

# Outbreak of Pan-resistant *Acinetobacter* Species in Intensive Care Units of a tertiary care hospital

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## ABSTRACT

**Background:** *Acinetobacter* has gained significant importance in the medical literature due to the steady development of drug resistance since 1980s.

**Aim:** To investigate various patterns and susceptibility trends of the *Acinetobacter* bacteria isolated from the patients of Intensive Care Units in Holy Family Hospital, Rawalpindi.

**Methods:** It was a cross sectional study carried out at Holy Family Hospital, Rawalpindi from January-July 2019 including case data from intensive care units of medical, surgical, burn and pediatric departments. *Acinetobacter* isolates were cultured from intensive care units. Antibiotic susceptibility testing was performed using disc diffusion method. A total 204 cases of *Acinetobacter* infection were isolated, of these 102 isolates were from intensive care unit. Majority of the cases were males (56.9%).

**Results:** Our results validate that intensive care units are the main source of overall hospital acquired infections such as *Acinetobacter baumannii* as half of our cases were isolated in ICUs compared to half in all other general departments. *Acinetobacter* was the most common bacterial pathogen 141 (69.1%) isolated in this study followed by *Klebsiella* spp. 32 (15.7%) and *E. coli* 15 (7.4%). *Acinetobacter* was found to be pan-resistant in more than 80% of the cases. *Campylobacter* showed frequent resistance to the drug TZP (85%) followed by CAZ (67.6%), SCF (66.2%) and CRO (60.3%).

**Conclusion:** Pan-resistance to *Acinetobacter* can be associated to the misuse of antibiotics and environmental contamination of hospital equipment and hence it can be implied that these factors play a major role in the outbreaks of *Acinetobacter* spp.

**Keywords:** Pan-resistance, *Acinetobacter*, Intensive Care Unit, Hospital Acquired Infections

## INTRODUCTION

Hospital acquired infections (HAIs) are one of the leading causes of severe morbidity and mortality among intensive care units, where critical patients are managed.<sup>1</sup> One of these HAIs is caused by *Acinetobacter baumannii* which is an opportunistic, ubiquitous aerobic gram-negative bacterium with a non-fermentative metabolism found in humid habitats and causes around 10% in ICUs in western world<sup>2,3</sup> whereas in the developing countries the infection incidence rate remains up to 60%. *A. baumannii* based HAIs have shown mortality ranging from 5% in the general hospital wards to 54% in the ICUs.<sup>4</sup> In humid environments, *A. baumannii* can display multiple antimicrobial resistance profiles, which are responsible for significant mortality.<sup>5,6</sup> It is a common cause of sepsis, pneumonia, and urinary tract infection following hospitalization of seriously ill patients. Due to non-empirical and overuse of antibiotics, these infections become resistant to many antimicrobials.<sup>7</sup> According to the SENTRY Antimicrobial Surveillance Program, *A. baumannii* resistance was reported in the range of 68%, 65%, and 48% to ceftazidime, ciprofloxacin, and ampicillin plus sulbactam, respectively.<sup>8</sup> Although some studies describe increasing resistance to carbapenems and other drugs, achieving resistance rates up to 90%<sup>9,10</sup>. This drug is still considered as the last resort in many critical care settings.

Information regarding hospital acquired infections is rare in our part of the world due to poor status of evidence generation, especially, in Pakistan, so is the pattern of antimicrobial susceptibility.

## METHODOLOGY

This cross-sectional study was conducted at Holy Family Hospital, Rawalpindi between January 2020 and July 2019. The routine culture samples coming to the microbiology department for detection of bacterial isolates were observed and studied. Between the study period 204 *Acinetobacter* isolates were cultured from various departments of the hospital, most of them from intensive

care units. Data was entered and analyzed in Statistical Package for Social Sciences (SPSS) version 16.0 (Chicago Inc.). The categorical variables like gender, departments, site of isolates, culture report and antibiotic susceptibility were analyzed as frequency and percentages.

## RESULTS:

In this study a total of 204 cases of *Acinetobacter* infections were isolated from various intensive care units of hospital. Majority of the cases were males (56.9%). Out of total 204 study cases, half of the isolates were from ICUs and other half from other general departments such as surgical, medical and allied wards. The frequency of *Acinetobacter* was found to be more in the Medical ICU 56 (27.4%), followed by Surgical ICU 33 (16.1%), burn ICU 10 (4.9%) and Pediatric ICU 3 (1.4%). *Acinetobacter baumannii* was found to be the most common bacterial pathogen 141 (69.1%) in this study followed by the *Klebsiella* spp. 32 (15.7%) and *E. coli* 15 (7.4%). *Staphylococcus aureus* was also present in 8 (3.9%) study cases whereas *Pseudomonas* was evident in 6 (2.9%). The most common site of organism isolation were endotracheal tube (ETT) 77 (37.7%) followed by wound 61 (29.9%) and pus 23 (11.2%). The other common sites were urine and catheters. *A. baumannii* was found to be resistant to general first and second line antibacterials in more than 80% cases. The most frequently resistant drug was TZP (85%) followed by CAZ (67.6%), SCF (66.2%) and CRO (60.3%). Other frequent resistant drugs were CIP (51%), CTX (46.6%) and IPM seen resistant in (45.1%) patients. Tigicycline was found out to be the most sensitive drug in our study patients (90.7%).

