

# Evaluation of Antibiotic use in Patients with Acute Respiratory Tract Infection (ARI) at Royal Prima Medan Hospital in 2023-2024

Yobel Sitorus<sup>1</sup>, Erida Novriani<sup>2</sup>, Nerly Juli Pranita Simanjuntak<sup>3</sup>

<sup>1</sup>Bachelor of Clinical Pharmacy, Faculty of Health Sciences, Universitas Prima Indonesia. <sup>2</sup>Development of Clinical Pharmacy, Faculty of Health Sciences, Universitas Prima Indonesia. <sup>3</sup>PUI Phyto Degenerative & Lifestyle Medicine, Universitas Prima Indonesia

Email: yobelsitorus735@gmail.com, eridaboreg@gmail.com, nerlyjulipranitasimanjuntak24@gmail.com

Acute Respiratory Tract Infection is one of the infectious diseases frequently encountered in healthcare services. This study aims to assess antibiotic use in ARI patients at Royal Prima Medan Hospital from January 2023 to August 2024 based on the appropriateness of drug selection, and appropriateness of dosage. This study used a quantitative descriptive design with a retrospective observational approach through data tracing of outpatient medical records. The sample size was 135 patients selected using a percentage. The results showed that ARI patients were predominantly male (57,8%) and aged 1-10 years (63,7%). The most prescribed antibiotic was cefixime (48,1%), followed by amoxicillin (17,0%), and cefadroxil (16,3%). Evaluation of antibiotic use showed that all patients met the criteria drugs, and appropriate dosage with a percentage of 100% each. This study indicates that antibiotic use in ARI patients at Royal Prima Medan Hospital is in accordance with the principles of rational drug use.

**Keywords:** ARI, Antibiotic, Rational Drug Use

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## Corresponding Author:

Yobel Sitorus

Bachelor of Clinical Pharmacy, Faculty of Health Sciences, Universitas Prima Indonesia

yobelsitorus735@gmail.com

## 1. Introduction

Acute Respiratory Tract Infection (ARI) is a respiratory disorder that can affect the upper and lower respiratory tract, from the nose to the lung alveoli, including supporting tissues such as the paranasal sinuses, middle ear, and pleura. This disease can be caused by various microorganisms, including viruses, bacteria, and fungi. ARI generally occurs when the immune system is weakened, increasing an individual's susceptibility to infection (Sukarto et al., 2021). ARI can affect all age groups, both children and adults, and occurs in both developing and developed countries. Based on data from the 2018 Basic Health Research (Riskesdas), the prevalence of ARI in all provinces in Indonesia was recorded at 9.3% (Nisa & Nugraheni, 2022).

From an environmental perspective, the incidence of Acute Respiratory Tract Infection (ARI) is closely related to suboptimal provision of basic sanitation, such as the availability of clean water, the use of healthy latrines, waste and sewage management, housing conditions that do not meet health standards, and water and air pollution. Furthermore, behavioral factors also contribute to the high rate of acute respiratory infections (ARI), characterized by poor handwashing habits, improper waste disposal, and proper spitting. Public awareness of transmission prevention measures, such as covering the mouth and nose when sneezing or wearing a mask when experiencing flu symptoms, remains low, increasing the risk of disease transmission (Directorate General of Pharmaceutical and Health Services, 2018).

Acute Respiratory Infections (ARI) remain a major health problem, potentially causing death in both children and adults. However, the mortality rate from ARI in Indonesia is higher among children (Aprilia et al., 2020).

The causes of acute respiratory infections (ARI) are diverse and involve more than 300 types of microorganisms, including bacteria, viruses, and other factors that contribute to infection. Common bacterial causes of ARI include *Streptococcus*, *Staphylococcus*, *Streptococcus pneumoniae* (pneumococcus), *Haemophilus influenzae*, *Bordetella*, and *Corynebacterium*. Meanwhile, viral agents that cause ARI include Myxovirus, Adenovirus, Coronavirus, Picornavirus, Mycoplasma, Herpesvirus, and various other viruses (Aprilla et al., 2020).

According to data from the World Health Organization (WHO), in 2016, there were 59,417 cases of Acute Respiratory Tract Infection (ARI) in children. The incidence of ARI in developing countries is estimated to be 40–80 times higher than in developed countries. ARI is a leading cause of morbidity and mortality worldwide. In Indonesia, this disease remains a significant cause of death among children and toddlers (Aprilla et al., 2020).

