Original Article

The Antibiogram Profile Of A.Baumannii Is Isolation From Patient With Uti In Iraq

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Abstract

Acinetobacter baumannii has grown to be a major source of worry. It has gained particular notoriety in the recent desert conflicts in Iraq, earning the nickname "Iraqibacter." it has been designated as a “red alert” human pathogen, generating alarm among the medical fraternity, arising largely from its extensive antibiotic resistance spectrum. Although most *A. baumannii* infections have been studied in the context of pneumonia and bloodstream infections. Urinary tract infections (UTIs) are occasionally caused by *A. baumannii*.

Three hundred and forty-six with positive culture results were examined for the detection of a baumannil urine samples were collected from several Baghdad hospitals in Karkh. Samples were taken from different ages and genders. A special questionnaire was conducted on each participant including personal information and questions about the UTI symptoms . This study has been done during the period from the first of November 2021 to the end of march 2022. Among all 346 urine samples with positive culture, only 14 cases revealed *Acinetobacter baumannii* isolates (about 4.5%), Eleven types of antibiotics was used in this study to determine the antibiotics susceptibility for all isolate of A.baumannii. It showed high resistance to each of Trimethoprim /sulfamethoxazole, Ciprofloxacin, Tobramycin, ceftazidime, cefepime, Gentamicin, the lowest percentage of resistance to each of Piperacillin/ Tazobactam, Imipenem and Meropenem, Minocycline and colistin which are that the most effective antibiotic against *A.baumannii*.

Keyword: A.baumannii (Iraqibacter), Urinary Tract Infection (UTI), Antibiotic resistant

INTRODUCTION:

Acinetobacter baumannii is a gram-negative coccobacillus initially considered to be an opportunistic pathogen, which plays a vital role as a major cause of healthcare-associated infections. In recent years, A.baumannii has become resistant to most effective antimicrobial agents and causing a high incidence rate of morbidity and mortality especially in the intensive care unit in many countries (Moulana et al.,2020). Acinetobacter baumannii strains have the ability to colonize several ecological niches including soil, water, and animals, including humans. They also survive under extremely harsh environmental conditions thriving on rare and recalcitrant carbon compounds (Yakkala et al., 2019). Acinetobacter baumannii is frequently described as the etiologic agent for ventilator-associated pneumonia, urinary infections, wound infections, and bloodstream infections (Yadav et al., 2020).

Acinetobacter baumannii are known as “Iraqibacter” as it was present in wound infections in soldiers who returned from Iraq and Afghanistan. A. baumannii has gained attention in the last few years because of its multidrug resistance properties which makes it a potential nosocomial pathogen (Alsan, M., & Klompas, M., 2010).
The common method of fighting UTI is antibiotic therapy. A huge problem arose when the widespread use of antibiotics resulted in the appearance of antibiotic-resistant bacterial strains all over the world.

Multidrug resistant *Acinetobacter baumannii*.

Multi drug resistant (MDR) A. baumannii refers to A. baumannii strains that have developed resistance to newly created antimicrobial drugs. It spread throughout the world's hospitals, where it is now widely acknowledged as the top nosocomial pathogen (Abbo et al., 2005). The degree of antimicrobial resistance for Acinetobacter spp. is described using a variety of terms, including multidrug resistant (MDR), extensive drug resistant (XDR), and pan-drug resistant (PDR). Acinetobacter spp. classified as MDR can be resistant to at least four different antimicrobial drug classes, such as all penicillin and cephalosporin antibiotics, fluoroquinolones, and aminoglycosides. (Jung and Park, 2015). Another specific definition of multidrug resistance is when there is resistance to two or more of the following five drug classes: fluoroquinolones (ciprofloxacin or levofloxacin), ampicillin-sulbactam, antipseudomonal cephalosporins (ceifiazidime or cefepime), anti-

pseudomonal carbapenems (imipenem or meropenem), and aminoglycoside (Peleg et al., 2008; Guide, 2011). The very few and tiny porin in Acinetobacter's outer membrane contribute to its overall resistance to antibiotics. Acinetobacter occasionally becomes permeable to antibiotics due to the reduced outer membrane porin content (Vila *et al*, 2007). In addition, Acinetobacter has a massive resistance island with 45 resistance genes within its genome. (Adams et al., 2008; Blackwell et al., 2016). Additionally, it has the ability to quickly pick up additional genetic components for resistance from other bacterial species, giving it the capacity to develop antibiotic resistance in the middle of a course of treatment (Cheng et al, 2015).

