

ORIGINAL ARTICLE

## Prevalence and Sensitivity Pattern of *Acinetobacter baumannii* in the Intensive Care Unit of Private Hospital in Jakarta


### Prevalensi dan Pola Kepekaan *Acinetobacter baumannii* di Ruang Rawat Intensif RS Swasta di Jakarta

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 <https://doi.org/10.56186/jbk.178-185>

#### ABSTRACT

##### Background

*Acinetobacter baumannii* is one of the bacteria that cause nosocomial infections, especially in the intensive care unit. These bacteria can cause infections, including bacteremia, pneumonia, urinary tract infections, surgical site infections, and meningitis. Most of these bacteria are multi-resistant to various antibiotics, impacting cure rates and length of stay. This study aimed to determine these bacteria's prevalence and antibiotic susceptibility patterns in the intensive care unit.

##### Methods

This research is descriptive research with a retrospective approach. The data was taken from the antibiotic susceptibility report in the intensive care unit of a private hospital in Jakarta in the period January 2020 – December 2021. The antibiotic susceptibility report was processed using the WHONET 2018 software.

##### Results

From 681 specimens examined in the intensive care unit, the prevalence of *Acinetobacter baumannii* was 28.7%, 80% of which came from respiratory specimens. In the sensitivity test results, only the antibiotic Colistin has the best sensitivity to this bacteria, which is 100% sensitive, while other antibiotics have poor sensitivity.

##### Conclusions

*Acinetobacter baumannii* is the bacteria that causes infection in the intensive care unit, with almost all of them being multi-drug resistant bacteria.

**Keywords:** *Acinetobacter baumannii*; intensive care unit; antibiotic susceptibility pattern.

**ABSTRAK****Latar Belakang**

*Acinetobacter baumannii* merupakan salah satu bakteri penyebab infeksi nosokomial terutama pada ruang perawatan intensif. Infeksi yang dapat ditimbulkan oleh bakteri ini antara lain berupa bakteremia, pneumonia, infeksi saluran kemih, infeksi daerah operasi dan meningitis. Kebanyakan bakteri ini bersifat multi-resisten terhadap berbagai antibiotik, yang dapat berdampak pada tingkat kesembuhan dan lamanya masa perawatan. Tujuan dari penelitian ini adalah mengetahui prevalensi dan pola kepekaan terhadap antibiotik pada bakteri ini di ruang perawatan intensif.

**Metode**

Penelitian ini bersifat deskriptif dengan pendekatan retrospektif. Data diambil dari laporan pola kuman ruang rawat intensif pada salah satu rumah sakit swasta di Jakarta pada periode Januari 2020 – Desember 2021. Laporan pola kuman diolah menggunakan software WHONET 2018.

**Hasil**

Dari total 681 spesimen yang diperiksa pada ruang rawat intensif, didapatkan prevalensi bakteri *Acinetobacter baumannii* sebesar 28.7%, dengan 80% diantaranya berasal dari spesimen saluran napas. Pada hasil uji sensitivitas, hanya antibiotik Colistin yang memiliki sensitivitas paling baik terhadap bakteri ini, yaitu 100% sensitif, sedangkan antibiotik lain memiliki sensitivitas yang kurang baik.

**Kesimpulan**

Bakteri *Acinetobacter baumannii* merupakan bakteri penyebab infeksi pada ruang rawat intensif, dengan hampir seluruhnya merupakan bakteri *multi-drug resistant*.

**Kata Kunci:** *Acinetobacter baumannii*; ruang rawat intensif; pola kepekaan bakteri

**INTRODUCTION**

*Acinetobacter baumannii* is a gram-negative coccobacillus-shaped bacterium, encapsulated, aerobic, non-fermenting lactose, and oxidase negative. The genus *Acinetobacter* has more than 20 known species, but the majority that cause infections in humans are *A. baumannii*, *A. pittii*, and *A. nosocomialis*.<sup>1-3</sup> *Acinetobacter baumannii* is a bacterium that causes nosocomial infections and often causes infection in patients in intensive care units, with high morbidity and mortality, especially in immunocompromised patients.<sup>4,5</sup> *Acinetobacter baumannii* is endemic in hospitals. These bacteria can adapt to colonising the human body and dry and wet environmental surfaces in hospitals. Globally, the incidence of *Acinetobacter baumannii* infection continues to increase. This is associated with the increasing proportion of patients who are seriously ill and need advanced medical equipment. *Acinetobacter baumannii* can cause clinical infections such as bacteremia, pneumonia, meningitis, urinary tract infections, and surgical site infections or wounds.<sup>6-10</sup>

*Acinetobacter baumannii* is one of the ESKAPE microorganisms (*Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, and *Enterobacter* sp.) which is a global threat to human health and poses a challenge in therapy due to the emergence of increasing resistance. According to WHO, *Acinetobacter baumannii* is resistant to antibiotics. Carbapenems were the priority in the research and

development of antibiotics in 2018. Carbapenems were chosen as markers because resistance to these antibiotics is usually associated with resistance to other antibiotics.<sup>11,12</sup>