In Indonesia, Acute Respiratory Tract Infection (ARI) was recorded as the leading cause of death in infants and children in 2009, accounting for 33.1%. In 2010, this figure decreased to 19.2%, but increased again in 2011 to 39.8% (Benua et al., 2020). Furthermore, ARI prevalence data reported by healthcare workers for the 2013–2018 period showed that the ten provinces with the highest ARI incidence rates were Papua (10.0%), Bengkulu (9.5%), West Papua (7.5%), East Nusa Tenggara (7.4%), Central Kalimantan (6.0%), East Java (5.5%), Maluku (5.4%), Banten (5.1%), West Java (4.9%), and Central Java (4.9%). The reported incidence of ARI did not show significant differences by gender, either in men or women (Ministry of Health of the Republic of Indonesia, 2023).

A study conducted by Dewi R. (2020) entitled Evaluation of Antibiotic Use in Toddler Patients Diagnosed with Upper Respiratory Tract Infection at the Koni Community Health Center in Jambi City showed that all toddler patients diagnosed with ARI received antibiotics rationally. This was demonstrated by the evaluation results of the accuracy of indication, accuracy of patient, accuracy of dose, and accuracy of duration of antibiotic administration, each of which reached 100%, namely in all 51 patients studied.

Tobat et al. (2020) conducted a study on the rationality of antibiotic use in patients with acute respiratory infections (ARI) at the Kuamang Kuning I Community Health Center in Bungo Regency. The results showed that the most frequently prescribed antibiotic was a  $\beta$ -lactam from the aminopenicillin group, namely amoxicillin (79%), followed by sulfonamide combinations in the form of co-trimoxazole (17.67%), quinolones, namely ciprofloxacin (3%), and metronidazole (0.33%). Evaluation of the rationality of antibiotic use based on Pharmaceutical Care standards for acute respiratory infections showed 100% accuracy of indication, 96.33% accuracy of drug selection, 86% accuracy of dosage, and 100% accuracy of route of administration. However, based on Dipiro's Pharmacotherapy standards, inaccuracies in drug selection were still found, with a percentage of 98.34%.

Irrational drug use includes inappropriate dosage, inappropriate timing, and inadequate duration of antibiotic use. The high prevalence of Acute Respiratory Tract Infections (ARI) and the continued use of antibiotics that do not fully comply with therapeutic standards are the basis for this study. This study aims to describe the pattern of antibiotic use in the treatment of ARI, including the appropriate indication, appropriate drug selection, and appropriate dosage in patients with Acute Respiratory Tract Infections (ARI) at Royal Prima Medan General Hospital.

Based on the explanation above, further education for patients regarding the correct use of antibiotics and the impact of non-compliance is necessary. Monitoring by healthcare professionals is essential to ensure patients follow medication instructions.

Royal Prima Medan General Hospital, as one of the hospitals serving patients with ARI, plays a crucial role in managing antibiotic use. Patient evaluation of antibiotic use in this hospital is necessary to determine the extent to which patients comply with physician recommendations and to identify factors influencing antibiotic use (Halim et al., 2021).

The explanation above indicates a correlation between patient evaluation and antibiotic use for patients with acute respiratory infections (ARI). Therefore, the researcher is interested in conducting a study entitled "Evaluation of Acute Respiratory Tract Infection (ARI) Patient Compliance with Antibiotic Use at Royal Prima Medan Hospital."

## 2. Method

This is a descriptive quantitative, observational study with a retrospective approach. The study used secondary data in the form of patient medical records available at the hospital. This study aimed to describe antibiotic use in patients with Acute Respiratory Tract Infections (ARI) at Royal Prima Medan General Hospital.

The study was conducted in the medical records department of the Outpatient Unit of Royal Prima Medan General Hospital from June to July 2025. The population consisted of all patients undergoing treatment for ARTI at the hospital. The population size was calculated based on data from January 2023 to August 2024, amounting to 200 patients.

The study sample was a subset of the population that met specific criteria in accordance with the research objectives. The sampling technique used purposive sampling, which involves selecting samples based on predetermined inclusion criteria until the required sample size is met. Based on calculations from a total population of 200 patients with a 5 percent margin of error, a sample size of 135 patients met the inclusion and exclusion criteria.

