

Assessment of Antibiotic Prescribing Practices in Hospital X, Malang Regency: A Gyssens Method

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ABSTRACT

Antibiotic resistance remains a major problem in medicine. The therapy and goals of antibiotic treatment given to patients do not meet the expected therapeutic targets due to the occurrence of antibiotic resistance. The long-term goal of this study is to achieve the rationality of antibiotic use based on the results of a qualitative analysis of antibiotic use at Hospital X, Malang Regency using the Gyssen method. The main goal to be achieved is to prevent antibiotic resistance in hospitals due to irrational use. The specific objective of this study is to assess the appropriateness of antibiotic use among patients in the Internal Medicine, surgical, and obstetrics-gynecology departments based on Gyssens criteria. This study uses a retrospective descriptive method to provide a general overview of antibiotic use at Hospital X, Malang Regency. The sample consisted of patient medical records and antibiotic administration record data, including 50 internal patients, 50 surgical patients, and 40 Obgyn patients. The results showed that ceftriaxone was the most commonly prescribed antibiotic across Internal Medicine, surgical, and Obgyn cases. Based on the Gyssens analysis, antibiotic use was classified into categories 0, I, IIB, IIIA, IIIB, and V, with the highest proportion observed in category IIIB. Overall, the findings indicate that antibiotic use at Hospital X, Malang Regency predominantly falls into category IIIA, suggesting issues related to the duration of therapy.

Keywords: Resistance, Antibiotics, Hospital X, Qualitative analysis, Gyssen

Introduction

Irrational use of antibiotics and non-adherence to therapeutic guidelines can lead to bacterial resistance, which contributes to increased patient morbidity and mortality. Other consequences of antibiotic resistance include higher treatment costs, failure to achieve therapeutic targets, and prolonged hospitalization. Antibiotic resistance can be prevented through rational and controlled use of antibiotics. As part of resistance prevention efforts in hospitals, periodic evaluations of antibiotic use are conducted, both quantitatively and qualitatively. One widely used qualitative evaluation method is the Gyssens method. The Gyssens method is a tool used to evaluate the quality of antibiotic use across various countries. This method assesses the appropriateness of antibiotic use based on several criteria, including indication, selection such as effectiveness, toxicity, cost, and spectrum,

duration of therapy, dosage, interval, route, and timing of administration. Antimicrobial resistance (AMR) is a growing global health threat that compromises the effectiveness of standard treatments and increases morbidity, mortality, and healthcare costs worldwide (World Health Organization, 2019; Klein et al., 2018). The inappropriate and excessive use of antibiotics in both hospital and community settings is recognized as the primary driver of this phenomenon, making rational antibiotic prescribing a critical component of patient safety and public health (McCullough et al., 2016; Dyar et al., 2017).

Hospitals are particularly important in the emergence of antimicrobial resistance due to the high intensity of antibiotic use, especially broad-spectrum agents prescribed empirically. In many clinical situations, antibiotics are initiated without microbiological confirmation because of the urgency of treatment and limited availability of culture and sensitivity testing. Although empirical therapy is sometimes necessary, inappropriate selection, dosing, interval, and duration of antibiotics may lead to suboptimal outcomes and promote the development of resistant organisms (Schuts et al., 2016; Van Dijck et al., 2018). In Indonesia, studies have shown that antibiotic prescribing practices are frequently suboptimal, with irrational use still commonly observed in hospital settings. Third-generation cephalosporins such as ceftriaxone are among the most widely used antibiotics, often prescribed empirically across various clinical departments (Rachmawati et al., 2023; Suri et al., 2024). Ceftriaxone is a third-generation cephalosporin antibiotic that is often chosen because it has a broad spectrum of activity, reaches many body tissues well, and can be given once daily by injection in many situations. Similar findings have been reported in several Indonesian studies using the Gyssens method, which consistently demonstrate varying levels of inappropriate antibiotic use in different hospital settings (Agustiana et al., 2025; Artanti et al., 2023; Limbong et al., 2023).

Antimicrobial stewardship programs (ASP) have been introduced globally as a strategy to optimize antibiotic use, improve clinical outcomes, and reduce resistance rates (Dyar et al., 2017; Hadi et al., 2020). However, implementation remains challenging, particularly in low- and middle-income countries where diagnostic limitations and prescribing habits often hinder guideline adherence (Van Dijck et al., 2018; Septimus & Owens, 2019). Behavioral and cultural factors among prescribers also influence antibiotic use, further complicating efforts to achieve rational prescribing practices (Broom et al., 2019). One widely used and validated method for evaluating antibiotic prescribing quality is the Gyssens method, which classifies prescriptions based on indication, drug choice, dosage, interval, route of administration, and duration of therapy (Pulcini & Gyssens, 2013; Efrilia et al., 2023). This structured approach provides a systematic assessment of prescribing appropriateness and helps identify specific categories of irrational antibiotic use. In Indonesia, the Gyssens method has been extensively applied in various clinical settings, including pneumonia, surgical cases, and intensive care units, demonstrating its usefulness in evaluating prescribing quality (Permana et al., 2023; Fadrian et al., 2024). Given the persistent challenge of irrational antibiotic use and the limited data from regional hospitals in Indonesia, particularly in Malang

