



Vol.6 No.2 | Agustus 2023

JURNAL BIOMEDIKA DAN KESEHATAN

Publikasi dari Fakultas Kedokteran Universitas Trisakti

Editorial

Workplace Violence in Healthcare Service

Nany Hairunisa

Original Article

Levels of TGF- Serum Positively Correlated with Levels of IgM Anti PGL-1 In Household Contacts of Multibacillary Leprosy Patients

Putu Yunita Primasari, Luh Made Mas Rusyati, I Gusti Ayu Agung Dwi Karmila et al

Antioxidant Effectiveness Test of Olive Oil on Malondialdehyde in Hyperglycemic Rats

Ariani Zaltin Okvenda, Eti Yerizel, Raveinal et al

Correlation of Peat Water and Skin Disease Complaints in the Community of Handil Sohor Village, Indonesia

Nawan, Intan Wahyu Wulandari, Francisca Diana Alexandra et al

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

Ade Dharmawan, Arleen Devita, Wani Devita Gunardi et al

The Difference in Blast Number Between Manual Count and Siemens Advia 2120i Automatic Hematology Analyzer

Mario, Paulus Budiono Notopuro

Molecular Epidemiology genes detection of *Klebsiella pneumoniae* Clinical Isolates from the Adult Patients with Comorbidities in Baghdad hospitals

Nuha B Kudaer, Mohsen Risan, Rasha Raheem, et al

Review Article

Prevention of Disability in Leprosy

Robert Thiodorus, Luh Made Mas Rusyati, Marrietta Sugiarti Sadeli

Occupational Asbestos Related Diseases in Indonesia: A Call for Urgent Action and Awareness

Ade Dwi Lestari, Nany Hairunisa, Alvin Mohamad Ridwan

Problematic *Clostridium difficile* infection

Conny Riana Tjampakasari, Deajeng Laras Hanayurianingtyas

The Role of Cytoglobin in Cancer

Deasyka Yastani, Novi Silvia H, Sri Widia A. Jusman

Editorial Team

[Home](#) / [Editorial Team](#)

Editorial Team

Editor in Chief


Husnun Amalia

Fakultas Kedokteran Universitas Trisakti, Indonesia

Academic profile:     

ML Edy Parwanto

Fakultas Kedokteran Universitas Trisakti, Indonesia

Academic profile:     

 **Associate Editor****Nany Hairunisa**

Fakultas Kedokteran Universitas Trisakti, Indonesia

Academic profile:     

Magdalena Wartono

Fakultas Kedokteran Universitas Trisakti, Indonesia

Academic profile:

 **Editorial Boards****Adi Hidayat**

Fakultas Kedokteran Universitas Trisakti, Indonesia

Academic profile:     

Laksmi Maharani

Fakultas Kedokteran Universitas Trisakti, Indonesia

Academic profile:     

Monica Dwi Hartanti

Fakultas Kedokteran Universitas Trisakti, Indonesia



Journal Information

Author Information Pack

Archives

Submissions

Contact



arleendevita 0

Raditya Wratsangka

Fakultas Kedokteran Universitas Trisakti, Indonesia

Academic profile:

Siti Sugih Hartiningsih

STIKes Dharma Husada Bandung, Indonesia

Academic profile:

Dito Anugroho

Universitas Muhammadiyah (Unismuh) Makassar, Indonesia

Academic profile:

Emad Yousif

Al-Nahrain University

Academic profile:

Editorial Office



[Journal Information](#)

[Author Information Pack](#)

[Archives](#)

[Submissions](#)

[Contact](#)



[arleendevita 0](#)



Jurnal Biomedika dan Kesehatan (JBK) is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](#).

