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Evaluation of antibiotic use in pneumonia patients at bahteramas hospital using the gyssens method

Agustiana[1], Adryan Fristiohady. L[2], Muhammad Arba[3], Asriullah Jabbar[4], Suryani[5], Nur Illiyyin Akib[6]

[1,2,3,4,5,6]Farmasi, Universitas Halu Oleo, Sulawesi Tenggara, Indonesia

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ABSTRACT

Pneumonia is one of the leading causes of morbidity and mortality due to lower respiratory tract infections, with treatment heavily reliant on antibiotic administration. However, irrational use of antibiotics significantly contributes to the rise of antimicrobial resistance. This study aimed to evaluate the rationality of antibiotic use in adult pneumonia patients at RSUD Bahteramas, Southeast Sulawesi Province, using the Gyssens method. A total of 100 hospitalized patients who met the inclusion criteria from January to December 2024 were included. Data were analyzed using the Gyssens method to assess the appropriateness of antibiotic therapy based on indication, dosage, duration, route, and timing of administration. The results showed that only 41% of antibiotic use was classified as rational (category 0), while 59% was deemed irrational (categories I–V). Levofloxacin was the most frequently used antibiotic (63%), although its use often did not align with clinical guidelines. Most patients required antibiotics for 3–4 days, consistent with recommendations for mild to moderate pneumonia. Nonetheless, inappropriate use was still observed, particularly in prolonged therapy durations and antibiotic combinations without clear indications. These findings underscore the importance of strengthening adherence to clinical guidelines and conducting regular evaluations to prevent resistance and improve treatment outcomes.

Corresponding Author:

Agustiana,
Farmasi,
Universitas Halu Oleo,
Kampus Hijau Bumi Tridharma, Anduonohu, Kec. Kambu, Kota Kendari, Sulawesi Tenggara, 93232, Indonesia
Email: agustiana.aziz@yahoo.com

INTRODUCTION

Pneumonia is one of disease infection channel breathing bottom which is still become reason main morbidity and mortality in the world, including Indonesia. Pneumonia is a infection acute attack network lungs (especially the alveoli) and can caused by various type microorganisms including viruses, bacteria, and fungi (Irawan et al., 2019). Among microorganisms causes of pneumonia, there are bacteria Streptococcus pneumoniae as the most common pathogens found, followed by

Haemophilus influenzae, Mycoplasma pneumoniae, Chlamydophila pneumoniae, and Legionella species (Zahra et al., 2023). Symptoms that arise from This disease is fever accompanied by shivering, sick head, cough phlegmy, and shortness of breath breath. Pneumonia is one of the reason main death and disability, as well as become the most common infection cause death globally. Based on Global Burden Diseae data, (2021) This disease causes around 2.2 million death in various group age. Around three quarter from amount death the occurs in groups prone to namely children aged < 5 years with 23 % percentage, newborns and toddlers with percentage 7% (age 0-2 years), elderly with age > 65 years, and individuals with comorbidity like malnutrition, disorders immunology (Utami, 2020). Seeing height number events and deaths due to pneumonia, especially that caused by bacteria, then role therapy antibiotics become very crucial in treatment this disease.

Treatment of pneumonia generally involves the use of antibiotics as the primary therapy. However, irrational use of antibiotics is a major factor driving antimicrobial resistance (AMR) which is also a serious threat to global public health. Inappropriate use of antibiotics, such as administration without proper indications, inappropriate doses, or inadequate duration of treatment has become a crucial issue in the field of public health and patient safety. Inaccuracy in administering antibiotics can cause various negative impacts such as increased treatment costs, the risk of more toxic drug side effects, the development of antimicrobial resistance, and the emergence of superinfections that are difficult to treat (Azyenela et al., 2025). Antimicrobial resistance is a condition in which microorganisms, such as bacteria, undergo changes that allow them to survive exposure to antimicrobial agents, which were previously effective in inhibiting or killing them. This condition causes antibiotics to lose their ability to inhibit the growth or kill the bacteria that cause infection, so that therapy becomes ineffective and increases the risk of treatment failure (Putri et al., 2023). Therefore, rational use of antibiotics is needed in the treatment of pneumonia infections.