Capsule:

A high molecular weight capsule, which encircles the outer membrane, is produced by A. baumannii (Russo et al., 2017). capsule surrounded their surface. This capsule plays a vital role in these bacteria. They act as a barrier that protects bacteria from environmental conditions and protects bacteria from phagocytosis (Singh et al., 2019). Capsular polPS, which is made up of closely packed repeating oligosaccharide subunits (K Units), creates a distinct layer on the surface of bacteria that protects it from a variety of environmental factors, aids in evading host immune defenses, and boosts resistance to several antimicrobial substances. (Russo et al., 2010; Iwashkiw et al., 2012; Geisinger and Isberg, 2015).CPS mediates immune evasion in many A. baumannii strains by limiting interactions between immunogenic surface structures of the bacteria and host defenses (Umland et al., 2012; Lees-Miller et al., 2013; Geisinger and Isberg, 2015; Wang-Lin et al., 2017). Besides protection from host defenses, in A. baumannii CPS production increases resistance to a range of antimicrobial compounds, including those used for disinfection in clinical settings (Geisinger and Isberg, 2015; Tipton et al., 2015; Chen et al., 2017). Furthermore, the growth of A. baumannii in subinhibitory levels of antimicrobials influences CPS production. The ability of A. baumannii to persist in the clinical environment has undoubtedly enhanced colonization and infections in susceptible patients. A. baumannii is capable of surviving for months on hospital surfaces such as bed rails, furniture, and medical devices, providing a reservoir that is often the source of transmission and infection (Wendt et al., 1997; Gayoso et al., 2013). CPS enhances desiccation tolerance by providing a physical barrier facilitating water retention (Roberts, 1996; Webster et al., 2000; Gayoso et al., 2013; Bravo et al., 2016)

MATERIAL AND METHOD:

Fourteen Isolation of A. baumannii were used in this study. Samples were collected from November 2021 to end the May 2022. These samples were collected from various hospitals in Baghdad city

Isolation and identification of Acinetobacter baumannii

Isolates of positive cultured urine were identification by conventional methods for identifying A*cinetobacter baumannii* (i.e. Iraqibacter). The non-lactose and partially lactose fermenting colonies on MacConkey agar and non-hemolytic vague creamy colonies on blood agar were sub-cultured on an additional MacConkey agar plate and incubated for 18-24 hours (i.e. overnight incubation) at 37ºC. These colonies were then cultured on CHROM agar selective medium for *A.baumannii*. More identification tests, including the morphological appearances -after staining- by microscope and biochemical tests, were carried out (Forbes et al,.2007).Finally, the isolates were definitely identified by using the VITEK-2 system and grown at 44ºC were chosen .All bacterial isolates were tested for Gram stain and conventional biochemical test (Forbes et al., 2007) .

The colonies on CHRO Magar

Acinetobacter medium CHRO Magar Acinetobacter was used for specific isolation of A. baumannii. On CHROMagar, isolates of A. baumannii appeared as creamy colonies at 37°C for 24 hours as shown in Figure (1), this medium also has selectivity for multidrug resistant A. baumannii by adding the supplement (CR102) to the prepared medium

Figure (1) Appearance of *A. baumannii* colonies on CHROMagar medium (milky appearance)

RESULTS AND DISCUSSION:

Types of bacterial isolates

Among all 346 urine samples with positive culture, only 14 cases revealed *Acinetobacter baumannii* isolates (about 4%). Other types of bacteria and their rates of infection are shown in figure (2).

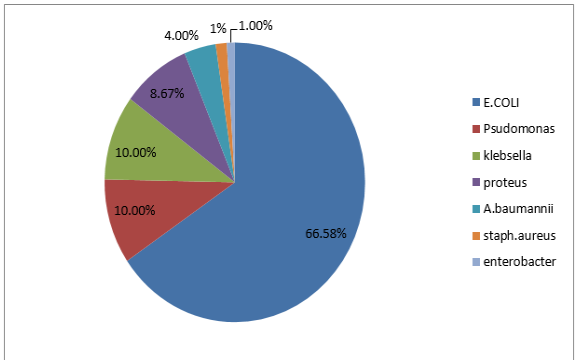

Figure (2) Types of bacterial infection in current study

For detectione of capsule (i.e. an important virulent factor) of *A. baumannii*, all 14 isolates were subjected to an examination to detect the capsule, which was performed by using Nigrosine stain (or Indian ink), then examined under the microscope . The cells appeared in the form of transparent areas on a black background, as shown in figure (3-4). All the isolates were containing a capsule (i.e. 100%).

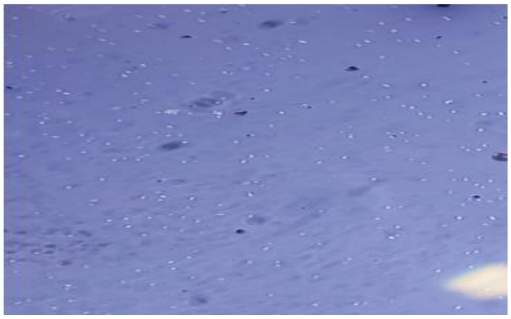

Figure (4-5): Appearance of capsulated A. baumannii under the microscope using Indian ink

All isolates under study, 14 isolates of *A.baumannii*, were subjected to a capsular assay, and the result was that all isolates under study (100%) of the capsule this agree with study of (Al-shammary., 2017) As the percentage of isolates containing the capsule was also (100%).