The inclusion criteria for this study were medical records of patients with acute respiratory infections (ARI) undergoing treatment at Royal Prima Medan Hospital, patients receiving antibiotic therapy, medical records from January 2023 to August 2024, and outpatients with complete medical records. Exclusion criteria included medical records of patients with acute respiratory infections (ARI) accompanied by other illnesses and incomplete medical records.

Variable measurements were conducted retrospectively using secondary data from the medical records of patients with acute respiratory infections (ARI). Data collection was conducted by reviewing medical records for the study period using a pre-designed data collection sheet. All data were obtained from documents systematically stored by healthcare professionals, preventing direct interaction with patients. This data was used to describe the condition and characteristics of antibiotic therapy use in patients with acute respiratory infections (ARI) in accordance with the research objectives.

The data collection process began with a pre-survey letter submitted to the university through the faculty administration. After obtaining the pre-survey permit, the researcher submitted it to the hospital for research permission. The researcher then conducted an initial survey to determine the number of ARI patients. The researcher then obtained ethical clearance and a research permit from the university. After obtaining a list of ARI patients from the medical records department, researchers identified patients who met the inclusion criteria and then reviewed their medical records to obtain data related to the types of antibiotics administered. All data collected was recorded in detail and accurately.

Data processing was carried out by reviewing the completeness and clarity of the collected data, coding each item to facilitate analysis, and organizing the data into tables for greater systematic and understandable interpretation.

Data analysis was conducted descriptively to provide an overview of the study results. The analysis included patient characteristics based on gender and age, a description of antibiotic use, including the class and type of antibiotic used, and an evaluation of antibiotic use based on patient appropriateness, drug appropriateness, and dosage appropriateness. The results of the analysis are presented as percentages to illustrate the proportion of each variable studied.

### 3. Results and Discussion

#### Result

Based on the gender characteristics of the 135 patients, the results showed that the majority of patients were male (78 patients, representing 57.8 percent), while 57 were female (42.2 percent).

Based on age characteristics, of the 135 patients, the largest age group was 1–10 years, with 86 patients representing 63.7 percent. The 11–20 age group comprised 15 patients (11.1 percent), 13 patients (9.6 percent) from the 21–30 age group, 3 patients (2.2 percent), 31–40 years (5 patients, representing 2.2 percent), 41–50 years (5 patients, representing 3.7 percent), 51–60 years (5 patients, representing 3.7 percent), 61–70 years (5 patients, representing 3.7 percent), and 71–80 years (3 patients, representing 2.2 percent). Thus, the highest number of cases occurred in the 1–10 age group, while the lowest number occurred in the 31–40 and 71–80 age groups.

Based on the types of antibiotics used in ARI patients at the Royal Prima Medan Hospital Outpatient Unit, cefixime was the most commonly prescribed antibiotic, representing 48.1 percent of the cases in 65 patients. Amoxicillin was prescribed to 23 patients, representing 17.0 percent, levofloxacin to 6 patients, representing 4.4 percent, and cefadroxil to 22 patients, representing 16.3 percent. Additionally, sulfadiazine was used in one patient, isoniazid in four patients, representing 3.0 percent, azithromycin in 11 patients, representing 8.1 percent, and metronidazole, ceftriaxone, and cefpodoxime each in one patient. The total number of patients receiving antibiotics was 135, representing 100 percent.

Based on the evaluation of indication accuracy, all 135 patients, or 100 percent, received antibiotics appropriate to the ARI diagnosis recorded in their medical records. The medication accuracy evaluation also showed that all prescribed antibiotics were in accordance with ARI therapy guidelines, with a 100 percent accuracy rate. Similarly, the dosage accuracy evaluation showed that all patients received antibiotics at the appropriate dose and frequency, resulting in a 100 percent accuracy rate.

#### Discussion

The results of the study on the Evaluation of Antibiotic Use in Patients with Acute Respiratory Tract Infections (ARI) at Royal Prima Medan Hospital in 2023-2024 revealed 135 patients who met the inclusion criteria.

Based on the results of research conducted at Royal Prima Medan Hospital, it shows a sample size of 135 patients. Medical records show that more male patients experienced Acute Respiratory Tract Infections (ARI) than female patients. Male patients accounted for 78 patients (57.8%) and female patients for 57 (32.2%). Although the distribution of cases was higher in males, gender did not significantly correlate with the incidence of respiratory tract infections. This suggests that both males and females are at relatively

equal risk, given that Acute Respiratory Tract Infections are generally caused by various microorganisms, particularly viral and bacterial infections.