Rational use of antibiotics is an important focus in efforts to improve the quality of health services and reduce the rate of antibiotic resistance. To ensure rational and targeted use of antibiotics in the treatment of pneumonia, a systematic and standardized evaluation method is needed. One method that is widely used in evaluating the appropriateness of antibiotic use that has been approved by the Indonesian Ministry of Health is the Gyssens method. This method aims to assess whether the antibiotics used by the patient are appropriate or not (Dianati et al., 2024). The Gyssens method was chosen because it has a more detailed ability to assess and evaluate various parameters related to antibiotic use, including indications, effectiveness, safety, cost and spectrum of activity. In addition, this method also allows evaluation of the duration of therapy, dose, interval and route, and time of antibiotic administration (Efrilia et al., 2023). Evaluation of antibiotic use using the Gyssens method is classified into category VI, where category 0 is the rational use of antibiotics, while categories I-VI are irrational antibiotics (Dianati et al., 2024).

Gyssens method requires the support of health care facilities that have the capacity and strategic role, especially in ensuring the proper use of antibiotics. The existence of referral hospitals plays an important role in integrating the evaluation of the rationality of antibiotic use into the health care system. One of the hospitals that has an important role in this regard is Bahteramas Regional Hospital, as the main referral hospital in Southeast Sulawesi Province. Based on the report of the Health Research and Development Agency of the Ministry of the Republic of Indonesia (2018), the prevalence of pneumonia in Southeast Sulawesi Province was recorded at 1.59%, with a total of 3,297 cases spread across 17 districts/cities. Among these areas , Kendari City recorded amount case highest. Data from the Kendari City Health Service shows that amount cases of pneumonia in toddlers and adults reached 1,332 cases in 2020, increasing to 1,543 cases in 2021, and slightly decrease to 1,345 cases in 2022. Although happen decline in the year last, number the Still reflect height burden pneumonia disease in the area In 2022, it was recorded as many as 13,214 cases of pneumonia in the group toddlers and adults all over Southeast Sulawesi Province, but

only around 11.14% of case those who succeeded identified and handled in a way medical. This is in line with research conducted by Haseng et al., (2022) In the period 2017-2020 on cases of pneumonia in toddlers in kendari City showed trend decline, but still need attention special especially in areas with prevalence tall like Subdistrict Nambo and Puuwatu. The height Pneumonia cases and the role of Bahteramas Regional Hospital confirm the importance of local data For support evaluation use antibiotics and policy based on proof.

Study similar related evaluation use antibiotics in pneumonia patients, have conducted by Hadiq et al., (2024) state results study evaluation use antibiotics adult pneumonia patients take care hospitalization at Nene Mallomo Regional Hospital use method gyssens show that 51.28% of usage antibiotics classified as rational (Category 0), while the remaining 48.72% included in the category improper use rational (Category IV–I). In a study conducted by Saroh et al., (2025) shows some inaccuracies, including duration. giving too much antibiotics short by 0.83%, inaccuracy dose by 0.83%, and inaccuracy of dosing interval by 2.44%. In general overall, usage antibiotics at home Jakarta Islamic Hospital Cempaka White has show level sufficient rationality high, namely by 95.9%. Evaluation with flow chart Gyssens allow classification use antibiotics at a time give understanding more about effectiveness pneumonia therapy, so that help taking right decision and improve external clinical patient. Based on hospital medical records, the incidence rate of pneumonia at RSUD Bahteramas reached approximately 18.2% in 2023, which is notably higher than the national average of 12.5% reported in the same year. This discrepancy emphasizes the urgency and importance of evaluating the rational use of antibiotics in this specific hospital setting.

The selection of the Gyssens method as the primary evaluation tool in this study is in line with national antibiotic stewardship policies, including the Ministry of Health Regulation No. 8 of 2015 on Antimicrobial Resistance Control and the implementation of Hospital Antimicrobial Stewardship Programs (ASPs). At the local level, RSUD Bahteramas has adopted these policies through its internal standard operating procedures (SOPs) and clinical pharmacy services. The Gyssens method provides a structured, criteria-based approach for assessing the appropriateness of antibiotic use, which supports efforts to optimize therapy and reduce antimicrobial resistance at both institutional and national levels.