Table 1: Type of bacteria isolated in the study patients (n=204)

	n	%age
<i>Acinetobacter</i>	141	69.1%
<i>Klebsiella</i> spp	32	15.7%
<i>E. coli</i>	15	7.4%
<i>Staphylococcus aureus</i>	8	3.9%
<i>Pseudomonas</i>	6	2.9%
<i>Proteus</i>	1	0.5%
<i>Caliform</i>	1	0.5%

Received on 11-10-2021

Accepted on 22-03-2022

Figure I: Gender distribution in the study (n=204)

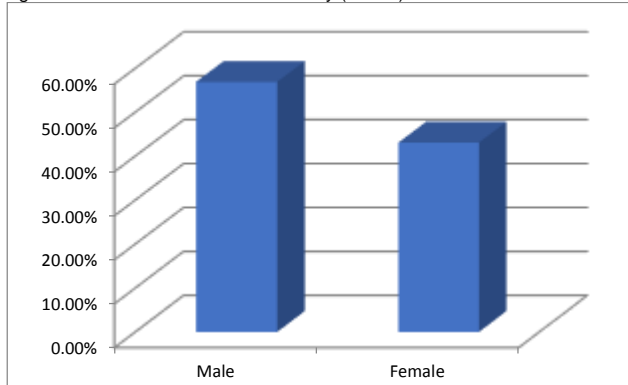


Figure II: Frequency of Acinobacter in various departments (n=204)

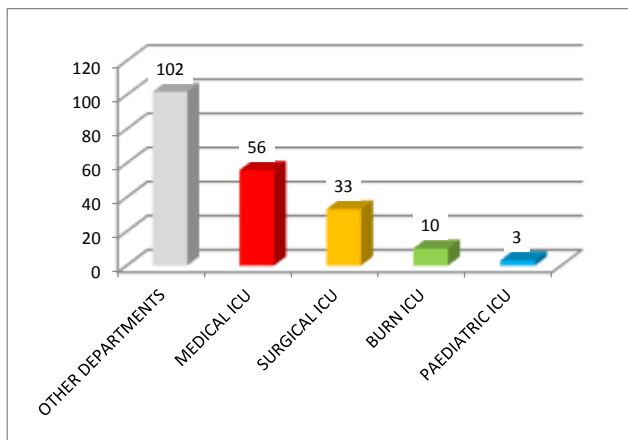


Table 2: Site of organism isolation in the study (n=204)

Site	n	%age
ETT	77	37.7%
Wound	61	29.9%
Pus	23	11.2%
Urine	10	4.9%
Foleys catheter	6	2.9%
CVP	6	2.9%
Pleural fluid	4	1.9%
Sputum	3	1.4%
Others	14	6.8%

Table 3: Antibiotic susceptibility pattern in the study patients (n=204)

Antimicrobials	Resistant	Sensitive
<b>Pan-resistant drugs</b>		
TZP	173 (84.8%)	6 (2.9%)
CAZ	138 (67.6%)	0 (0.0%)
SCF	135 (66.2%)	33 (16.2%)
CRO	123 (60.3%)	0 (0.0%)
CIP	104 (51.0%)	0 (0.0%)
CTX	95 (46.6%)	1 (0.5%)
IPM	92 (45.1%)	5 (2.5%)
AK	82 (40.2%)	5 (2.5%)
AMC	81 (39.7%)	0 (0.0%)
MXF	79 (38.7%)	1 (0.5%)
MRP	77 (37.7%)	1 (0.5%)
AKN	72 (35.3%)	7 (3.4%)
AMP	70 (34.2%)	0 (0.0%)
FEP	61 (29.9%)	0 (0.0%)
CFM	33 (16.2%)	0 (0.0%)
C	30 (14.7%)	2 (1.0%)
SXT	20 (9.8%)	1 (0.5%)
<b>Sensitive drugs</b>		
TGC	2 (1.0%)	185 (90.7%)

## DISCUSSION

This study highlights that the pan resistance to *A. baumannii* microorganisms is very high in our local settings with more than 80% of cases. This situation is alarming for the healthcare workers involved with critical care patients and health departments and program managers, since its spread could lead to severe morbidity and mortality. In this study, only one drug tigecycline was found sensitive in more than 90% cases. In the present study the most common reason of pan-resistant isolates was found to be antibiotic overuse especially imipenem, in ICU patients and contamination of laryngoscopes, ambu bags and oxygen masks with *Acinetobacter spp.* etc. Approximately one-fifth of the cases with polymicrobial infections were observed, of which 76% were co-infected with *Klebsiella spp.* and 19% were infected with *Methicillin-Resistant Staphylococcus Aureus* (MRSA). Many previous investigators have also witnessed high rates of resistance to carbapenems and other drugs in *A. baumannii* cases<sup>9,10</sup>. In most of our cases, tigecycline was found susceptible to *A. baumannii* infection. Playford and colleagues reported that patients with infections caused by carbapenem-resistant *A. baumannii* displayed a 20% higher rate of hospital mortality, with greater odds of mortality OR (95% CI) 3.9 (1.4 to 10.7) than those merely colonized<sup>11</sup>.

In another case control study paired according to severity of infections, described a higher mortality rate in patients infected by MDR *A. baumannii* when compared to controls ( $p < 0.01$ )<sup>12</sup>.

## CONCLUSION

Novel strategies, to adopt strict infection control measures and maintaining a check on antibiotic use in hospitals is required to prevent the transmission of *Acinetobacter baumannii* otherwise dissemination of these outbreaks can lead to epidemics. Proper implementation of hospital protocols, hand hygiene and environmental cleaning can bring down the rates of hospital acquired infections.

**Conflict of interest:** Nil

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