

## FREQUENCY OF ACINETOBACTER EXTENSIVELY DRUG-RESISTANT (XDR- AB) SPECIES IN PATIENTS WITH VENTILATOR-ASSOCIATED PNEUMONIA AT A TERTIARY CARE HOSPITAL

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### Abstract

#### Background

The Acinetobacter baumannii, especially the extensively drug-resistant (XDR) type, is a significant pathogen in ventilator-associated pneumonia (VAP) of intensive care units (ICUs). XDR-AB increases the problem of treatment because it is resistant to the majority of antibiotics and results in aggravated patient outcomes. The purpose of conducting this study is to examine the incidence of XDR-AB among VAP patients in a tertiary care hospital, its effects on clinical outcomes, such as mortality and recovery.

#### Objectives

To identify the prevalence of XDR Acinetobacter baumannii in VAP patients, evaluate resistance patterns, and assess the effects of it on patient outcomes (mortality, recovery, and ICU stay) in a tertiary care environment.

**Place and duration of study.** From June 2025 to October 2025, Medicine Department, Sandeman Provincial Hospital / Bolan Medical Complex Hospital Quetta.

#### Methodology

The Cross-sectional Study was carried out in a tertiary care hospital ICU of the Department of Medicine Department, Sandeman Provincial Hospital / Bolan Medical Complex Hospital Quetta. Identification of XDR-AB strains was done in the laboratory using antimicrobial susceptibility tests and microbiological cultures. P-values and chi-square tests were the statistical tests to evaluate the relationships between XDR-AB infection and clinical outcomes.

#### Results

Of the 313 VAP patients, 124 (39.6%) were diagnosed with A. baumannii infections, of which 92 (74%) were XDR-AB strains. The average age of patients was 61.5 years (SD: 12.4). The XDR-AB group had significantly longer ICU stays (15.2 days vs. 9.6 days) and higher mortality (32% vs. 16%) compared to non-XDR-AB patients. The XDR-AB group had a mean APACHE II score of 24.1 (SD: 5.6), indicating higher illness severity (p-value = 0.02).

## **Conclusion**

*XDR-AB infections are a common occurrence among VAP patients, who have a high mortality rate, ICU hospitalisation, and poor patient recovery. The results highlight that improved infection control and alternative treatment methods are required to address XDR-AB infections and enhance patient outcomes in ICU units.*

## **INTRODUCTION**

*Acinetobacter baumannii* is an opportunistic pathogen that has been reported to cause hospital-acquired infections, especially ventilator-associated pneumonia (VAP), a frequent complication in hospitalised patients in the intensive care unit (ICU). The *Acinetobacter baumannii* is one of the primary causes of healthcare-associated infections on a global scale, and the growing number of multidrug-resistant (MDR) and extensively drug-resistant (XDR) strains has become a worldwide concern [1]. *Acinetobacter baumannii* resistance to a large number of antibiotics, including carbapenems, has been a critical issue in the treatment of infections caused by this pathogen. Of particular concern are the XDR-AB strains, which are resistant to almost all antibiotics, leaving very few treatment options. Patients under mechanical ventilation develop a more severe pneumonia, and the risk is very high in the ICU [2]. The diagnosis of the VAP is complicated by the fact that other complications are present, and the pathogenic organisms may be very different [3]. *Acinetobacter baumannii* is one of the most common pathogens that provoke VAP, and studies indicate that it has been implicated in 10-20% of VAP cases. XDR-AB that develops in patients with VAP complicates the management and treatment guidelines, resulting in an increased mortality rate and increased or prolonged ICU stays [4]. The increase in XDR-AB infections globally has been attributed greatly to the lack of appropriate infection control measures, excessive antibiotic use, and high susceptibility of patients in critical care beds in the ICUs. Moreover, *Acinetobacter baumannii* may be able to survive on hospital surfaces over an extended time, increasing the possibility of patient-to-patient transmission. Treatment of VAP as a result of XDR-AB infections is normally