171560 [View My Stats](#)

© Platform & Workflow by: [Open Journal Systems](#)

Designed by [Material Theme](#)

Abstracting & Indexing

[Home](#) / Abstracting & Indexing

Jurnal Biomedika dan Kesehatan, with registered number [ISSN: 2621-539X](#) (print), [ISSN: 2621-5470](#) (online) have been indexed on:

1. [Google Scholar](#)
2. [Publons](#)
3. [Scilit Basel](#)
4. [WorldCat](#)
5. [CrossRef](#)
6. [Dimensions](#)
7. [Garuda](#)
8. [BASE \(Bielefeld Academic Search Engine\)](#)
9. [SINTA 3 \(Science and Technology Index\)](#)



Jurnal Biomedika dan Kesehatan (JBK) is licensed under a Creative Commons

Attribution-NonCommercial 4.0 International License.

171558 [View My Stats](#)

© Platform & Workflow by: Open Journal Systems
Designed by Material Theme

Vol. 6 No. 2 (2023)

[Home](#) / [Archives](#) / Vol. 6 No. 2 (2023)



Published: 2023-08-28



Workplace Violence in Healthcare Service

Nany Hairunisa

142-145

PDF

Original Article



Levels of TGF- β_2 Serum Positively Correlated with Levels of IgM Anti PGL-1 In Household Contacts of Multibacillary Leprosy Patients

Putu Yunita Primasari, Luh Made Mas Rusyati, I Gusti Ayu Agung Dwi Karmila, Ketut Kwartantaya Winaya, Nyoman Suryawati, Ni Luh Putu Ratih Vibriyanti Karna

146-157



Antioxidant Effectiveness Test of Olive Oil on Malondialdehyde in Hyperglycemic Rats

Ariani Zaltin Okvenda, Eti Yerizel, Raveinal Yerizel, Almurdi Yerizel

158-169



Correlation of Peat Water and Skin Disease Complaints in the Community of Handil Sohor Village, Indonesia

Nawan Nawan, Intan Wahyu Wulandari, Francisca Diana Alexandra, Septi Handayani

170-177



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

Ade Dharmawan, Arleen Devita, Wani Devita Gunardi, Nicolas Layanto
178-185



The The Difference in Blast Number Between Manual Count and Siemens Advia 2120i Automatic Hematology Analyzer

Mario Mario, Notopuro PB
186-195





Molecular Epidemiology genes detection of *Klebsiella pneumoniae* Clinical Isolates from the Adult Patients with Comorbidities in Baghdad hospitals

Nuha B Kudaer, Mohsen Hashim Risan, Rasha Raheem, Khalid Zainulabdeen, Israa Salman, Nany Hairunisa, Husnun Amalia, Seenar Hameed, Emad Yousif
196-215



Review Article



Prevention of Disability in Leprosy

Robert Thiodorus, Luh Made Mas Rusyati, Marrietta Sugiarti Sadeli
216-223





Occupational Asbestos Related Diseases in Indonesia: A Call for Urgent Action and Awareness

Ade Dwi Lestari, Nany Hairunisa, Alvin Mohamad Ridwan
224-234



Problematic Clostridium difficile infection

Infeksi C. difficile

Conny Riana Tjampakasari, Deajeng Laras Hanayurianingtyas
235-249





The Role of Cyoglobin in Cancer

Deasyka Yastani, Novi Silvia H, Sri Widia A Jusman

250-260



Jurnal Biomedika dan Kesehatan (JBK) is licensed under a [Creative Commons](https://creativecommons.org/licenses/by-nc/4.0/)

Attribution-NonCommercial 4.0 International License.

171581 [View My Stats](#)

© Platform & Workflow by: [Open Journal Systems](#)

Designed by [Material Theme](#)

BUKTI KORESPONDENSI

The screenshot shows a web application interface with a dark blue header. The header contains the text "Jurnal Biomedika dan Kesehatan" on the left, and a bell icon and a user profile icon on the right. Below the header, there is a navigation bar with a "Back to Submissions" link. The main content area is divided into a sidebar on the left and a main panel on the right. The sidebar has a "Round 1" section with a "Round 1 Submissions" button. The main panel displays a notification modal titled "Notifications" with a close button (X). The modal content includes the title "[JBK] Editor Decision", the timestamp "2023-08-27 08:30 PM", and the text "Ade Dharmawan, arleen devita, Wani Devita Gunardi, Nicolas Layanto:". Below this, it states "We have reached a decision regarding your submission to Jurnal Biomedika dan Kesehatan, 'Prevalensi dan Pola Kepekaan Acinetobacter baumannii di Ruang Rawat Intensif Sebuah RS Swasta di Jakarta'." and "Our decision is to: Accept Submission". At the bottom of the modal, there is a signature line for "Jurnal Biomedika dan Kesehatan" with the address "Jl. Kyai Tapa No. 260 Kampus B, Grogol, DKI Jakarta 11440" and contact information "Telp. (021) 5672731 | E-mail: jbiomedkes@trisakti.ac.id".

