

High prevalence of multidrug resistant *Acinetobacter species* in Khartoum Intensive Care Units (ICUs)

Einas Awad Ibrahim Osman¹ and Nagwa El Mustafa El Amin²

¹**Corresponding** author: Department of Microbiology, Faculty of Medical laboratory Sciences, Africa University, Khartoum Sudan

²Department of Microbiology and parasitology, Faculty of Medicine, University of Khartoum, Khartoum, Sudan

Abstract

Acinetobacter spp have become one of the important organisms which cause nosocomial infection in ICU hospitalized patients. Microbiological culture and antibiotic susceptibility testing are the proper methods to assess the magnitude of this problem.

The current study was done in selected hospitals in Khartoum State, at the ICU departments.

The aims of this study were to determine the prevalence of *Acinetobacter species* nosocomial infections in intensive care unit hospitalized patients, and the rate of isolation of *Acinetobacter species*. Antibiotic sensitivity of *Acinetobacter* strains isolated and the prevalence of multi-drug resistant *Acinetobacter baumannii* strain in ICU hospitalized patients during ICU stay were also studied.

Different types of samples (wound swab, umbilical swab, sputum, urine, and pus aspirates) were collected from patients of different genders and age groups who were admitted at the ICUs studied.

The samples were grown in MacConkey agar and Muller Hinton agar was used for antibiotic susceptibility testing. The sensitivity of the isolated organisms to amikacin, cefazidime,

ciprofloxacin, meropenem & gentamicine were determined. The API 20 NE test was used for identification of *Acinetobacter species*.

A total of 120 bacterial isolates were obtained from clinical specimens of which 37(30.8%) specimens were positive for *A. baumannii* and *A. calcoaceticus*.

Our study showed a high prevalence of multiresistant *Acinetobacter Baumannii* in ICU hospitalized patients in Khartoum hospitals which is an alarming situation as there are very few therapeutic options available for such isolates in Sudan.

Key words: multiresistant acinetobacter, ICU, Khartoum hospitals

{**Citation:** Einas Awad Ibrahim Osman, Nagwa El Mustafa El Amin. High prevalence of multidrug resistant *Acinetobacter species* in Khartoum Intensive Care Units (ICUs). American Journal of Research Communication, 2015, 3(2): 35-42} www.usa-journals.com, ISSN: 2325-4076.

Introduction

Acinetobacter was first described in 1911 as *Micrococcus calco-aceticus*. Since then, it has had several names, becoming known as *acinetobacter* in the 1950s^{1,2}. Its natural habitats are water and soil, and it has been isolated from foods, arthropods, and the environment^{2,3}. In humans, *Acinetobacter* spp. can colonize skin, wounds, and the respiratory and gastrointestinal tracts. *Acinetobacter* is a gram-negative coccobacillus that during the past three decades has emerged from an organism of questionable pathogenicity to an infectious agent of importance to hospitals worldwide. *Acinetobacter* infections have long been clinically prominent in tropical countries, have been a recurrent problem during wars and natural disasters, and have recently caused

multihospital outbreaks in temperate climates^{4,5,6,7}. Furthermore, *Acinetobacter* species are becoming multiresistant. An American study that included more than 300 U.S. hospitals surveyed by the Centers for Disease Control and Prevention (CDC), showed that the rates of carbapenem resistance in 3601 isolates of *Acinetobacter baumannii*, clinically the most important of 25 *Acinetobacter* genospecies, has increased from 9% in 1995 to 40% in 2004⁸.

The objectives of this study were to determine the rate of isolation of *Acinetobacter* species from hospitalized patients in intensive care units (ICU) and to study the antibiotic susceptibility pattern of *Acinetobacter* strains isolated.

Materials and Methods

Specimens

A hundred and twenty clinical specimens were collected by the ICU staff (doctors and nurses as appropriate) from infected patients at the ICU. Wound swab, umbilical swab, and sputum were collected. Amie's medium was used for transporting the wound and umbilical swabs.

Culture and identification

The specimens were cultured on MacConkey agar (MA) plates. The MA plates were incubated at 37°C for 24 hours in an aerobic atmosphere. Identification of significant isolates (gram negative coccobacilli which were oxidase negative) was done using the API20 NE (bioMerieux, Inc., Hazelwood, MO) as advised by the manufacturer. A purity plate was employed to ensure that the inoculum used for the API20 NE tests was pure.

Antibiotic susceptibility testing

The antibiotic sensitivity test of the isolates from the clinical specimen was done in Mueller Hinton agar (MHA) by Kirby-Bauer method, as recommended by Clinical and Laboratory Standards Institute (CLSI)⁹.

For disk susceptibility testing, amikacin, cefazidime, ciprofloxacin, meropenem & gentamicine were used.

Results and discussion

In a total 120 of clinical specimens collected in this study we found 37 (30.8%) of the specimens positive for *Acinetobacter baumannii* and *A. calcoaceticus* from different types of samples (Table 1).

Isolates from neonates and children were all found to be *Acinetobacter baumannii*, while two of adult's isolates were *A. calcoaceticus* (table 2). The prevalence in our study (30.8%) is higher than that reported in a study done in a Guatemalan ICU which showed 17% of total cases of ventilator-associated pneumonias were caused by *Acinetobacter*. Manikal VM, Landman D and Saurina G in New York City at 2000 also reported lower prevalence than in our study¹⁰.

In a Turkish ICU in which casualties of the 1999 Marmara earthquake were treated a prevalence of 20% of *A. baumannii* from wounds, blood and respiratory secretions was reported¹¹.

