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Review Article

Epidemiological review of nosocomial infections caused by *Acinetobacter baumannii*

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Abstract

One of the most important dilemmas that faced patients and medical staff in the past in health institutions is a hospital infection, and it continues at present. Nosocomial infections are caused by almost all organisms but are mostly caused by bacteria, and the species *Acinetobacter baumannii* is of clinical importance as. It is one of the main causes of nosocomial infections in most regions of the world. These species are characterized by their ability to grow with a wide temperature range between 15- 44 °C, causing common clinical multiples including Hospital-acquired pneumonia, Meningitis. Nosocomial, post-neurosurgical, and bloodstream infections. World Health Organization (WHO) has identified a group of twelve “significant” pathogenic including carbapenem-resistant *A. baumannii* as the supreme severe pathogens. The universal spread of antimicrobial resistance (AMR) is one of the major universal problems in the twenty-first century. This evaluated that by the year 2050, an infection caused via resistant strains will result in three hundred million diseases. Relevant efforts must be combined to avoid complications caused by the universal spread of antimicrobial-resistant (AMR) strains.

Keywords Nosocomial infections, *Acinetobacter baumannii*, Resistance of antibiotic, Epidemiological.

Introduction

One of the most important dilemmas that faced patients and medical staff in the past in health institutions is a hospital infection, and it continues at present. Nosocomial infections are caused by almost all organisms, but are mostly caused by bacteria and can gradually change depending on the use of antibiotics (Custovic et al., 2014; Mulani et al., 2019; WHO, 2002).

ci is a glucose-non fermentation, gram-negative It is classified under coccobacillus, non-motile and non-germ forming is a bacterium that wide extensive aquatic, and soils, there are about 20 different species that do not cause problems (Doughari et al., 2011; Eze et al., 2018). The species *A. baumannii* is characterized by its ability to grow with a wide temperature range between 15-44°C, is a characteristic that distinguishes it from other species of the *Acinetobacter* genus (Poirel and Nordmann, 2011).

A. baumannii this one of the main causes of hospital infection universal, especially in intensive care units. In humans, it can inhibit the skin, wounds, respiratory or gastrointestinal tract as well as the oral mucosa, predisposing to chronic pneumonia in the case of aspiration in the lower respiratory tract. Catheter-related urinary tract infections, surgical site infections (Abo-Zed and Phan, 20202).

Objective of the Study

Review the epidemiological observation of Nosocomial infection caused by Baumann *Acinetobacter* to provide detailed knowledge in a simplified form to investigators and those interested in the medical field.

Infection and spread

Given its ability to withstand harsh environmental conditions, *A. baumannii* is considered one of the opportunistic pathogens

of health importance and It spreads quickly in health care centers and hospitals, causing nosocomial infections, such as septicemia, urinary tract infection, kidney infection, meningitis, bone infections, and lung infections, especially in patients in intensive care units. Numerous studies have shown the presence of *A. baumannii* in all health center facilities (table tops, doors, and hands of nurses, staff, and doctors) Hands are considered one of the most important vectors of infection because they are in direct contact with pathogens and the environment (Custovic et al., 2014; McGuckin et al., 2009; Zarrilli et al., 2011; Greene et al., 2016; Morris et al., 2019). *A. baumannii* has a great ability to resist harsh environmental conditions its reputation is due to the heavy losses suffered by the US military during the wars in Iraq and Afghanistan in 2003, hence its name "Iraq's Bacteria" (Peleg et al., 2008).