RESEARCH METHOD

Population

The population in this study is patient with adults diagnosed with pneumonia and undergoing Home Care Sick Bahteramas Regional Public Southeast Sulawesi Province during the period January – December 2024.

Sample

The sample used in this study was patient Pneumonia mature with number of 100 patients at Bahteramas Regional Hospital Southeast Sulawesi Province during the period January–December 2024 which meets the requirements criteria exclusion and inclusion. The inclusion criteria for this study are: a) Patient with pneumonia diagnosis, patient various sex women and men man; b) Patient with range age 17-25 years; c) Pneumonia patients who receive treatment antibiotics; d) Patient take care stay at Bahteramas Regional Hospital during the period January – December 2024. Whereas criteria exclusion This research includes: a) Record medical patient No complete so that No can done evaluation with method gyssens; b) Patients who do not take care stay, where diagnosed with pneumonia at Bahteramas Hospital period January-December 2024.

RESULTS AND DISCUSSIONS

Subject Overview Study

Characteristics Patient Based on Type Sex

Table 1. Frequency distribution of characteristics based on patient age (n-100)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Man	52	52.0	52.0	52.0
	Woman	48	48.0	48.0	100.0
	Total	100	100.0	100.0	

Based on the grouping of patient data by gender in Table 1, it shows that male patients at Bahteramas General Hospital slightly outnumber female patients in pneumonia cases, with 52 males (52%) and 48 females (48%). This indicates that the incidence of pneumonia is relatively evenly distributed and is not influenced by gender. This finding is consistent with research conducted by Sinaga (2018), where statistical analysis yielded a p-value of 0.787 (>0.05) at a 95% confidence level, leading to the conclusion that there is no significant relationship between gender and the increased risk of pneumonia.

Although the distribution of pneumonia patients at Bahteramas General Hospital is nearly balanced based on gender, biological differences such as hormones, genetics, and drug metabolism between males and females can influence therapeutic responses (Corica et al., 2022). For example, estrogen in females plays a role in immune response, while differences in drug metabolism can affect the efficacy and side effects of treatment (Mambo et al., 2023; Nasrun et al., 2024). Therefore, dosage adjustments or antibiotic selection may need to be tailored accordingly.

In addition, this gender balance supports more targeted education and prevention programs, such as vaccination promotion and risk factor control according to the characteristics of each group (Andayani & Waladi, 2019; Corica et al., 2022; Meinitasari et al., 2021). This data-driven approach is important for improving therapeutic success and the quality of care at Bahteramas General Hospital (Hadiq et al., 2024). Selvany et al. (2024) also explain that factors contributing to the occurrence of pneumonia are not limited to gender, but also include age, education, and patients' medical history.

Duration of Antibiotic Administration

Table 2. Frequency distribution of antibiotic administration duration in patients

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3 days	40	40.0	40.0	40.0
	4 days	29	29.0	29.0	100.0
	5 days	20	20.0	20.0	89.0
	6 days	5	5.0	5.0	94.0
	7 days	4	4.0	4.0	98.0
	8 days	2	2.0	2.0	100.0
	Total	100	100.0	100.0	

Where analysis statistics obtained p value *of* 0.787 (>0.05) at the level 95% confidence, so concluded that No there is significant relationship between type sex and enhancement risk got pneumonia. Although distribution pneumonia patients at Bahteramas Regional Hospital almost balanced based on type gender, differences biological like hormones, genetics, and metabolism medicine between men and women influence response to therapy (Corica et al., 2022). For example, the hormone estrogen in women play a role in the response immune, while difference drug metabolism can influence effectiveness and effects side treatment (Mambo et al., 2023; Nasrun et al., 2024).

