ORIGINAL ARTICLE

Emergence of Extensively Resistant *Acinetobacterbaumannii* Isolated from Hospitalized patients in a Tertiary Care Hospital

SANAA S. M. HAMAM[1,2], MUHAMMAD USMAN QAMAR[3*], SONIA YOUNAS[4], *SARA MUSAED ALMURSHED[1], KASHAF JUNAID[5], KHALID O. A. ABOSALIF[5,6], ABUALGASIM E. ABDALLA[5,6], MOHAMMED Y. M. ELAMIR[5,6], MAHTAB AHMAD[3], HASAN EJAZ[5]*

[1]Department of Microbiology, King Abdulaziz Specialist Hospital, Sakaka, Saudi Arabia.
[2]Department of Medical Microbiology and Immunology, Faculty of Medicine, Menoufia University, Egypt.
[3]Department of Microbiology, Faculty of Life Sciences, Government College University, Faisalabad, Pakistan.
[4]Department of Pathology, Tehsil Headquarter Hospital Kamoke, District Gujranwala, Pakistan.
[5]Department of Clinical Laboratory Sciences, College of Applied Medical Sciences, Jouf University, Al Jouf, Saudi Arabia.
[6]Faculty of Medical Laboratory Sciences, Omdurman Islamic University, Sudan.
**Correspondence: Dr. Muhammad Usman Qamar, Email: musmanqamar@gcuf.edu.pkm, Mobile +92 301 3054705*

ABSTRACT

Background: Emergence of extensively drug-resistant Acinetobacterbaumannii (XDR-AB) is an alarming situation and a serious global concern.
Aim: To determine the prevalence of XDR-AB in hospitalized patients.
Methods: A total of 161 clinical isolates were collected from different sources (sputum blood, pus, and urine) aseptically. Blood and MacConkey culture media used aerobically at 37ºC for the isolation of microbial growth. Preliminary identification was done by morphological characteristics and isolates confirmation carried out using the Microscan Walkaway Plus system (Beckman Coulter, USA). The minimum inhibitory concentration (MIC) of the various antibiotics determined by the Microscan Walkaway Plus system.
Results: Of 161 isolates, 154 (95.6%) were A. baumannii, and 7 (4.3%) were A. lwoffii. The male to female ratio was 1.87: 1. Most of the A. baumannii (n=73) recovered from sputum samples followed by pus (n=34) and blood (n=16). Moreover, A. baumannii predominantly recovered from ICU (n=104) followed by OPD (n=13) and FMW (n=9). Antibiogram revealed that 100% A. baumannii were resistant to imipenem, followed by 90% to cephalosporins (cefotaxime, ceftazidime, and cefepime), and ciprofloxacin. However, most effective antibiotics were tetracycline (24.7%) and trimethoprim/ sulfamethoxazole (24.3%).
Conclusion: There was a high prevalence of MDR and XDR A. baumanniipresent in hospitalized patients. This situation can lead to high mortality if it remains untreated. It is the need of the hour to take measures to overcome this emerging health care issue.
Keywords: Acinetobacterbaumannii, Antimicrobial Resistance, Intensive care unit, MDR, XDR

INTRODUCTION

Antimicrobial resistance (AMR) is becoming a severe threat to the public health sector around the globe, mainly in developing countries[1-3]. Extensively-resistant Acinetobacterbaumannii (XDR-AB) is an escalating problem and needs to address with paramount attention[4]. These pathogens can survive in hospital and community settings for a prolonged time due to various AMR mechanisms such as target alteration, porins loss, and production of the enzymes. Infection caused by these pathogens leads to a prolonged hospital stay, extra financial burden, and even fatal consequences[5]. In health care settings, A. baumannii is considerably associated with bacteremia, wound infections, pneumonia, meningitis, urinary tract infections, skin, and soft tissue infections. A. baumannii is responsible for 60% of ventilator-associated pneumonia (VAP) in healthcare-acquired infections[6].