294 / Dharmawan et al. / Prevalence and Sensitivity Pattern of Acinetobacter bauma

Library

Workflow

Publication

Submission

Review

Copyediting

Production

Round 1

Round 1 Status

Submission accepted.

Notifications

[JBK] Editor Decision	2023-08-27 08:30 PM
[JBK] Editor Decision	2023-08-27 08:50 PM

Reviewer's Attachments


Q Search

No Files

Revisions

Q Search

Upload File

▶  2639 [artikel-oa-294-for-revision \(1\).docx](#)

August 10, 2023

Article Text

Review Discussions				Add discussion
Name	From	Last Reply	Replies	Closed
Revision required	husnun_a 2023-08-06 08:37 AM	-	0	<input type="checkbox"/>
▶ Revisian manuskrip	arleendevita 2023-08-06 07:30 PM	-	0	<input type="checkbox"/>

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

Ade Dharmawan¹, Arleen Devita² , Wani Devita Gunardi¹, Nicolas Layanto¹

¹Department of Microbiology, Faculty of Medicine and Health Sciences, Universitas Kristen Krida Wacana, Jakarta, Indonesia

²Department of Microbiology, Faculty of Medicine, Universitas Trisakti, Jakarta, Indonesia

 arleen.devita@trisakti.ac.id

 <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*.¹⁻³ *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..^{4,5} *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 in the form of bacteremia, pneumonia, meningitis, urinary tract infections, and surgical site infections or wounds.⁶⁻¹⁰

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.^{11,12}

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.² 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.^{12,13} Studies in Saudi Arabia found the prevalence of *Acinetobacter baumannii* infection to be 17%.¹⁴ One study conducted in Indonesia in 2018 found *Acinetobacter baumannii* infection in intensive care patients as many as 412 out of 1211 patients treated, with a prevalence of carbapenem-resistant *Acinetobacter baumannii* of 38.3%.¹⁵ 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*.¹⁶ 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).

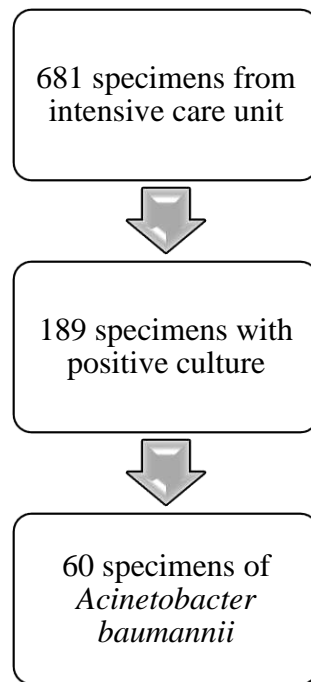


Figure 1. Sample Selection Flow

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
Tabel 2. Hasil Pola Kepekaan Bakteri *A. baumannii* pada Pasien Ruang Rawat Intensif di Sebuah RS Swasta di Jakarta, Periode Januari 2020 – Desember 2021

Antibiotik	% Sensitive/Sensitif
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*.¹⁷ 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%.¹⁸ 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%.¹⁹

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%.^{7,15} Another study conducted at RSU Dr. Wahidin Sudirohusodo, Makassar, found a lower prevalence of 20.7%.⁽¹⁶⁾ 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%.^{20,21}

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%.^{21,22} The results of other studies in Mexico and South Africa also show the same thing with lower percentages, namely 50% and 53.8%.^{11,23}

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.¹¹ 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%.²³ 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%.²⁴

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 nodid not receive any~~ specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

CONFLICT OF INTEREST

The author declares no conflict of interest.