Regency, there is a need for further evaluation of prescribing practices. Therefore, this study aims to assess antibiotic prescribing practices in Hospital X, Malang Regency using the Gyssens method. The findings are expected to support antimicrobial stewardship efforts and contribute to improving the rational use of antibiotics in hospital settings (Wijaya et al., 2025).

Methodology

This study employed a descriptive observational design using the qualitative Gyssens method based on a flowchart approach. The method evaluates several aspects of antibiotic use, including indication, availability of more effective alternatives, less toxic and more affordable options, narrower-spectrum antibiotics, as well as dosage, duration, interval, route, and timing of administration. The quality of antibiotic use was assessed using antibiotic administration records and patient medical records. This study describe a retrospective review of medical records, then the researchers typically collect data only from existing charts and databases, without conducting in-depth interviews with patients. Evaluation criteria included diagnostic accuracy (clinical symptoms and laboratory results), indication, dosage regimen, safety, and cost considerations. The Indonesian Ministry of Health Regulation No. 2406/MENKES/PER/XII/2011 on the General Guidelines for Antibiotic Use recommends the use of the Gyssens method for qualitative evaluation.

Result and Discussion

This study analyzed 140 medical records consisting of 50 internal medicine, 50 surgical, and 40 Obstetrics-gynecology (Obgyn) patients.

Gender Distribution

Table 1. Demographic Characteristics of Subjects by Gender

Gender	N (%) Interna	N (%) Surgical	N (%) Obgyn
Male	21 (42%)	26 (52%)	0(0%)
Female	29(58%)	24 (48%)	40(100%)
Total	50	50	40

The majority of subjects were female, particularly in the Obgyn group (100%).

Age Distribution

Most patients were aged >40 years in IPD and surgical groups, while OBGYN patients were predominantly aged 12–40 years (90%).

Table 2. Demographic Characteristics of Subjects by Age

Ages	N (%) Interna	N (%) surgery	N (%) Obgyn
< 12 years	2(4%)	1(2%)	-
12- 40 years	4(8%)	9(18%)	36 (90%)
>40 years	44(88%)	40(80%)	4(10%)
Total	50	50	40

Pattern of Antibiotic Use

Cephalosporins were the most frequently used antibiotic class, with ceftriaxone being the most commonly prescribed antibiotic across all departments. This was followed by ciprofloxacin and clindamycin (particularly in interna departement).

Table 3. Antibiotic Use by Class Therapy

Classes of antibiotics	Types of antibiotic	N(%) Interna	N (%) surgery	N(%) Obgyn
Sefalosporin	Cefotaxim	4,7%	1,7%	0%
	Ceftriaxon	46%	85,9%	44,6%
	Cefixim	1,6%	1,7%	1,4%
	Cefadroxil	0%	3,4%	18,9%
	Ceftazidim	0%	1,7%	0%
	Cefazolin	0%	0%	1,4%
Fluorokuinolon	Ciprofloxacin	23,8%	1,7%	17,6%
	Levofloxacin	4,8%	0%	0%
Penisilin	Amoksisilin	4,8%	3,4%	9,5%
	Coamoksiclav	0%	0%	2,8%
Macrolide	Clindamycin	9,6%	0%	4,1%
	Azitromycin	4,8%	0%	0%

Gyssens Analysis

The results of the Gyssens analysis showed:

Table 4. Gyssens Analysis Results of Antibiotic Use at Hospital X, Malang Regency

Category	Gyssen Criteria	N (%) IPD	N (%) surgery	N (%) Obgyn
0	Rational use of antibiotics	0 %	4%	9,1%
I	Inappropriate timing of drug administration	17,4 %	24 %	6,8 %
IIB	Incorrect dosing interval	6,5 %	4 %	6,8 %
IIIA	Excessive duration of antibiotic therapy	2,2 %	0 %	0 %
IIIB	Insufficient duration of antibiotic therapy	73,9 %	64 %	77,3 %
V	No indication for antibiotic use	0 %	4 %	0 %