The prevalence study of the Extended Prevalence of Infection in the ICU-II (EPIC II) conducted in 2007 in 75 countries found *Acinetobacter* sp. as a cause of infection in the intensive care unit by 8.8%, with an average prevalence of 19% in Asia and 17% in Eastern Europe. Studies from the SENTRY antimicrobial surveillance program in 2009 – 2011 found *Acinetobacter baumannii* complex responsible for 7% of cases of infection in intensive care units in the United States and Europe.<sup>2</sup> CDC data for 2017 shows 8,500 cases of *Acinetobacter baumannii* infection in the United States, with a death rate of up to 700 cases.<sup>12,13</sup> Studies in Saudi Arabia found the prevalence of *Acinetobacter baumannii* infection to be 17%.<sup>14</sup> One study conducted in Indonesia in 2018 found *Acinetobacter baumannii* infection in intensive care patients as many as 412 out of 1211 treated, with a prevalence of carbapenem-resistant *Acinetobacter baumannii* of 38.3%.<sup>15</sup> Another study conducted in Makassar in 2016 found that from 323 isolates of *Acinetobacter baumannii*, 20.7% of them were multi-drug resistant (MDR) *A. baumannii*.<sup>16</sup> MDR bacteria are usually found in the intensive care unit compared to the usual ward. Therefore, this study has focused on the intensive care unit. This study aimed to determine the prevalence of *Acinetobacter baumannii* infection and its sensitivity pattern in the intensive care unit at a hospital in Jakarta.

## METHODS

This study is a descriptive retrospective study. The data was taken from a microbiology laboratory germ pattern report at a private Jakarta hospital from January 2020 – December 2021. The germ pattern report was processed using the WHONET 2018 software. The data was in the form of infection data in intensive care room patients caused by the bacterium *Acinetobacter baumannii*, as many as 60 clinical specimens. Identification of bacteria and antibiotic sensitivity tests were carried out using an automatic test with a BD Phoenix system machine, Becton Dickinson, USA. The method of the antibiotic susceptibility test uses minimal inhibitory concentrations.

## RESULTS

From January 2020 - December 2021, 681 samples were obtained from various specimens of intensive care patients, comparing positive culture results in 189 samples and negative culture results in 492 samples. From positive culture results, 60 samples were found, including *Acinetobacter baumannii*, with a prevalence of 28.7% (Figure 1).

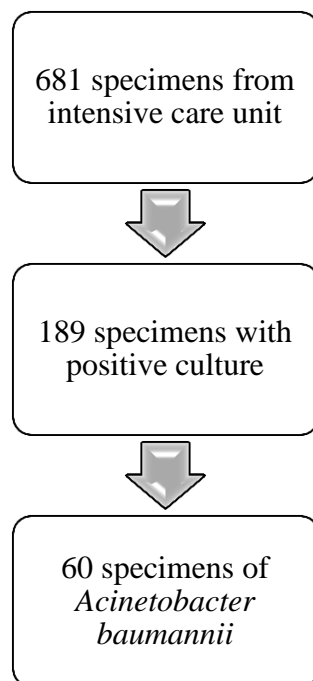


Figure 1. Sample Selection Flow

Table 1. Distribution of Pathogenic Bacteria and Specimens of Intensive Care Patients at a Private Hospital in Jakarta (January 2020 – December 2021).

No	Microorganisms	Sputum	Bronchia l rinse	Body fluids	Blood	Pus/cell tissue	Urin e	Number of micro- organisms
1	<i>Acinetobacter baumannii</i>	48	6	3	3	0	0	60
2	<i>Klebsiella sp.</i>	23	2	0	2	1	0	28
3	<i>Stenotrophomonas maltophilia</i>	15	5	0	2	3	1	26
4	<i>Pseudomonas aeruginosa</i>	15	2	0	2	0	2	21
5	<i>Staphylococcus epidermidis</i>	7	0	2	8	1	0	18
6	<i>Escherichia coli</i>	3	0	2	4	3	4	16
7	<i>Staphylococcus aureus</i>	2	0	0	2	2	1	7
8	<i>Enterococcus sp.</i>	2	0	0	1	0	3	6
9	<i>Enterobacter sp</i>	2	0	0	0	1	1	4
10	<i>Citrobacter koseri</i>	0	0	0	0	0	1	1
11	<i>Serratia marcescens</i>	0	1	0	0	0	0	1
12	<i>Streptococcus viridans</i>	0	0	0	0	0	1	1
13	No growth	90	7	20	244	9	122	492
Total		207	23	27	268	20	136	681

Of the 60 *Acinetobacter baumannii* isolates obtained, the majority came from sputum specimens, namely 48 specimens, the remaining six from bronchial washings, three from blood, and three from body fluids (Table 1). The results of the sensitivity pattern showed that antibiotics were still excellent; the sensitivity was only Colistin, which was 100% (Table 2).