REFERENCES

1. Kharaba A, Algethamy H, Hussein M, et al. Incidence, outcomes, and predictors of Acinetobacter infection in Saudi Arabian critical care units. *J Crit Care*. 2021;66:109-16. doi:10.1016/j.jcrc.2021.08.010
2. Lynch JP, Zhanel GG, Clark NM. Infections Due to Acinetobacter baumannii in the ICU: Treatment Options. *Semin Respir Crit Care Med*. 2017;38(3):311-25. doi:10.1055/s-0037-1599225
3. Ren J, Li X, Wang L, et al. Risk factors and drug resistance of the MDR Acinetobacter baumannii in pneumonia patients in ICU. *Open Med*. 2019;14(1):772-7. doi:10.1515/med-2019-0090
4. Sileem AE, Said AM, Meleha MS. Acinetobacter baumannii in ICU patients: A prospective study highlighting their incidence, antibiotic sensitivity pattern and impact on ICU stay and mortality. *Egypt J Chest Dis Tuberc*. 2017;66(4):693-8. doi:10.1016/j.ejcdt.2017.01.003
5. Uwingabiye J, Frikh M, Lemnouer A, et al. Acinetobacter infections prevalence and frequency of the antibiotics resistance: Comparative study of intensive care units versus other hospital units. *Pan Afr Med J*. 2016;23:1-10. doi:10.11604/pamj.2016.23.191.7915
6. Ben-Chetrit E, Wiener-Well Y, Lesho E, et al. An intervention to control an ICU outbreak of carbapenem-resistant Acinetobacter baumannii: Long-term impact for the ICU and hospital. *Crit Care*. 2018;22(1):1-10. doi:10.1186/s13054-018-2247-y
7. Bissenova N, Yergaliyeva A. Epidemiology of Acinetobacter baumannii Isolates in an Intensive Care Unit in Kazakhstan. *J Microbiol Infect Dis*. 2018;8:83-8. doi:10.5799/jmid.458451
8. Xiao D, Wang L, Zhang D, et al. Prognosis of patients with Acinetobacter baumannii infection in the intensive care unit: A retrospective analysis. *Exp Ther Med*. 2017;13(4):1630-3. doi:10.3892/etm.2017.4137
9. Lin M-F. Antimicrobial resistance in Acinetobacter baumannii : From bench to bedside . *World J Clin Cases*. 2014;2(12):787. doi:10.12998/wjcc.v2.i12.787
10. Alotaibi T, Abuhaimed A, Alshahrani M, et al. Prevalence of multidrug-resistant Acinetobacter baumannii in a critical care setting: A tertiary teaching hospital experience. *SAGE Open Med*. 2021;9:205031212110011. doi:10.1177/20503121211001144
11. Alcántar-Curiel MD, Rosales-Reyes R, Jarillo-Quijada MD, et al. Carbapenem-Resistant Acinetobacter baumannii in Three Tertiary Care Hospitals in Mexico: Virulence Profiles, Innate Immune Response and Clonal Dissemination. *Front Microbiol*. 2019;10:1-19. doi:10.3389/fmicb.2019.02116
12. Lukovic B, Gajic I, Dimkic I, et al. The first nationwide multicenter study of Acinetobacter baumannii recovered in Serbia: emergence of OXA-72, OXA-23 and NDM-1-producing isolates. *Antimicrob Resist Infect Control*. 2020;9(1):1-12. doi:10.1186/s13756-020-00769-8