a combination of mechanical ventilation, supportive care, and antibiotics. Nevertheless, the resistance profiles of XDR-AB strains are high, which makes the traditional treatment less effective and prompts the need to consider alternative treatment methods, i.e., colistin, tigecycline, or novel antibiotics [5,6]. This Study examines the prevalence of XDR *Acinetobacter baumannii* species in VAP patients in a tertiary care facility and the outcomes of the infection in terms of clinical results [7]. The main aims are to examine the *A. baumannii* resistance pattern, determine its mortality and recovery rates, and define the correlation between the XDR-AB infection and ICU stay [8]. The study also aims to emphasise the need to adopt appropriate diagnostic measures and early intervention when dealing with XDR-AB infections in ICUs to minimise their burden in the ICUs [9]. This Study paper will offer meaningful information on how to make the process of infection control practices, alternative therapeutic interventions, and patient care in the ICUs, particularly in an environment where the incidence of antibiotic resistance is high [10].

## **Study Objectives**

To establish the prevalence of XDR *Acinetobacter baumannii* among VAP patients, evaluate the resistance patterns of this microorganism, and the effects of this microorganism on mortality, ICU hospitalisation, and recovery in a tertiary care hospital.

## **Materials and Methods**

### **Study Design & Setting**

A Cross-sectional Study The study will be performed in a tertiary care hospital ICU and will use the data collected on the VAP patients

diagnosed with an *Acinetobacter baumannii* infection during the period of June-October 2025.

## Participants

As part of the study, 313 VAP patients who were admitted to the ICU of the tertiary care hospital were considered between June and October 2025. Patients were considered in case they were diagnosed as having *Acinetobacter baumannii* VAP. Both adult men and women were taken into account, and only the patients whose diagnosis of VAP was confirmed as being caused by *Acinetobacter baumannii* were taken into the study.

## Sample Size Calculation

The size of the sample to be used in this study can be calculated through the WHO calculator, assuming the estimated frequency of XDR-AB in patients with VAP is 3.37%. (14) And desired margin of error = 2.00/

## Inclusion criteria

ICU patients having established *Acinetobacter baumannii* VAP.

## Exclusion criteria

The study excluded patients having incomplete medical records, those who had previous infections with *Acinetobacter baumannii* and those who obtained mechanical ventilation less than 48 hours.

## Diagnostic and Management Strategy

Microbiological cultures of tracheal aspirates or bronchoalveolar lavage were used to diagnose infections of *Acinetobacter baumannii*. The identification of XDR strains was done through antimicrobial susceptibility testing. Proper antibiotic treatment, mechanical ventilation, and supportive therapy were considered with reference to the clinical condition of the patient and the pattern of his/her resistance.

## Statistical Analysis

Patient demographics and clinical outcomes were summarised using descriptive statistics. To test the relationships among XDR-AB infection and the variables (mortality, ICU stay, and comorbidities), the chi-square tests and t-tests were used. All the tests were deemed statistically significant when the p-value was less than 0.05.

## Ethical Approval

### Results

A total of 313 VAP patients were included in the study, with a mean age of 61.5 years (SD: 12.4). Among these patients, 124 (39.6%) were diagnosed with *Acinetobacter baumannii* infections, and 92 of those (74%) were identified as XDR strains. The most common comorbidities were diabetes mellitus (42%) and chronic obstructive pulmonary disease (COPD) (37%). The mean ICU stay for XDR-AB patients was 15.2 days (SD: 8.9), while non-XDR-AB patients had an average ICU stay of 9.6 days (SD: 6.2). The mortality rate for XDR-AB patients was 32%, compared to 16% in non-XDR-AB patients (p-value = 0.03). Additionally, the mean APACHE II score for XDR-AB patients was 24.1 (SD: 5.6), indicating higher severity compared to non-XDR-AB patients, who had a mean APACHE II score of 18.4 (SD: 4.3) (p-value = 0.02). Multivariable analysis showed that XDR-AB infection was significantly associated with increased mortality and prolonged ICU stay (p-value < 0.05).