Clinical Symptoms

Infections of *A. Baumannii* overlap across a wide range of anatomically different regions and with different severity from one person to another, and there is great debate about the clinical impact of infection and its relationship to the patient and the severity of the disease (Jang et al., 2009). The most common clinical symptoms consist of:

- Acquired pneumonia. Pneumonia infection is often associated with a ventilator (VAP) (Garnacho-Montero et al., 2005).
- Community-acquired pneumonia: It is caused outside health centers and hospitals by Acinetobacter bacteria in both Asia and Australia. The source of infection is the transmission of the throat, which appears in about 10% of the population who use large amounts of alcohol (Anstey et al., 2002)
- Meningitis. Also, acini bacterial meningitis, which often occurs after neurosurgery, is progressively more common (Metan et al., 2007).
- Infections of the circulatory system and blood In a 7-year investigative study (1995-2002) of a blood infection at US hospitals, the rate of infection in bacteria Acinetobacter is approximately 1.3% for each bloodstream infection (Wenzel and Edmond, 2004).

Treatment

- Antibiotics: Initial studies focused on combination treatments Like minocycline/tigecycline, colistin-tigecycline, colistin-rifampin, and polymyxin B complex. However, these alternatives have only shown a very limited effect on the therapy and prevention of nosocomial infections (Vrancianu et al., 2020; Menegucci et al., 2019).
- Innovative ways for the therapy of *A. Baumannii* Antimicrobial Peptides (AMP): A class of compounds widespread in the world as part of natural immunity, and effective as a primary position against infection. It also has an

important role in regulating immune processes, such as activating and stimulating immune system cells, angiogenesis, and inflammation (Fan et al., 2016).

The most susceptible group to infection is *Acinetobacter Baumannii*

Patients were admitted to intensive sponsor units and immunocompromised patients (McGuckin et al., 2009). In these people, the danger of death rate is higher and predominating up to 40-50% (Greene et al., 2016; Zhou et al., 2016). In addition to people with chronic diseases such as diabetes, heart disease, stress (Gerischer, 2008).

Resistance of antibiotics

The universal use of antimicrobial treatment in health institutions has resulted in the emergence and increase of strains *A. Baumannii* resistance to a wide domain of antibiotics, including broad-spectrum beta-Lactam aminoglycoside, and fluoroquinolone (Zarrilli et al., 2014). Danger risk factors of the conquest of *A. Baumannii* involve antibiotic uses, mostly lactams which generality used drug to treat infections caused by major pathogens which caused a type of diseases in humans and animals In recent years, the overall number of antibiotics that act on the *A. Baumannii*, decreased significantly (Manchanda et al., 2010). World Health Organization (WHO) has identified a group of 12 "significant" pathogens included, including carbapenem-resistant *A. baumannii* as the number one dangerous pathogens (Blanco et al., 2018). The prevalence of antimicrobial-resistant (AMR) is one of the universal problems of the 21st century. It is evaluated that by 2050, an infection caused by resistance strain will cause 300 million defunct MR is an old phenomenon, accelerated due to the misuse of antibiotics The number *A. Baumannii* of carbapenem-resistant isolates has lately extended Most of these isolates have again become more resistant to other antimicrobial drugs such as aminoglycoside, fluoroquinolones, and polymyxin a study indicated *A. Baumannii* strains high resistance to carbapenem and aminoglycoside (Vrancianu et al., 2020; Lavrinenko et al., 2021).

Epidemiological distribution

World Health Organization classifies *A. Baumannii* pathogen of great importance" which states that the development of antibiotics is urgently necessary. It has been sure that nearly one million people worldwide infective with *A. Baumannii* every year (Vrancianu et al., 2020). international study shows the Tigecycline Test for estimation and control (TEST), showed the proportion of *A. Baumannii* isolated the most among all diagnosed Gram-negative bacteria, increasing from 23% in 2004 to 63% in 2014 (Giammanco et al., 2017). One of the studies conducted in the hospital's intensive care unit indicated that infection with this bacterium led to a 7.8% increase in the death rate among these patients (Daniels et al., 2008). *A. baumannii* It can live for several months on the roofs

of properties in health facilities, this causes infection to the patient and the medical staff alike (Custovic et al., 2014).