Therefore, adjustments dosage or choice antibiotics need adjusted. In addition, the balance type This gender supports more education and prevention programs. Appropriate targets, such as promotion vaccination and control factor risk in accordance characteristics of each group (Andayani & Waladi, 2019; Corica et al., 2022; Meinitasari et al., 2021). Approach This data- based is important For increase success therapy and quality services at Bahteramas Regional Hospital (Hadiq et al., 2024). Selvany et al. (2024) also explained factor the occurrence of pneumonia is not

only one type gender, but age , education , and history disease patients also become related factors with pneumonia incident.

Duration of Grant Antibiotics

Table 2. Frequency distribution of duration of antibiotic administration to patients

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3 days	40	40.0	40.0	40.0
	4 days	29	29.0	29.0	100.0
	5 days	20	20.0	20.0	89.0
	6 days	5	5.0	5.0	94.0
	7 days	4	4.0	4.0	98.0
	8 days	2	2.0	2.0	100.0
	Total	100	100.0	100.0	

Based on data on the duration of antibiotic administration in pneumonia patients at Bahteramas Regional Hospital in Table 1, the majority patient accept therapy antibiotics with duration that is classified as short. As many as 69% of patients accept antibiotics for 3–4 days, where duration the in accordance with guidelines clinical For case light until moderate. Duration short therapy designed For guard effectiveness treatment at a time minimize risk emergence resistance antibiotics, which become challenge big in handling infection bacteria. In addition, treatment term short can lower possibility effect side consequence use antibiotics and help press cost care, so that give benefit Good in a way clinical and economical (Burhan et al., 2022; Hadiq et al., 2024; Sundariningrum et al., 2020).

As many as 20% of patients undergo therapy for 5 days, with indication the need observation more continued, while 11% of patients get treatment longer (6–8 days), which reflects condition more clinical complex. Extension duration therapy antibiotics generally reflect condition clinical more patients complex or severe, such as difficult-to-treat pneumonia overcome, infection consequence bacteria resistant, or the presence of complications medical needs Handling intensive and prolonged (Ikawati, 2023). This condition demands evaluation more medical thorough as well as monitoring strict to response treatment use guard effectiveness therapy and prevention antibiotic resistance (Afiani & Desiani, 2023). Therefore, it is important For differentiate enough patient with therapy term short from those in need treatment longer based on condition each clinical. This targeted approach can increase success treatment , optimizing use antibiotics, as well as reduce risk effect side and resistance Long term (Afiani & Desiani, 2023). Evaluation periodic to duration therapy must become part from effort improvement quality services at Bahteramas Regional Hospital so that pneumonia management runs smoothly more effective, efficient and sustainable (Mambo et al., 2023).

Type Antibiotics

Table 3. Frequency distribution of antibiotic types

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Levofloxacin Inj.	63	63.0	63.0	63.0
	Inj. Levofloxacin and Inj. Ceftriaxone	12	12.0	12.0	75.0
	Ciprofloxacin Inj.	9	9.0	9.0	84.0
	Ceftriaxone Inj.	14	14.0	14.0	98.0
	Inj. Ceftazidime	1	1.0	1.0	99.0
	Cefotaxime Inj.	1	1.0	1.0	100.0
	Total	100	100.0	100.0	

Based on type data antibiotics used in pneumonia patients at Bahtermas Regional Hospital in table 3, it is known that Levofloxacin injection is the most common antibiotic used For pneumonia patients with percentage by 63%, because its wide effectiveness to bacteria reason

common pneumonia. Findings the in accordance with study Ilmi et al. (2020), where 62.7% of antibiotics the used in pneumonia patients, where Levofloxacin use has wider spectrum wide to gram positive, gram negative bacteria, and bacteria reason infection lower respiratory tract, including pneumonia. This drug also has profile superior pharmacokinetics, with bioavailability height and time beak long elimination. Preparation oral easy absorbed, and is also available in parenteral form, so suitable used For handle infection heavy (Garneta et al., 2023).