13. da Silva MCB, Werlang MHB, Spada Júnior V, et al. Risk Factors Associated with *Acinetobacter baumannii* Infections in Patients in an Intensive Care Unit of a Public Hospital in Paraná. *Adv Infect Dis*. 2022;12(01):90-105. doi:10.4236/aid.2022.121008
14. Ibrahim ME. Prevalence of *Acinetobacter baumannii* in Saudi Arabia: Risk factors, antimicrobial resistance patterns and mechanisms of carbapenem resistance. *Ann Clin Microbiol Antimicrob*. 2019;18(1):1-12. doi:10.1186/s12941-018-0301-x
15. Saharman YR, Karuniawati A, Sedono R, et al. Endemic carbapenem-nonsusceptible *Acinetobacter baumannii*-calcoaceticus complex in intensive care units of the national referral hospital in Jakarta, Indonesia. *Antimicrob Resist Infect Control*. 2018;7(1):1-12. doi:10.1186/s13756-017-0296-7
16. Tungadi DK, Sennang N. Prevalence And Characteristic Of Multidrug-Resistant *Acinetobacter Baumannii* Cases At The Dr. Wahidin Sudirohusodo General Hospital In Makassar. *J Clin Pathol Med Lab*. 2019;25(2):211-7.
17. Budayanti NS, Aisyah DN, Fatmawati NND, et al. Identification and Distribution of Pathogens in a Major Tertiary Hospital of Indonesia. *Front Public Heal*. 2020;7:1-8. doi:10.3389/fpubh.2019.00395
18. Akter T, Murshed M, Begum T, et al. Antimicrobial Resistance Pattern of Bacterial Isolates from Intensive Care Unit of a Tertiary Care Hospital in Bangladesh. *Bangladesh J Med Microbiol*. 2017;8(1):7-11. doi:10.3329/bjmm.v8i1.31052
19. Bhandari P, Thapa G, Pokhrel BM, et al. Nosocomial Isolates and Their Drug Resistant Pattern in ICU Patients at National Institute of Neurological and Allied Sciences, Nepal. *Int J Microbiol*. 2015;2015. doi:10.1155/2015/572163
20. Banerjee T, Mishra A, Das A, et al. High Prevalence and Endemicity of Multi-drug Resistant *Acinetobacter* spp. in Intensive Care Unit of a Tertiary Care Hospital, Varanasi, India . *J Pathog*. 2018;2018:1-8. doi:10.1155/2018/9129083
21. Kaur T, Putatunda C, Oberoi A, et al. Prevalence and drug resistance in *acinetobacter* sp. Isolated from intensive care units patients in Punjab, India. *Asian J Pharm Clin Res*. 2018;11(Special Issue 2):88-93. doi:10.22159/ajpcr.2018.v11s2.28590
22. Sudhaharan S, Vemu L, Kanne P. Prevalence of multi-drug resistant *Acinetobacter baumannii* in clinical samples in a tertiary care hospital. *Int J Infect Control*. 2015;11(3):11-5. doi:10.3396/IJIC.v11i3.023.15
23. Ntusi NBA, Badri M, Khalfey H, et al. ICU-Associated *Acinetobacter baumannii* Colonisation/Infection in a High HIV-Prevalence Resource-Poor Setting. *PLoS One*. 2012;7(12):1-7. doi:10.1371/journal.pone.0052452
24. Boral B, Unaldi Ö, Ergin A, et al. A prospective multicenter study on the evaluation of antimicrobial resistance and molecular epidemiology of multidrug-resistant *Acinetobacter baumannii* infections in intensive care units with clinical and environmental features. *Ann Clin Microbiol Antimicrob*. 2019;18(1):1-9. doi:10.1186/s12941-019-0319-8



This work is licensed under a Creative Commons Attribution Non-Commercial 4.0 International License

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

by dr. Arleen

Submission date: 21-Aug-2024 09:21AM (UTC+0700)

Submission ID: 2400879299

File name: 5._Dokumen_Acineteto.pdf (525.91K)

Word count: 3064

Character count: 17135

ORIGINAL ARTICLE

1
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

Ade Dharmawan¹, Arleen Devita², Wani Devita Gunardi¹, Nicolas Layanto¹

¹Department of Microbiology, Faculty of Medicine and Health Sciences, Universitas Kristen Krida Wacana, Jakarta, Indonesia

²Department of Microbiology, Faculty of Medicine, Universitas Trisakti, Jakarta, Indonesia

✉ arleen.devita@trisakti.ac.id

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

ABSTRACT

Background

18
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.