Moreover, the attributed mortality due to A. baumannii infection range from 8.5% to 36%; however, the fatality rate is between 26% to 56%[7]. Because of these superlative clinical damages and high resistance against antimicrobial agents, the World Health Organization (WHO) has placed A. baumannii at the top in the Global Priority list of the AMR pathogens[8]. A substantial upsurge in AMR in A. baumannii has been reported in the past decade. This extensive antimicrobial resistance in A. baumannii is mainly plasmid-mediated, which can easily be transmitted from bacteria to other host pathogens and produce resistance to a wide range of antibiotics[9, 10].

The majority of the clinical strains of A. baumannii are being reported to produce β-lactamase enzymes (A to D). These enzymes not only hydrolyzed β-lactam drugs but also produce resistance to other classes of antibiotics[11-15]. Class D β-lactamases producing A. baumannii are on the top as they are posing life-threatening consequences in nosocomial infection[16]. The study aimed to report the pan drug-resistant A. baumanniifrom various wards of a tertiary care hospital in Saudi Arabia.

METHODS

The study conducted prospectively at the King Abdulaziz Specialist Hospital- Al-Jouf, keeping in view no human or animal experiments done in the study. A total of 161 Acinetobacter species recovered from diverse clinical sources such as pus, blood, urine, sputum, wound swabs, throat aspirates, nasal swabs, vaginal swabs, and catheter tips using the aseptic technique over a period of two years. All samples were collected from different sites of the hospital, including male/female surgical wards, male/female medical wards, ICUs, OPD, blood banks, and operating room.

Specimens cultured on Blood and MacConkey agar (Oxid UK) and incubated at 37°C overnight aerobically. Preliminary identification of the microbes was carried out by colony morphology, culture characteristic, and confirmed by MicroscanWalkAway Plus automated analysis (Beckman Coulter, USA)[17].

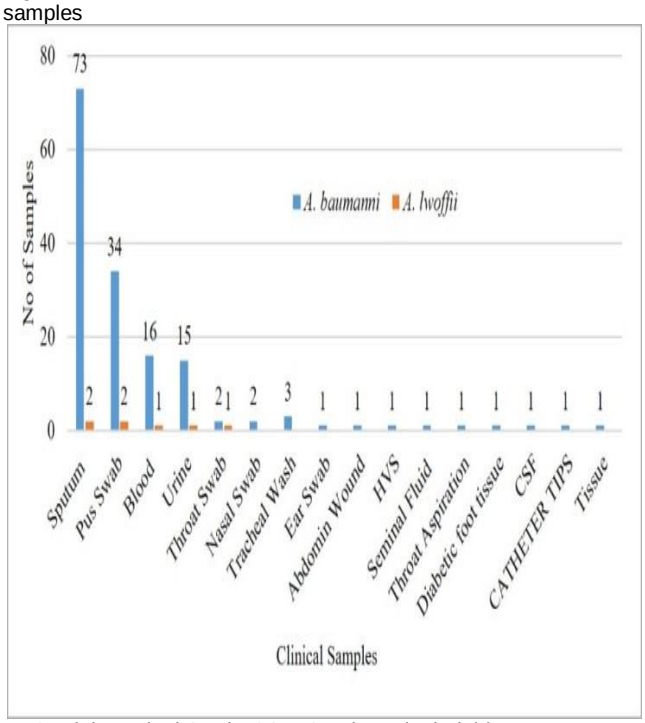
Antibiogram was performed by the MicroscanWalkAway Plus system (Beckman Coulter, USA) MIC breakpoints interpreted as per Clinical Laboratory Standard Institute, 2017 guidelines. The following antibiotics were used; amikacin (30µg), ampicillin/sulbactam (10/10µg), cefepime (30µg), cefotaxime (30µg), ceftazidime (30µg), ciprofloxacin (5µg), gentamicin (10µg), imipenem (10µg), levofloxacin (5µg), meropenem (30µg), mezlocillin (75µg), piperacillin (100µg), tetracycline (30µg), tobramycin (10µg), trimethoprim/sulfonamide (1.25/23.75µg).