In addition, the combination of Levofloxacin and Ceftriaxone was used in 12% of patients. as therapy empirical double For case heavy or risky complications, while single Ceftriaxone (14%) and Ciprofloxacin (9%) were used as alternative based on condition clinical. The use of Ceftazidime and Cefotaxime in each of the patient reflect customized therapy with culture or sensitivity results antibiotics. The use of Ceftriaxone which is antibiotics from group cephalosporin generation third, have spectrum wide especially to Gram- negative and some Gram-positive bacteria. When combined with Levofloxacin, this combination provides coverage more therapy wide, especially For handle infection mixture or pathogen that cannot yet be identified in a way fast (Efriani et al., 2025). Approach this combination is common used in patients with condition weight or risk high, especially moment culture results are not yet available. However, its use must accompanied by strict evaluation For prevent use overuse and antibiotic resistance (Miftahul & Yuliana, 2024).

Therefore, the selection of Levofloxacin, either as therapy single or in combination, it is necessary customized with condition clinical and guidelines therapy that applies so that the treatment still effective and safe (Iswandi, 2023). Ilmi et al. (2020) also added that, the use of Levofloxacin shows more activities strong against Streptococcus pneumoniae in infections channel breathing compared to with ciprofloxacin or ofloxacin.

Evaluation Use Antibiotics with Method Gyssens

Comparison Rationality Based on Type Sex

Table 4. Crosstabulation results of relationships type sex with quality treatment antibiotics in patients

Count				
		Quality_of_Treatment		
		Rational	No rational	Total
Gender	Man	15	37	52
	Woman	26	22	48
Total		41	59	100

Based on table 4 crosstatabulation type gender and quality treatment antibiotics in pneumonia patients at Bahteramas Regional Hospital, there are difference striking in rationality use antibiotics. Of the 52 patients men, only 28.8% got treatment rational, while 71.2% are not in accordance standard Gyssens, indicates trend therapy that does not right. On the other hand, 54.2% of the 48 patients Woman accept therapy rational, showing greater compliance tall to guidelines compared to patient man.

Analysis show difference significant in rationality use antibiotics between patient men and women at Bahteramas Regional Hospital. Patients man more often accept therapy that does not in accordance guidelines, reflect imbalance implementation standard treatment based on type gender. This difference can influenced by variations disease , level severity , response biological , as well as factor communication and clinical bias (Amrullah et al., 2022; Hudmawan et al., 2023). Statement the compared to straight with results study Anggraini et al. (2020) and Wiharsanti (2018) who stated inaccuracy rationality administration of antibiotics to patients due to consequence from non-compliance patients and types lack of antibiotics appropriate.

The height number treatment No rational in men emphasize the need intervention special, such as education power health, strengthening monitoring use antibiotics, and approaches

personalized data -based (Mahbub et al., 2023). Efforts the aiming increase rationality therapy, results treatment, and prevention resistance antimicrobials in male pneumonia patients and Woman (Miftahul & Yuliana, 2024).

CONCLUSION

The use of antibiotics in pneumonia patients at Bahteramas General Hospital is still dominated by irrational therapy. The Gyssens method shows only 41% of therapies comply with guidelines, while 59% are irrational. Inaccuracies mainly occur in the selection of antibiotic types and duration. These findings emphasize the need for regular evaluation and strengthening of evidence-based management to prevent resistance and improve therapy quality. Therefore, it is recommended that hospitals implement continuous medical education (CME) programs for prescribers, establish antibiotic stewardship teams, and conduct regular prescription audits. In addition, regional health offices should enforce policy compliance, facilitate training on the Gyssens method, and develop clear standard operating procedures (SOPs) for rational antibiotic use. These interventions are essential to improve rational prescribing behavior and reduce antimicrobial resistance rates.

Furthermore, the Gyssens method can be developed as a sustainable audit tool within the hospital's quality assurance system. By incorporating the method into periodic prescription reviews and clinical pharmacy audits, hospitals can monitor antibiotic use trends over time, identify patterns of irrational use, and provide feedback to prescribers. Integrating this approach into service accreditation standards such as national hospital accreditation (SNARS) or international quality frameworks can help institutionalize rational antibiotic practices as part of evidence-based healthcare delivery.

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