOVA.

3. Results: The total of samples collected 182 from October 2018 to March 2019. We note that *Acinetobacter* in increased in ICU in the hospital and in low immunity patient. The most isolated of Acinetobacter was from the sputum. The samples collected from adult, children, pediatric, and ICU, (Table 1), there is no difference between male and female.

Table 1: The 182 samples of *Acinetobacter baumannii* isolated from October 2018 to March 2019 from patient in AL –Bushier hospital

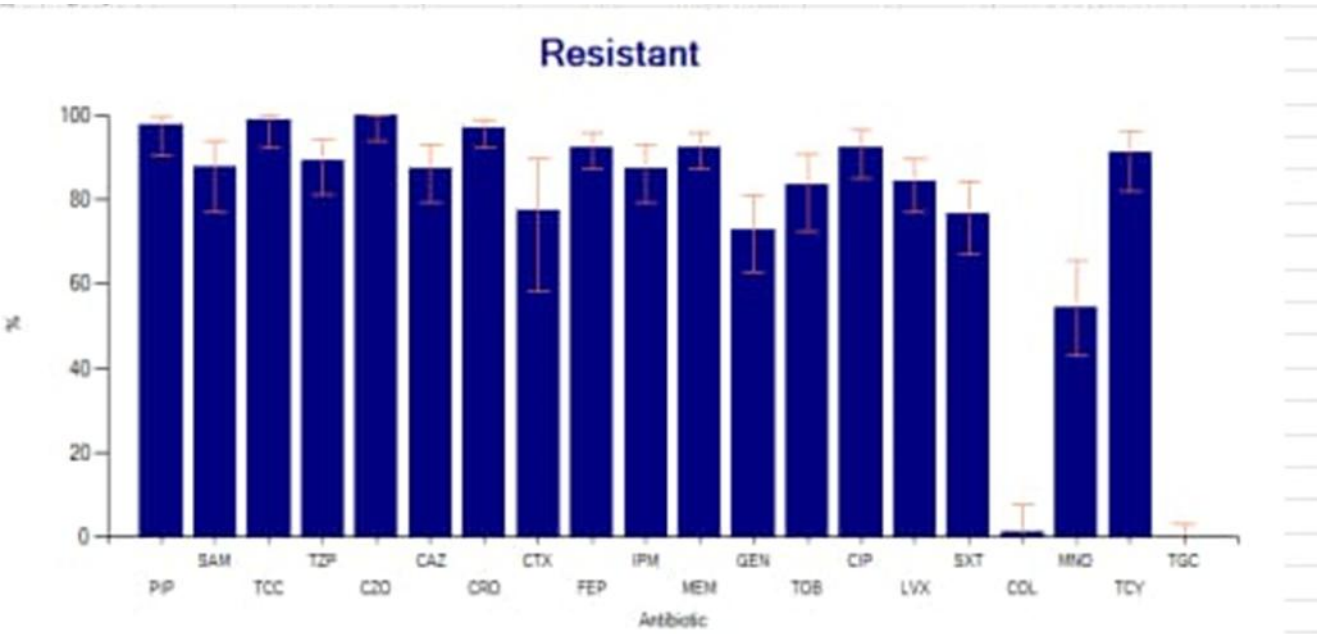
Hospital department	Number of sample	Tigacycline Antibiotic Sensitive	Colistin Antibiotic Sensitive
Intensive care	61	79%	93.3%
Pediatric and neonate ICU	62	-	96.3%
Other section	59	83%	94%

Table 2: The levels of Antibiotic resistance of bacteria "Resistant, Sensitive and Intermediate " with the number of performed tests

Antibiotic	Number of test	Resistant%	Intermediate	Sensitive%
Piperacillin	79	97.5	1.3	1.3
Tazocin	103	100	0	0
Cefazolin	72	100	0	0
Cefazidin	103	87.4	2.9	9.7
Ceftriaxone	151	77.4	9.7	12.9
Cefepime	31	92.3	0	7.7
Imipenem	103	87.4	0	12.6
Meronem	182	92.3	0	7.7
Gentamycin	103	72.8	1	26.2
Tobramycin	72	83.3	1.4	15.3
Ciprofloxacin	103	92.2	0	7.8
Levofloxacin	151	84.1	13.2	2.6
Trimethoprim sulfamethoxazole	109	76.7	0	23.3
Colistin	79	1.3	3.8	94.9
Tigacycline	151	2	3	95

VITEK identified all the samples that were identified manually as *Acinetobacter baumannii*. Also VITEK detect the sensitive of *Abaumanni* to Polymyxines (Colistin) and Tigacyclines. However, it resistant to a number of other antibiotics; such as: Carbapenemes, Cephalosporines, Fluoroquolonies and Aminoglycosides. Table 2 represents the level of resistance in the bacteria. Figure 1 represents the values of resistance.

Figure 1: The level of resistance of the different types of Antibiotics in Acinetobacter baumannii.



4. Discussion: A. baumannii has acquired resistance to a vast array of antimicrobials in recent decades. This capacity is partly dependent on the ability of this bacterium to acquire resistance genes, often by horizontal gene transfer has also been shown to significantly upregulate iron acquisition systems, genes associated with epithelial cell adherence and DNA uptake, as well as numerous putative antibiotic efflux pumps, leading to increased antibiotic tolerance [11] *Acinetobacter baumannii* increase in ICU in the hospital and in low immunity patient in ICU this bacteria found especially in sputum section sample.

The results appear that there is increase in patients whose suffer from *Acinetobacter baumannii* from OCT- 2018 TO MAR - 2019 and increase resistance to all antibiotic except (Tigacycline) for adult and (COLISTIN) for children and adult, and there is no difference between male and female.

According to this should be control the spread of *Acinetobacter*. So we need to implemented proper safety programs to limit the spread in hospital and control the spread at other hazardous bacteria

Research should focus on identifying the gene responsible in the resistance of antibiotics in *Acinetobacter* and other nosocomial bacteria

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