Based on patient characteristics, children aged 1-10 years had the highest prevalence, at 63.7%. The high percentage of antibiotic use in children is related to the higher incidence of ARI in this age group in the Outpatient Unit of Royal Prima Medan Hospital compared to other ages. The highest prevalence in children aged 1-10 years is in line with the 2022 Basic Health Research (Riskesdas), which recorded a peak incidence in the primary school age group, triggered by exposure to the school environment and the immaturity of mucociliary clearance mechanisms. This condition is influenced by children's underdeveloped immune systems, as well as high exposure to the surrounding environment, both at home and in play settings, which increases the risk of infection.

Based on the result, the most commonly used antibiotic class in patients with Acute Respiratory Tract Infections (ARI) at Royal Prima Medan Hospital in the outpatient setting is the cephalosporin class, namely cefixime (48.1%), followed by the beta-lactam aminopenicillin class, namely amoxicillin (17.0%). The study results indicate that cefixime is the most commonly used antibiotic in patients with Acute Respiratory Tract Infections (ARI). Cefixime is a third-generation cephalosporin antibiotic with a broad spectrum of action, making it a frequent choice in practice for treating ARI caused by bacteria. The high use of cefixime reflects the trend toward the use of broad-spectrum antibiotics in ARI cases.

This study aligns with research conducted by Yuliati and Maulina (2022), which reported that cefixime was the most commonly prescribed antibiotic in pediatric patients diagnosed with ARI, at 46.9%. The similarity of these study results indicates relatively similar antibiotic prescribing patterns across healthcare facilities.

Based on the World Health Organization (WHO) principles of Rational Drug Use (RDR), antibiotic administration must be tailored to the patient's clinical needs, including appropriate indications, drug selection, dosage, and duration of administration. Given that most cases of acute respiratory infections (ARI) are caused by viral infections, antibiotic use, including cefixime, requires careful evaluation to ensure compliance with the RDR principles. Irrational antibiotic use has the potential to increase the risk of antibiotic resistance and therapeutic ineffectiveness, making evaluation of antibiotic use in ARI patients crucial.

The evaluation of appropriate indications, as described in Table 1.4, is the process of assessing the appropriateness of drug administration to the patient's clinical needs. The appropriateness of antibiotic indications is determined based on the doctor's diagnosis, based on medical considerations. This assessment aims to determine whether the patient truly requires antibiotic therapy. Antibiotic use is considered appropriate if it is administered in accordance with the clinical signs and symptoms and the established diagnosis. Appropriate antibiotic selection plays a crucial role in the success of therapy for patients with acute respiratory infections (ARI) caused by bacterial infections. Furthermore, appropriate antibiotic use can inhibit or kill the bacteria causing the infection and improve the quality of therapy. Conversely, inaccuracies in antibiotic selection and dosage can lead to bacterial resistance to the antibiotic.

Antibiotics are used to prevent and treat diseases caused by infections. However, in daily clinical practice, antibiotics are often prescribed for conditions not caused by infections, both in community health centers, clinics, and hospitals. Inaccuracies in antibiotic diagnosis, indication determination, dosage, route and frequency of administration, and duration of therapy can result in suboptimal antibiotic treatment.

Based on research on outpatients with Acute Respiratory Tract Infections at Royal Prima Medan Hospital, 100% of patients received the correct indication. According to the 2005 Pharmaceutical Care Standards for Acute Respiratory Tract Infections, patients diagnosed with Acute Respiratory Tract Infections (ARI),

such as pharyngitis, bronchitis, sinusitis, and otitis media, are recommended to receive antibiotic therapy. This is because these conditions are categorized as bacterial infections, thus ensuring appropriate antibiotic use.

Antibiotic administration is typically determined based on the results of microbiological tests, such as bacterial cultures or susceptibility tests, to determine the cause of infection. However, in healthcare settings, antibiotic use is generally based on the patient's clinical condition upon admission. Laboratory tests or bacterial cultures are rarely performed due to the time required. Therefore, in this study, the assessment of antibiotic prescription accuracy was based on the physician's diagnosis of a respiratory infection. Furthermore, the researchers used Pharmaceutical Care guidelines for respiratory tract infections as a reference in determining whether antibiotic administration was appropriate.