17
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

20
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

10
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*.¹⁻³ *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..^{4,5} *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.⁶⁻¹⁰

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.^{11,12}

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.² 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.^{12,13} Studies in Saudi Arabia found the prevalence of *Acinetobacter baumannii* infection to be 17%.¹⁴ 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%.¹⁵ 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*.¹⁶ 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).

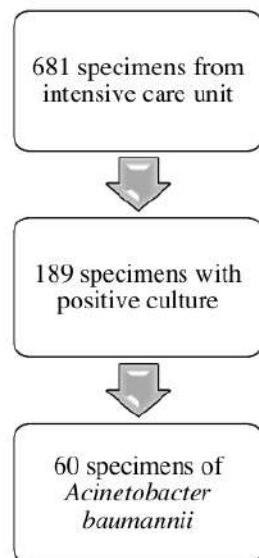


Figure 1. Sample Selection Flow

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*.¹⁷ 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%.¹⁸ 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%.¹⁹

²¹ 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%.^{7,15} Another study conducted at RSU Dr. Wahidin Sudirohusodo, Makassar, found a lower prevalence of 20.7%.⁽¹⁶⁾ 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%.^{20,21}

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%.^{21,22} The results of other studies in Mexico and South Africa also show the same thing with lower percentages, namely 50% and 53.8%.^{11,23}

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.¹¹ 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%.²³ 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%.²⁴

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.

REFERENCES

1. Kharaba A, Algethamy H, Hussein M, et al. Incidence, outcomes, and predictors of Acinetobacter infection in Saudi Arabian critical care units. *J Crit Care*. 2021;66:109-16. doi:10.1016/j.jcrc.2021.08.010
2. Lynch JP, Zhanel GG, Clark NM. Infections Due to Acinetobacter baumannii in the ICU: Treatment Options. *Semin Respir Crit Care Med*. 2017;38(3):311-25. doi:10.1055/s-0037-1599225
3. Ren J, Li X, Wang L, et al. Risk factors and drug resistance of the MDR Acinetobacter baumannii in pneumonia patients in ICU. *Open Med*. 2019;14(1):772-7. doi:10.1515/med-2019-0090
4. Sileem AE, Said AM, Meleha MS. Acinetobacter baumannii in ICU patients: A prospective study highlighting their incidence, antibiotic sensitivity pattern and impact on ICU stay and mortality. *Egypt J Chest Dis Tuberc*. 2017;66(4):693-8. doi:10.1016/j.ejcdt.2017.01.003
5. Uwingabiye J, Frikh M, Lemnouer A, et al. Acinetobacter infections prevalence and frequency of the antibiotics resistance: Comparative study of intensive care units versus other hospital units. *Pan Afr Med J*. 2016;23:1-10. doi:10.11604/pamj.2016.23.191.7915
6. Ben-Chetrit E, Wiener-Well Y, Lesho E, et al. An intervention to control an ICU outbreak of carbapenem-resistant Acinetobacter baumannii: Long-term impact for the ICU and hospital. *Crit Care*. 2018;22(1):1-10. doi:10.1186/s13054-018-2247-y
7. Bissenova N, Yergaliyeva A. Epidemiology of Acinetobacter baumannii Isolates in an Intensive Care Unit in Kazakhstan. *J Microbiol Infect Dis*. 2018;8:83-8. doi:10.5799/jmid.458451
8. Xiao D, Wang L, Zhang D, et al. Prognosis of patients with Acinetobacter baumannii infection in the intensive care unit: A retrospective analysis. *Exp Ther Med*. 2017;13(4):1630-3. doi:10.3892/etm.2017.4137
9. Lin M-F. Antimicrobial resistance in Acinetobacter baumannii: From bench to bedside. *World J Clin Cases*. 2014;2(12):787. doi:10.12998/wjcc.v2.i12.787
10. Alotaibi T, Abuhaimed A, Alshahrani M, et al. Prevalence of multidrug-resistant Acinetobacter baumannii in a critical care setting: A tertiary teaching hospital experience. *SAGE Open Med*. 2021;9:205031212110011. doi:10.1177/20503121211001144
11. Alcántar-Curiel MD, Rosales-Reyes R, Jarillo-Quijada MD, et al. Carbapenem-Resistant Acinetobacter baumannii in Three Tertiary Care Hospitals in Mexico: Virulence Profiles, Innate Immune Response and Clonal Dissemination. *Front Microbiol*. 2019;10:1-19. doi:10.3389/fmicb.2019.02116
12. Lukovic B, Gajic I, Dimkic I, et al. The first nationwide multicenter study of Acinetobacter baumannii recovered in Serbia: emergence of OXA-72, OXA-23 and NDM-1-producing isolates. *Antimicrob Resist Infect Control*. 2020;9(1):1-12. doi:10.1186/s13756-020-00769-8