RESULTS

Of 161 isolates, 154 (95.6%) were A. baumannii, and 7 (4.3%) were confirmed as A. lwoffii with 105 from males and 56 from females. The male to female ratio was 1.87: 1. Highest A. baumannii (n=73) recovered from sputum samples followed by pus (n=34), blood (n=16), and urine (n=15); however, A. lwoffii were mainly found in sputum (n=2) and pus samples (n=2) (Fig. 1).

The majority of the A. baumannii were recovered from ICU (n=104), OPD (n=13), FMW (n=9), and CCR (n=8) while 2 A. lwoffii were isolated from ICU, OPD and MMW (Table-I).

Fig. 1: Prevalence of A. baumannii and A. lwoffii in different samples



HVS: High Vaginal Swab, CSF: Cerebrospinal Fluid

Table-I: Prevalence of A. baumannii and A. lwoffii in different clinical wards

Isolates (n=161)	ICU	OPD	FMW	CCR	MMW	MSW	FSW	OR	Blood bank room
Acinetobacterbaumannii (n=154)	104 (67.5%)	13 (8.5%)	09 (5.8%)	08 (5.2%)	05 (3.3%)	05 (3.3%)	03 (2%)	01 (0.6%)	0
Acinetobacterlwoffii (n=7)	02 (28.5%)	02 (28.5%)	0	0	02 (28.5%)	0	0	0	01 (14.2%)

ICU: intensive care unit; CCR: critical care unit; MMW: Male medical ward; FMW: Female medical ward; OPD: Outpatient door; MSW: Male surgical ward; FSW: Female surgical ward; OR: Operating room

Antimicrobial susceptibility pattern exhibited that 100%A. baumannii resistant to imipenem, followed by 90% to cephalosporins (cefotaxime, ceftazidime, and cefepime), and ciprofloxacin. Moreover, 88% of the isolates were resistant to meropenem, piperacillin, and levofloxacin. However most effective antibiotics were tetracycline (24.7%) and trimethoprim/ sulfamethoxazole (24.3%) (Fig. 1).

Furthermore, 75 (48.7%) isolates were extensively-resistant and displayed resistant to 15 different antibiotics, 34 (22%) were resistant to 14 antibiotics, 10 isolates (6.4%) showed resistance toward 13 antibiotics (Fig. 2).

Fig. 2: Percentage susceptibility pattern of A. baumannii

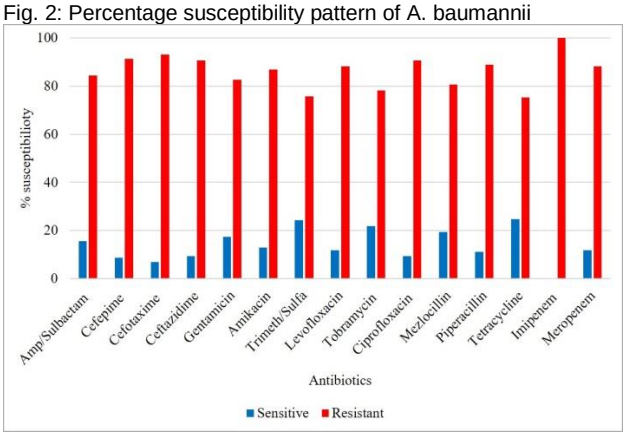
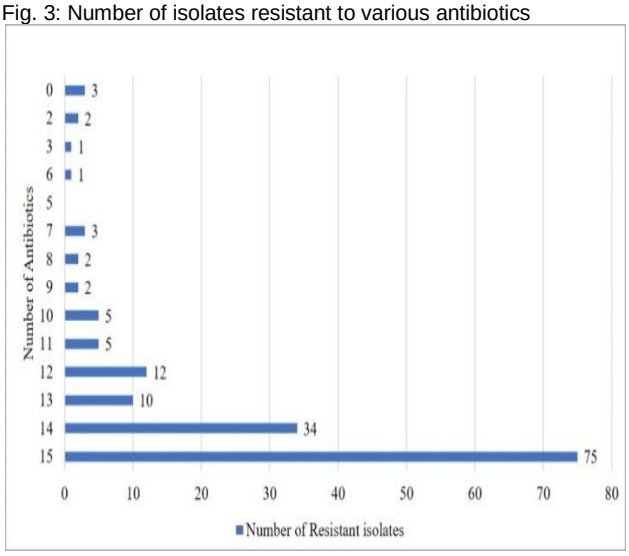