The capsule is composed of polysaccharides and works to protect the bacteria from the host's defenses, especially complement action and phagocytosis (wang .D et al., 2017).

This is inconsistent with a study (AL-kareem 2008) that showed that only 50% of isolates possess a capsule. This is probably due to the fact that current research samples are from the hospital environment , specifically from the intensive care unit, it is probably due to the many years elapsed since that time and the exposure of bacteria to various antibiotics in an excessive and frequent manner during these years since 2008, which led to making all These bacteria contain a capsule and become fierce.

Antimicrobial susceptibility for clinical isolates of *A. baumannii*

A total of 14 A. baumannii were examined for their susceptibility to Antibiotics (Table1). Overall, susceptibility of *A. baumannii* to antibiotics was low ranging between 0% and 41.37%. A High degree of resistance was observed to the various antibiotics used (Trimethoprim /sulpfamethoxazole and B-lactams).

Table (1): The antibiogram profile of *A. baumannii* to commonly used antimicrobials in current study

Antimicrobial agent	No. of sensitive isolates	No. of isolates with intermediate resistance	No. of resistant isolates	Percentage of Total resistance
Ciprofloxacin	3	0	11	78.6%
Trimetheprim/ Sulfamethoxazole	2	1	11	78.6%
Tobramycin	2	2	10	71.4%
Ceftazidime	4	1	9	64.3%
Cefepime	4	1	9	64.3%

Gentamicin	**8**	**1**	**5**	**35.7%**
Piperacillin/ Tazobactam	**10**	**0**	**4**	**28.6%**
Imipenem	**5**	**6**	**3**	**21.4%**
Meropenem	**7**	**4**	**3**	**21.4%**
Minocycline	**12**	**2**	**0**	**0%**
Colistin	**14**	**0**	**0**	**0%**

Acinetobacter baumannii evolved to become widespread Drug resistance and multidrug resistance have been classified as a major therapeutic problem which can be explained by several theories; One of them is the incorrect use of Antibiotics, coupled with extensive use of antibiotics. This made this bacteria the focus of researchers.

An antibiotic sensitivity test was conducted for *A. baumannii*, which included 14 isolates, and the isolates were tested for sensitivity to 11 antibiotics. It showed high resistance to each **Trimethoprim /sulfamethoxazole** (78.6)% ,**Ciprofloxacin** (78.6)% , **Tobramycin** (71.4) % , **ceftazidime ,cefepime** (64.3)%, **Gentamicin** (34.7)% .the lowest percentage of resistance to each **Piperacillin/ Tazobactam** (28.6) %, **Imipenem and Meropenem** (21.4)%, **Minocycline and colistin** (0)% of which showed that the most effective antibiotic against *A.baumannii* is This is in agreement with (al-Rifai S. B. *et al* .,2022).

The results of resistance to **trimethoprim / sulphandmethoxole** were close to the results reached by the researcher in the research (AL-ghaima k. k. ., 2016), where the resistance ratio was (84.4%) and also close to the results of the research of (Abdellal., 2021), also was agreed with (Angoti et al., 2016) who recorded that the *Acinetobacter baumannii* resist to a wide range of antibiotic including Trimethoprim in the percentage of (81%).

Ciprofaxacin (78.6)% The results are consistent with (AL-Rifia S. B. et al.,2021) research, which was reached by the resistance rate (85%), and also consistent with (AL-Ghaima K .K. ,2016) research. The resistance rate was (80%), Another local study revealed that *A. baumannii* clinical isolates were 100 % resistant to Ciprofloxacin, (Al- Khafaji, 2006).

Colitin (0%) The results were in agreement with those of (Somily *et al*., 2012), who reported that most strains of *A. baumannii* were isolated from patients at King. Hospital Khalid University Hospital, Saudi Arabia Colistin had the highest activity against *A. Baumannii* while the rest of the results were not possible due to the lack of samples.

There are many reasons which made these bacteria resistant to almost all antibiotics. One of these reasons which are the most important is the presence of efflux pump families (Monem, 2020) .these families make bacteria enable us to exclude antibiotics, heavy metals and so much more, there are many families of efflux pumps in *Acinetobacter baumannii*, but the most an important family of *Acinetobacter baumannii* is the presence of Resistance The nodulation cell Division (RND) family this one was divided into three groups of pump each group responsible for resistinga group of antibiotics.

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