13. da Silva MCB, Werlang MHB, Spada Júnior V, et al. Risk Factors Associated with *Acinetobacter baumannii* Infections in Patients in an Intensive Care Unit of a Public Hospital in Paraná. *Adv Infect Dis*. 2022;12(01):90-105. doi:10.4236/aid.2022.121008
14. Ibrahim ME. Prevalence of *Acinetobacter baumannii* in Saudi Arabia: Risk factors, antimicrobial resistance patterns and mechanisms of carbapenem resistance. *Ann Clin Microbiol Antimicrob*. 2019;18(1):1-12. doi:10.1186/s12941-018-0301-x
15. Saharman YR, Karuniawati A, Sedono R, et al. Endemic carbapenem-nonsusceptible *Acinetobacter baumannii*-calcoaceticus complex in intensive care units of the national referral hospital in Jakarta, Indonesia. *Antimicrob Resist Infect Control*. 2018;7(1):1-12. doi:10.1186/s13756-017-0296-7
16. Tungadi DK, Sennang N. Prevalence And Characteristic Of Multidrug-Resistant *Acinetobacter Baumannii* Cases At The Dr. Wahidin Sudirohusodo General Hospital In Makassar. *J Clin Pathol Med Lab*. 2019;25(2):211-7.
17. Budayanti NS, Aisyah DN, Fatmawati NND, et al. Identification and Distribution of Pathogens in a Major Tertiary Hospital of Indonesia. *Front Public Heal*. 2020;7:1-8. doi:10.3389/fpubh.2019.00395
18. Akter T, Murshed M, Begum T, et al. Antimicrobial Resistance Pattern of Bacterial Isolates from Intensive Care Unit of a Tertiary Care Hospital in Bangladesh. *Bangladesh J Med Microbiol*. 2017;8(1):7-11. doi:10.3329/bjmm.v8i1.31052
19. Bhandari P, Thapa G, Pokhrel BM, et al. Nosocomial Isolates and Their Drug Resistant Pattern in ICU Patients at National Institute of Neurological and Allied Sciences, Nepal. *Int J Microbiol*. 2015;2015. doi:10.1155/2015/572163
20. Banerjee T, Mishra A, Das A, et al. High Prevalence and Endemicity of Multi-drug Resistant *Acinetobacter* spp. in Intensive Care Unit of a Tertiary Care Hospital, Varanasi, India . *J Pathog*. 2018;2018:1-8. doi:10.1155/2018/9129083
21. Kaur T, Putatunda C, Oberoi A, et al. Prevalence and drug resistance in *acinetobacter* sp. Isolated from intensive care units patients in Punjab, India. *Asian J Pharm Clin Res*. 2018;11(Special Issue 2):88-93. doi:10.22159/ajpcr.2018.v11i52.28590
22. Sudhaharan S, Vemu L, Kanne P. Prevalence of multi-drug resistant *Acinetobacter baumannii* in clinical samples in a tertiary care hospital. *Int J Infect Control*. 2015;11(3):11-5. doi:10.3396/IJIC.v11i3.023.15
23. Ntusi NBA, Badri M, Khalfey H, et al. ICU-Associated *Acinetobacter baumannii* Colonisation/Infection in a High HIV-Prevalence Resource-Poor Setting. *PLoS One*. 2012;7(12):1-7. doi:10.1371/journal.pone.0052452
24. Boral B, Unaldi Ö, Ergin A, et al. A prospective multicenter study on the evaluation of antimicrobial resistance and molecular epidemiology of multidrug-resistant *Acinetobacter baumannii* infections in intensive care units with clinical and environmental features. *Ann Clin Microbiol Antimicrob*. 2019;18(1):1-9. doi:10.1186/s12941-019-0319-8