Acinetobacter baumannii Bacterial infection during the COVID-19 epidemic

COVID_19 global has caused many immune weak patients to enter the hospital. Meanwhile, several COVID_19 patients have been diagnosed with secondary infection (Kyriakidis et al., 2021; Rasmussen et al., 2020; Ritchie Singanayagam, 2020). Bacteria are responsible for developing these infections. Associated infection with *A. baumannii* secondary to SARS-CoV-2 infection has been reported several times in the literature during the COVID-19 pandemic including in Italy, Wuhan (China), Spain, Iran, Egypt, New York (USA), France, and Brazil (Table 1). secondary (especially lower respiratory tract infection) due to *A. Baumannii*, a study of the frequency and characteristics of collective respiratory infections in COVID-19 patients in the intensive care unit; They discovered that *A. Baumannii* and *S. aureus* were highly identified through late ICU admissions (Yang et al., 2021). Showed an Iranian study in the care unit reported concomitant infection for MDR A. Of the 1,495 COVID-19 hospitalized patients in Wuhan (China), 102 (6.8%) patients developed a secondary bacterial infection, at most due to *A. Baumannii* (35.8%%) with high resistant average (91.2%) and nearly half (49.0%) died while receiving hospitalization (Li et al., 2020).

Table: 1 The rate of secondary infection with A. Baumannii during the COVID-19 epidemic (Rangel and De-Simone, 2021)

Area	COVID_19 epidemic	Co-infection with <i>A. baumannii</i> (%)
China/Wuhan	102	(35.8%)
Iran/Qom	90	(90%)
China/Wuhan	221	(55.6%)
Spain/Valladolid	712	(18.7%)
Brazil/Minas	212	(32.8%)
France/Argenteuil	92	(3%)
Egypt/Alrajhr	260	(16.6%)
Italy/Milan	731	(30.4%)
China/Beijing	20	(20%)
Italy/Ferrara	28	(13.6%)

Virulence factors

Polysaccharide capsules which formed by long-chain polysaccharides composed of frequent carbohydrate chains, the synthesis which capsular polysaccharides (CPS) are related to a Klocus (KL), which contains gen at the synthesis of activated sugar precursors (Kenyon et al., 2013). Outer membrane porin A: such a family is a group of surface-exposed, porin proteins, OmpA is the most virulence agent that play important role in the regulation of the adhesion and biofilm-forming of *A. Baumannii* and the immune response of the host. Overproduction of OmpA is a distinct risk factor for the death rate of nosocomial pneumonia and bacteremia

caused by *A. Baumannii* OmpA joins to the host epithelium and mitochondria, once binding to the mitochondria, OmpA stimulates mitochondrial dysfunction, and due to the mitochondria to swell (Nie et al., 2020; Parra-Millan et al., 2018). Pumps Efflux: flow pumps are an important means of resistance in bacterial cells, as they are protein channels that permeate the cytoplasmic membranes and play a significant role in the flow of many toxic compounds, disinfectants, sterilizers, antibiotics, and other drugs and put them outside the cells to get rid of their harmful effect (Michot et al., 2005; Chen et al., 2017). Flow pumps are classified according to the specificity of the material transported into two classes, Specific Efflux Pumps, which have the specificity of transporting substances and expelling them outside the cells, such as pumps specialized in transporting only one antibiotic, and General Efflux Pumps, which has the specificity of transporting substances different substances in the chemical composition (Jin et al., 2011).

Conclusion

Considered *A. Baumannii* of the main causes of nosocomial infected in worldwide.

Increased incidence of multidrug-resistant pathogens confirms the epidemiological activity of *A. Baumannii*.

Choosing the right antibiotic for treatment is very difficult and required global native control of sensitivity in each hospital.

In hospitals, COVID-19 patients suffer from other health problems antimicrobial-resistant like *A. Baumannii*, It is a larger menace to the entire health system.

Conflict of Interest

The author hereby declares no conflict of interest.

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