Fig. 3: Number of isolates resistant to various antibiotics



DISCUSSION

A. baumannii is considered as the utmost common life-threating nosocomial microbe, mainly in the ICU around the globe[18]. Previous data suggested the mortality rate range from 20-60%. A. baumannii are low virulence pathogens and mainly caused infections in immunocompromised persons[19].

A. baumannii were recovered from hospitalized patients mainly from ICU 104(67.5%) followed by OPD 13(8.5%) and FMW 9(5.8%). Moreover, most of the A. baumannii recovered from the sputum samples (n=73) followed by blood (n=34) and urine (n=16). A similar finding has reported from an Indian study with A. baumanniiprevalence of 64% in ICU from the respiratory tract[20]. Moreover, a retrospective study conducted in King Fahad National Guard Hospital Saudi Arabia documented that A. baumannii (34%) were the predominant isolated recovered from the ICU[21]. Similarly, another study from Pakistan Also revealed the prevalence of A. baumannii (30.8%) in critically ill hospitalized patients[22].

Antimicrobial susceptibility testing determined against various commonly used antibiotics. Acquisition of antimicrobial resistome is mainly carried out due to transferring the plasmid and transposons[23]. A. baumannii is intrinsically resistant to various antibiotics, therefore limited and no treatment option available[24]. There was 100% resistance observed against last resort imipenem antibiotic followed by 90 % resistance to cephalosporins and ciprofloxacin; however, most useful drugs were tetracycline (24.7%) and trimethoprim/ sulfamethoxazole (24.3%). Moreover, a large number of isolates (n=75) identified as XDR, which showed resistance to 15 different types of antibiotics, is critically frightening. Further, 34 A. baumannii were resistant to 14 different antibiotics. Similarly, an Iranian study also reported that 32 isolates recovered from immunocompromised patients admitted in the ICU displayed 100% resistance to all available antibiotics[25]. Another study from South Africa also documented that 67% of the A. baumannii isolates were XDR, and mostly (67.5%) were recovered from the patients admitted to ICUs[26]. This high prevalence is an indication of the compromised immune status of patients, which makes the patients vulnerable for the A. baumannii infection. Various studies have been reported on the spread of XDR-AB in different parts of the world, including Italy[27], Egypt[28], USA[29,] and Brazil[30].

The high resistance is mainly linked with overuse and misuse of antibiotics, easy availability of antibiotics over the counter, and lack of rapid microbial diagnosis[31-33]. Moreover, the high prevalence of nosocomial infections is mainly linked with unhygienic practices, overcrowded, sharing of beds, colonization of hands of the health care workers and contaminations of the various environmental surfaces and instruments (door handle, floor, bedsheet, catheter, ventilators, ambubag). Further antimicrobial resistance in the clinical settings is also due to the misuse of broad-spectrum empirical drugs, which are not following WHO criterion[34].

CONCLUSION

The study has concluded that there is a high prevalence of MDR and XDR-AB in hospitalized patients, mainly the intensive care unit. This situation can lead to mortality and morbidity in the dissemination of these pathogens in other departments of the health care facility. Therefore, infection control measures could help in the prevention of this emerging issue.

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