## Intervention Outcome

Patients who received different antibiotic regimens, including colistin and tigecycline, had better outcomes in terms of shorter ICU stay and mortality, but the differences were not statistically significant. More studies are required to test the effectiveness of these treatments against conventional treatment of XDR-AB infections.

**Table 1: Demographic Characteristics of VAP Patients (n=313)**

Characteristic	Value
Total Patients	313
Age (Mean ± SD)	61.5 ± 12.4
Gender	
Male	180 (57.5%)
Female	133 (42.5%)
Comorbidities	
Diabetes Mellitus	131 (42%)
Chronic Obstructive Pulmonary Disease (COPD)	116 (37%)
ICU Stay (Mean ± SD)	12.4 ± 7.3

This table summarizes the demographic characteristics of VAP patients included in the study. The mean age of patients was 61.5 years

(SD = 12.4), with a higher proportion of male patients (57.5%) and comorbidities such as diabetes mellitus and COPD.

**Table 2: Frequency of *Acinetobacter baumannii* Infections in VAP Patients**

Infection Type	Frequency (%)
Total Infections	124 (39.6%)
XDR-AB Strains	92 (74%)
Non-XDR-AB Strains	32 (26%)

This table shows the frequency of *Acinetobacter baumannii* infections among VAP patients. Of the total 124 infections, 92 (74%) were identified

as XDR-AB strains, while the remaining 32 (26%) were non-XDR-AB strains.

**Table 3: Clinical Outcomes by Infection Type**

Outcome	XDR-AB (n=92)	Non-XDR-AB (n=32)	p-value
ICU Stay (Mean ± SD)	15.2 ± 8.9	9.6 ± 6.2	<0.05
Mortality Rate (%)	32%	16%	0.03
Mean APACHE II Score	24.1 ± 5.6	18.4 ± 4.3	0.02

Table 3 compares the clinical outcomes between patients with XDR-AB and non-XDR-AB infections. XDR-AB patients had significantly

longer ICU stays, higher mortality, and greater severity (as indicated by the APACHE II score) compared to non-XDR-AB patients.

**Table 4: Comorbidities of VAP Patients with *Acinetobacter baumannii* Infections**

Comorbidity	XDR-AB (n=92)	Non-XDR-AB (n=32)	p-value
Diabetes Mellitus	42%	37%	0.56
Chronic Obstructive Pulmonary Disease (COPD)	40%	30%	0.43
Hypertension	22%	25%	0.61

This table summarizes the prevalence of comorbidities in VAP patients with *Acinetobacter baumannii* infections. Diabetes mellitus and COPD were the most common comorbidities in both XDR-AB and non-XDR-AB

groups, with no significant difference between the two groups.

## Discussion

The objective of the study was to identify the prevalence and the clinical consequences of *Acinetobacter baumannii* (AB) infections, especially the extensively drug-resistant (XDR) ones, among patients with ventilator-associated pneumonia (VAP) in a tertiary care hospital. The results showed that XDR-AB strains are a major cause of AB infections among ICU patients, and such infections were linked to high mortality rates, extended ICU hospitalisation, and increased disease severity. This section will compare our findings with the recent works, which gives a bigger picture of the global problem of XDR-AB in VAP [11,12]. We have discovered in our study that 74 per cent of patients with *A. baumannii* infection in VAP were infected with XDR strains, in line with other reports in other parts of the world. As an illustration, a Chinese study by Zhang et al. (2021) of VAP patients has determined that 70% of *A. baumannii* isolates were XDR, which directly correlates with our results. In a comparable study, Rao et al [13]. (2020) found that 72 per cent of *A. baumannii* strains in ICU-acquired infections were XDR. This underscores the prevalence of XDR-AB and the necessity of proper management policies to hold this increasing menace down [14]. The same results can be further supported by the fact that in our study, the rate of death among XDR-AB patients (32) is very high, compared to other studies. According to a multi-centre study by Lee et al. (2022), mortality in ICU patients with XDR-AB was between 28 and 35 per cent, depending on the severity of the infection and comorbidities [15]. The fact that XDR-AB patients had much higher APACHE II scores, meaning that the illness was more severe, is also in line with a study by Bhattacharya et al. (2021), in which XDR-AB infections were linked to increased APACHE II scores and poor clinical outcomes. These results underline the connection between the increased severity of diseases among the patients infected with XDR-AB and the necessity to use more aggressive and specific treatment approaches [16]. The extended ICU stay of XDR-AB-infected patients is one of the major observations to be made in our study.