**Table 2. Results of the Sensitivity Pattern of *A. baumannii* Bacteria in Intensive Care Room Patients at a Private Hospital in Jakarta, Period January 2020 – December 2021**

Antibiotic	% Sensitive
Amikacin	5
Gentamicin	5
Ampicillin	0
Imipenem	3,3
Meropenem	3,3
Cefazolin	0
Ceftazidime	5
Cefotaxime	3,3
Cefepime	5
Aztreonam	0
Amoxicillin-Clavulanat	0
Piperacillin-Tazobactam	5
Trimethoprim-Sulfamethoxazole	30
Ciprofloxacin	3,3
Levofloxacin	3,3
Tetracycline	3,3
Ampicillin-Sulbactam	5
Moxifloxacin	5
Chloramphenicol	0
Colistin	100

## DISCUSSION

From the results of the study, it was found that the five most Gram-negative bacteria in infected patients in the intensive care unit were *Acinetobacter baumannii* at 31.7%, *Klebsiella* sp. at 14.8%, *Stenotrophomonas maltophilia* 13.8%, *Pseudomonas aeruginosa* 11.1% and *Escherichia coli* 8.5%. In contrast, the most common Gram-positive bacteria are *Staphylococcus epidermidis* at 9.5% and *Staphylococcus aureus* at 3.7%. These results are similar to a study in Bali in 2020 by Budayanti et al. in all wards. The study found that the bacteria that dominate the cause of infection are Gram-negative bacteria, namely *Escherichia coli*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, and *Klebsiella pneumoniae*.<sup>17</sup> The results of this study are also almost

the same as a study conducted by Akter *et al.* in Bangladesh in the intensive care unit in 2017, with the bacteria that cause the most infections, namely *Escherichia coli* by 28%, *Klebsiella sp.* 27%, *Acinetobacter sp.* 17.3%, *Pseudomonas sp.* 9.6% and *Staphylococcus aureus* 5.3%.<sup>18</sup> The same results were carried out in Nepal on intensive care unit patients with the most common bacterial cause of infection, *Acinetobacter sp.* 31%, *Klebsiella sp.* 24%, *E. coli*, and *Pseudomonas sp.*, each 10.1%.<sup>19</sup>

In this study, the prevalence of *Acinetobacter baumannii* in the intensive care unit was 31.7%. These results are similar to the research conducted by Saharman *et al.* at the ICU RSUPN Dr. Cipto Mangunkusumo, with a prevalence of *Acinetobacter baumannii* infection of 34%. Similar results were also found in a study conducted in Kazakhstan in 2015, with the prevalence of *Acinetobacter baumannii* infection in intensive care patients reaching 34.1%.<sup>7,15</sup> Another study conducted at RSU Dr. Wahidin Sudirohusodo, Makassar, found a lower prevalence of 20.7%.<sup>(16)</sup> A lower prevalence was also found in a study in Morocco, namely 9.2%, while studies conducted in Punjab and Varanasi, India, found a greater prevalence, reaching 42% and 43.2%.<sup>20,21</sup>

The identification results found that most specimens with *Acinetobacter baumannii* infection were from the respiratory tract (sputum and bronchial washings), which reached 90%. Similar results were shown by a study conducted in India, with most specimens of this bacterial infection coming from the respiratory tract, namely 63.15% - 67%.<sup>21,22</sup> The results of other studies in Mexico and South Africa also show the same thing with lower percentages, namely 50% and 53.8%.<sup>11,23</sup>

On the results of antibiotic sensitivity, it was found that only the antibiotic Colistin remained, which had a sensitivity of 100%. Trimethoprim-sulfamethoxazole antibiotics have a sensitivity of 30%, while other antibiotics have a sensitivity of  $\leq 5\%$ . The sensitivity test results showed that carbapenem-resistant *Acinetobacter baumannii* prevalence reached 96.7%. These results are similar to a study conducted in Mexico in 2019, with the prevalence of Carbapenem-resistant *Acinetobacter baumannii* reaching 97.5% with a sensitivity of 95% sensitive to the antibiotic Colistin.<sup>11</sup> Similar results were also shown in a study conducted in South Africa, where *Acinetobacter baumannii* isolates were resistant to Meropenem by 89.2% and sensitivity to Colistin was 97.3%.<sup>23</sup> The sensitivity of the antibiotic Colistin is still high; the sensitivity rate was also found in a study conducted in Turkey, which was 98.8%.<sup>24</sup>

## CONCLUSION

The prevalence of *Acinetobacter baumannii* infection was found to be 28.7% in the period January 2020 – December 2021, with the most significant number of specimens contributing to the respiratory tract (sputum and bronchial washings). *Acinetobacter baumannii* is a bacteria that causes infection in intensive care units, with the majority being multi-drug resistant. Colistin antibiotic is the only antibiotic with good sensitivity, reaching 100%.

## ACKNOWLEDGEMENT

Nothing to declare.

## AUTHORS CONTRIBUTION

AD and NL contributed to data collection. AD contributed to the preparation of draft manuscripts and the writing of manuscripts. WDG contributed to improving the manuscript. All authors have read the final manuscript and given their approval.

## FUNDING

This research received no specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## CONFLICT OF INTEREST

The author declares no conflict of interest.

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