From Table 4, it can be observed that the selection of antibiotics generally aligns with clinical indications and available laboratory data. However, the choice of prophylactic antibiotics does not conform to established guidelines. The duration of empirical antibiotic therapy, averaging 1–3 days, is also inconsistent with recommended practices for empirical antibiotic use. Overall, the prescribing pattern does not fully adhere to clinical guidelines, pathways, or standard principles of antibiotic use, particularly in terms of treatment duration, which was notably short, with the highest proportion (77.3%) observed in obstetrics and gynecology patients (Schuts et al., 2016; Dyar et al., 2017). Based on the Gyssens analysis conducted on 140 medical records, 10% of antibiotic use was for prophylaxis and 90% for

empirical therapy. Prophylactic antibiotics should ideally consist of first- or second-generation cephalosporins and should not be used as empirical or definitive therapy. In cases involving anaerobic infections, metronidazole is recommended, while alternatives such as ampicillin-sulbactam, amoxicillin-clavulanic acid, or gentamicin may be used in patients with cephalosporin allergies (Bratzler et al., 2017; Schuts et al., 2016).

Prophylactic antibiotics should only be administered in surgical procedures with clear indications. In clean surgical procedures such as hernia repair, tonsillectomy, and uncomplicated vaginal delivery, prophylaxis is generally not recommended. However, it is indicated in procedures such as cesarean section and appendectomy. Administration should occur within 30 minutes prior to incision and should not exceed 24 hours postoperatively, except in cases of significant intraoperative blood loss or prolonged surgery requiring repeat dosing (Bratzler et al., 2017). In this study, ceftriaxone was the most commonly prescribed antibiotic across surgical (89%), internal medicine (46%), and obstetrics and gynecology (44.6%) departments. Its predominant use as empirical therapy appears to be largely influenced by the absence of culture and sensitivity testing, resulting in antibiotic selection based primarily on clinical judgment and laboratory findings. This pattern raises concerns regarding adherence to first-line (drug of choice) recommendations and may indicate suboptimal prescribing practices (Limato et al., 2022; Hadi et al., 2020). Empirical antibiotic therapy should follow established guidelines, consider local microbial patterns, and involve broad-spectrum antibiotics for 48–72 hours, followed by reassessment based on microbiological and clinical data. However, this study revealed that antibiotic duration was frequently too short, occurring in 73.0% of internal medicine cases, 77.3% in obstetrics and gynecology, and 64% in surgical cases, potentially compromising therapeutic effectiveness (Schuts et al., 2016; Van Dijck et al., 2018).

The indication for antibiotic use should be based on clinical assessment supported by laboratory findings. Biological markers such as leukocyte count are commonly used indicators of infection, where leukocytosis or leukopenia may reflect an infectious process. Clinically, infection may also be indicated by symptoms such as fever, pain, nausea, lethargy, and general weakness (McCullough et al., 2016). The Gyssens method evaluates antibiotic use based on indication, effectiveness, safety, cost, and duration. In this study, Category IV findings were limited, with insufficient data regarding the availability of more effective or safer alternatives. For example, ceftriaxone is commonly used for urinary tract infections in pregnant women, although alternative step-down therapy such as cefixime may be more appropriate in certain cases. This raises questions about whether antibiotic selection truly reflects first-line therapy (Pulcini & Gyssens, 2013; Efrilia et al., 2023). From a pharmacological perspective, antibiotics are classified into concentration-dependent and time-dependent groups. Ceftriaxone is a time-dependent antibiotic, meaning its efficacy depends on maintaining drug concentrations above the minimum inhibitory concentration (MIC) for an adequate duration. While ceftriaxone has strong activity against Gram-negative bacteria, its activity against Gram-positive cocci is lower compared to first-generation

cephalosporins (Klein et al., 2018). Overall, although antibiotic selection was generally consistent with clinical indications, important issues remain regarding inappropriate prophylactic use and suboptimal duration of therapy. The widespread use of ceftriaxone as empirical therapy, combined with limited microbiological testing, suggests a deviation from evidence-based guidelines and highlights the need for improved antimicrobial stewardship, including better diagnostic support and adherence to prescribing standards (Dyar et al., 2017; Hadi et al., 2020; Septimus & Owens, 2019).

Conclusion

The Gyssens analysis of antibiotic prescribing at Hospital X, Malang Regency revealed that Category IIIA indicating an insufficient duration of antibiotic therapy was the most predominant form of irrational use. This issue was particularly prominent across all departments, affecting 73.9% of internal medicine patients, 64% of surgical patients, and 77.3% of obstetrics and gynecology patients, suggesting a consistent pattern of antibiotic therapy. In Category I, incorrect timing of antibiotic administration, the proportions were 17.4% in internal medicine patients, 24% in surgical patients, and 6.8% in obstetrics and gynecology patients.

Declaration of Competing Interest

The authors confirm that there are no conflicts of interest associated with this publication.

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