XDR-AB patients spent an average total of 15.2 days in the ICU, which is considerably higher than in non-XDR-AB patients (9.6 days). This finding is in line with the results of a study by Sharma et al. (2020), who reported an average of 14.3 days for patients with XDR-AB strains in the ICU versus 8.9 days for patients with non-XDR strains [17]. The long ICU stay is not just an indicator of more serious infection, but it also leads to the emergence of other complications, such as secondary infection and organ failure, that further add to the increased expenditure and resource use in healthcare [18]. The results of our study on the comorbidities are also in line with contemporary studies. The most common comorbidities among the XDR-AB and non-XDR-AB patients were diabetes mellitus and chronic obstructive pulmonary disease (COPD) [19]. The same tendency was noted in the work of Khan et al. (2022), as diabetes mellitus and COPD were largely related to the *Acinetobacter baumannii* infections among the patients in ICUs [20]. These comorbidities can also increase the severity of infections, since underlying chronic diseases suppress the immune response and can result in a worse prognosis with infection by the drug-resistant organisms, such as XDR-AB [21]. Another important idea presented in the study is that to have better means of controlling the infection. Much of the recent work has focused on the importance of strict infection prevention and control measures in the control of the spread of resistant pathogens, such as XDR-AB [22]. A meta-analysis study by García et al. (2021) has pointed to the fact that better hand hygiene, clean-up and isolation guidelines have a strong impact by reducing the occurrence of XDR-AB in ICU units. This is corroborated by our results, which showed that the percentage of XDR-AB in the ICU of our hospital is similar to that of other hospitals worldwide in which lapses in infection control have led to increased spread of multidrug-resistant organisms [23]. In the context of treatment, our Study is consistent with the results of other recent studies that reveal that the XDR-AB treatment is not an easy task and only a few antibiotics can be used. Study by Gupta et al [24]. (2020) and Li et al. (2021) underscores the

fact that colistin, tigecycline, and some more recent antibiotics, such as cefetecol, are promising in treating XDR-AB infections, though their effectiveness may vary. In our experiment, other antibiotics such as colistin were applied, but the treatment was less effective due to the intensity of the infection and

the development of colistin resistance in certain patients. This indicates that continuous studies into new treatment alternatives and the possible use of combination therapy to circumvent resistance are necessary [25,26]. To sum up, the results of our study are similar to the recent study, which points to the increased prevalence and effects of XDR-AB in patients with VAP. The increased mortality, increased ICU length of stay, and severity of the disease that XDR-AB infections present support the necessity to improve infection control, implement more effective diagnostic solutions, and use alternative treatment methods to address such resistant infections. Future studies need to aim at refining treatment protocols and the dynamics of XDR-AB transmissions within medical facilities [27,28].

### Limitations

This Study also has a number of limitations, such as being retrospective in nature and being subject to selection bias. The Study was also carried out in one tertiary care hospital, which restricts the external validity of the study to other hospitals. Information regarding treatment regimens and bacterial resistance patterns was also missing in a few cases.

### Conclusion

VAP patients with XDR *Acinetobacter baumannii* infections are overwhelming in the ICU units and are associated with extensive patient outcomes, such as mortality and extended ICU hospitalisation. The reinforcement of infection control, the quality of timely diagnostics, and the elaboration of alternative treatment methods are primary to enhance patient management and address the XDR-AB infections in an effective manner.

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### Authors Contributions

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Final Approval of version: All Mentioned Authors Approved the Final Version.

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