Based on the research results, the evaluation of antibiotic use in patients with Acute Respiratory Tract Infections (ARI) showed a 100% drug selection accuracy rate. This indicates that all antibiotics administered were in accordance with the clinical diagnosis and established therapeutic guidelines. Accurate drug selection is a crucial component of implementing rational drug use (RDR), as it plays a role in increasing therapeutic success and reducing the risk of antibiotic resistance.

Drug appropriateness can be assessed based on the concordance between the established ARI diagnosis and the type of antibiotic prescribed. These results demonstrate that antibiotic selection took into account the spectrum of activity, effectiveness, and safety of the drug, in accordance with Pharmaceutical Care guidelines for Acute Respiratory Tract Infections (ARI). With 100% drug appropriateness, it can be concluded that antibiotic selection in patients with Acute Respiratory Tract Infections (ARI) in this study was carried out appropriately and in accordance with therapeutic standards.

This study aligns with the results of research conducted by Etikasaria et al. (2024), which reported that antibiotic selection accuracy for ARI patients reached 100% in two community health centers in Kudus Regency. Similar results were also reported by Angela et al. (2025) at the Wangi-Wangi Community Health Center, which showed that all antibiotics prescribed to outpatients with Acute Respiratory Tract Infections (ARI) met the criteria for appropriate medication. However, evaluation of other aspects, such as dosage accuracy, frequency, and duration of administration, is still necessary to ensure the overall rational use of antibiotics.

Based on the results of this study, it can be seen that the antibiotic dosage for ARI patients was appropriate, with the majority of 78 patients (57.8%) prescribed a dose of 8 mg/kgBW according to ISO and DiPiro 11th edition. Inappropriate antibiotic dosing can have various negative impacts, including therapeutic failure, increased risk of side effects, increased treatment costs, and the emergence of bacterial resistance. Using antibiotics in insufficient doses can result in suboptimal disease recovery, increase the risk of bacterial resistance, and prolong the duration of treatment. Conversely, administering antibiotics in excessive doses can potentially increase the incidence of side effects and drug toxicity (Nurmala and Adriani, 2020).

Antibiotic use is considered rational if the medication is administered according to the patient's clinical condition, by selecting the appropriate antibiotic type, appropriate dosage, adequate duration of use, and affordable cost. Irrational antibiotic use can include inappropriate dosing, self-medication, and prescribing antibiotics for diseases not caused by bacterial infections (Mboya et al., 2018). Inappropriate antibiotic use can potentially lead to therapy failure, increase the risk of side effects, increase treatment costs, and contribute to the rise in antibiotic resistance (Alfal 2018).

According to existing guidelines, the management algorithm for ARIs does not rely solely on antibiotic use. ARIs caused by viruses do not require antibiotic therapy; supportive therapy is sufficient. Supportive

therapy plays a role in the success of antibiotic therapy, as it can reduce symptoms and improve patient well-being. Antibiotic use, on the other hand, must be based on evidence of infection, as evidenced by the patient's clinical condition, such as fever, leukocytosis, or culture results. Underdosing can result in suboptimal drug effects, while overdosing can cause toxicity and undesirable side effects during treatment (Habibuloh 2020).

Previous research in Indonesia found that factors contributing to inaccurate antibiotic dosing include decimal errors, inappropriate dosages for the strength of the drug, unclear prescriptions, missing instructions for use, and incomplete prescriptions (Tajuddin and Sudirman 2021).

This study has limitations, including the use of secondary data from medical records, which relies on the completeness of healthcare provider records. Furthermore, this study did not evaluate other rationality parameters, such as the appropriate duration of administration, dosage intervals, and patient compliance. Therefore, the results do not fully reflect the rationality of antibiotic use.

#### 4. Conclusion

Based on the results of research conducted at Royal Prima Medan Hospital on the evaluation of antibiotic use in patients with Acute Respiratory Tract Infections (ARI) during the 2023–2024 period, it can be concluded that the evaluation of antibiotic use based on appropriate indications showed that all 135 patients, or 100 percent, received antibiotics appropriate to their diagnosis.

The evaluation based on appropriate medication also showed similar results, with all 135 patients, or 100 percent, receiving medication in accordance with applicable therapy guidelines. Furthermore, the evaluation based on appropriate dosage showed that all 135 patients, or 100 percent, received the appropriate dosage and frequency. Based on the type of antibiotic used, the most commonly prescribed drug was cefixime, with 65 patients (48.1 percent), followed by amoxicillin (23 patients, 17.0 percent), and cefadroxil (22 patients, 16.3 percent).

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