The susceptibility testing showed that thirteen (35.1%) *A. Baumannii* and one (2.7%) *A. calcoaceticus* isolates were resistant to all antibiotics used except to amikacin, the other 23 isolate (62.2%) were resistant to amikacin and other antibiotics (Ceftazidime, Ciprofloxacin, Meropenem & Gentamycin).

In a study in the Iraq–Kuwait region (January 2002 to August 2004) carried out to identify susceptibility for antibiotics of *A. baumannii*, a total of 35% of the isolates were susceptible only to imipenem¹². In this study 4% showed resistance to all tested antibiotics including meropenem. According to another report, among 142 *Acinetobacter* isolates recovered from October 2003 to November 2005, strains from deployed personnel showed a lower rate of susceptibility to imipenem than isolates from no deployed personnel (63% vs. 87%, $P < 0.01$)¹³.

Table (1): The Organisms Isolated from different Types of Specimen

		Organism Isolate			Total
		<i>A. baumannii</i>	<i>A. calcoaceticus</i>	Other organisms	
Specimen Types	Wound Swab	4 (9.1%)	0 (0%)	40 (90.9%)	44
	Sputum	22 (68.75%)	2 (6.25%)	8 (25%)	32
	Umbilical swab	9 (30%)	0 (0%)	21 (70%)	30
	Other	0(0%)	0(0%)	14(100%)	14
	Total	35	2	83	120

Table (2): The *Acinetobacter* species isolation frequency in the age Groups

Age groups	<i>Acinetobacter.</i> <i>Baumannii</i>	<i>A. Calcoaceticus</i>
Neonates (1day- 6mth)	10 (18.18%)	0 (0%)
Child (7mth-15yr)	2 (40%)	0 (0%)
Adult (15yr- 89yr)	23 (38.3%)	2 (3.4%)
Total	35(29.2%)	2(1.6%)

Conclusion

The prevalence of *Acinetobacter* nosocomial infections in ICU patients was very high (30, 8%) and species isolated were *A.baumannii* and *A.calcoaceticus*. *Acinetobacter* strains isolated showed resistance to multiple antibiotics in ICU patients.

References

- 1) Beijerinck MW. Uber Pigmentbildung bei Essigbakterien. Cent Bakteriolog Parasitenk 1911; 29:169-76.
- 2) Schreckenberger PC, Daneshvar MI, Weyant RS, Hollis DG. *Acinetobacter*, *Achromobacter*, *Chryseobacterium*, *Moraxella*, and other nonfermentative gramnegative rods. In: Murray PR,

- Baron EJ, Jorgensen JH, Landry ML, Pfaller MA, eds. Manual of clinical microbiology. 9th ed. Washington, DC: ASM Press, 2007:770- 802.
- 3) Getchell-White SI, Donowitz LG, Groschel DH. The inanimate environment of an intensive care unit as a potential source of nosocomial bacteria: evidence for long survival of *Acinetobacter calcoaceticus*. *Infect Control Hosp Epidemiol* 1989; 10:402-407.
 - 4) Lolans K, Rice TW, Munoz-Price LS, Quinn JP. Multicity outbreak of carbapenem-resistant *Acinetobacter baumannii* isolates producing the carbapenemase OXA-40. *Antimicrob Agents Chemother* 2006; 50:2941-2945.
 - 5) Dima S, Kritsotakis EI, Roumbelaki M, et al. Device-associated nosocomial infection rates in intensive care units in Greece. *Infect Control Hosp Epidemiol* 2007; 28:602-605.
 - 6) Wisplinghoff H, Edmond MB, Pfaller MA, Jones RN, Wenzel RP, Seifert H. Nosocomial bloodstream infections caused by *Acinetobacter* species in United States hospitals: clinical features, molecular epidemiology, and antimicrobial susceptibility. *Clin Infect Dis* 2000; 31:690-7.
 - 7) Garnacho-Montero J, Ortiz-Leyba C, Fernandez-Hinojosa E, et al. *Acinetobacter baumannii* ventilator-associated pneumonia: epidemiological and clinical findings. *Intensive Care Med* 2005; 31:649-655.
 - 8) Carey RB, Banerjee SN, Srinivasan A. Multidrug-resistant acinetobacter infections, 1995-2004. Presented at the 46th Interscience Conference on Antimicrobial Agents and Chemotherapy, San Francisco, September 27–30, 2006.
 - 9) Clinical and Laboratory Standard Institute: Performance standards for antimicrobial susceptibility testing, Seventeenth informational supplement. *CLSI document M100 S17*. Wayne PA. USA 2007.

- 10) Manikal VM, Landman D, Saurina G, Oydn E, Lal H, Quale J. Endemic carbapenem-resistant *Acinetobacter* species in Brooklyn, New York: citywide prevalence, interinstitutional spread, and relation to antibiotic usage. *Clin Infect Dis* 2000; 31:101-106.
- 11) Oncül O, Keskin O, Acar HV, Küçükardali Y, Evrenkaya R, Atasoyu EM, et al. Hospital-acquired infections following the 1999 Marmara earthquake. *J Hosp Infect.* 2002 May;51(1):47-51.
- 12) *Acinetobacter baumannii* infections among patients at military medical facilities treating injured US. Service members, 2002-2004. *CDC Morb Mortal Wkly Rep* 2004;53:1063-1066.
- 13) Scott P, Deye G, Srinivasan A, et al. An outbreak of multidrug-resistant *Acinetobacter baumannii*-calcoaceticus complex infection in the US military health care system associated with military operations in Iraq. *Clin Infect Dis* 2007; 44:1577-1584.