This work is licensed under a Creative Commons Attribution Non-Commercial 4.0 International License

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

ORIGINALITY REPORT

18%

SIMILARITY INDEX

13%

INTERNET SOURCES

16%

PUBLICATIONS

4%

STUDENT PAPERS

PRIMARY SOURCES

1

ojs.unud.ac.id

Internet Source

2%

2

researchspace.ukzn.ac.za

Internet Source

2%

3

chped.net

Internet Source

1%

4

jurnal.umj.ac.id

Internet Source

1%

5

Irgie Catur Ryansyah, Dyah Ayu Woro Setyaningrum. "Nicotine Dependence and Perceived Stress during the Pandemic", Jurnal Biomedika dan Kesehatan, 2023

Publication

1%

6

www.textroad.com

Internet Source

1%

7

aricjournal.biomedcentral.com

Internet Source

1%

8	"13th European Congress of Clinical Microbiology and Infectious Diseases", Clinical Microbiology and Infection, 2003 Publication	1 %
9	ismb.ir Internet Source	1 %
10	www.wjgnet.com Internet Source	1 %
11	"Posters", Clinical Microbiology and Infection, 2011 Publication	1 %
12	Bassetti, Matteo, Righi Elda, and Alessia Canelutti. "Bloodstream Infections in the Intensive Care Unit", Virulence, 2016. Publication	1 %
13	Submitted to unikal Student Paper	1 %
14	123dok.com Internet Source	1 %
15	Hin, Tan Kian. "Characterization of AHL-Type Quorum Sensing in Cedecea Neteri SSMD04", University of Malaya (Malaysia), 2023 Publication	1 %
16	Joseph P. Lynch, Nina M. Clark, George G. Zhanel. "Infections Due to Acinetobacter baumannii–calcoaceticus Complex: Escalation	1 %

of Antimicrobial Resistance and Evolving Treatment Options", Seminars in Respiratory and Critical Care Medicine, 2022

Publication

17

Rida Darotin, Eky Madyaning Nastiti. "Analysis of Predictors that Influence on Prevalence of Hypertension", Jurnal Kesehatan dr. Soebandi, 2022

Publication

1 %

18

rjms.iums.ac.ir

Internet Source

1 %

19

Anastashia Baharutan, Fredine E. S. Rares, Standy Soeliongan. "POLA BAKTERI PENYEBAB INFEKSI NOSOKOMIAL PADA RUANG PERAWATAN INTENSIF ANAK DI BLU RSUP PROF. DR. R. D. KANDOU MANADO", Jurnal e-Biomedik, 2015

Publication

<1 %

20

Bruce Y. Lee, Sarah M. McGlone, Yohei Doi, Rachel R. Bailey, Lee H. Harrison. " Economic Impact of Infection in the Intensive Care Unit ", Infection Control & Hospital Epidemiology, 2015

Publication

<1 %

21

Snežana Kuzmanović Nedeljković, Nada Čujić Nikolić, Milica Radan, Dušan Milivojević et al. "Microencapsulation of *Origanum heracleoticum* L. and *Thymus vulgaris* L.

<1 %

essential oils – Novel strategy to combat multi-resistant *Acinetobacter baumannii*", Industrial Crops and Products, 2024

Publication

22

www.frontiersin.org

Internet Source

<1 %

23

www.panafrican-med-journal.com

Internet Source

<1 %

24

www.researchgate.net

Internet Source

<1 %

Exclude quotes On

Exclude matches < 10 words

Exclude bibliography On

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

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

/0

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8