
Analysis of the Rational Use of Antibiotics in Cases of Respiratory Tract Infections at Siti Fatimah Regional General Hospital

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Abstract

Acute Respiratory Tract Infections (ARI) are a leading cause of morbidity and mortality worldwide, with often irrational antibiotic use risking resistance. This study aims to analyze the rationality of antibiotic use in ARI patients at Siti Fatimah Provincial Hospital, Palembang, in 2024. This study used a quantitative descriptive design with a cross-sectional method. Data were obtained retrospectively from the medical records of inpatients who met the inclusion criteria from January to December 2024. Rationality analysis was conducted based on appropriate indication, appropriate drug, appropriate dose, appropriate patient, appropriate duration of administration, and appropriate diagnosis, in accordance with WHO standards and antibiotic therapy guidelines. The results showed that the overall accuracy rate was quite good, with 99% of patients receiving antibiotics according to their diagnosis, 95% receiving the appropriate dose, 100% receiving the appropriate indication, 100% receiving the appropriate type, 100% receiving the appropriate duration, and 100% receiving the appropriate patient.

Keywords: Antibiotics, ARI, Rationality.

INTRODUCTION

Acute respiratory infection (ARI) is a sudden inflammation of the upper or lower respiratory tract caused by a microbial infection (Wulandari et al., 2024). ARI is an infectious disease that affects one or more parts of the respiratory tract, such as the nose, sinuses (adnexa), middle ear cavity, lung alveoli, and pleura (Growth et al., 2022). ARI is characterized by various symptoms such as fever, fatigue, loss of appetite, vomiting, sensitivity to light, restlessness, coughing, excessive mucus production, abnormal breath sounds, and difficulty breathing. If not treated promptly, this condition can progress to respiratory failure and potentially lead to death. The risk of ARI in children is influenced by several factors. The first factor is the causative agent (pathogen), which can be a virus, bacteria, fungus, or protozoa. The second factor is the condition of the infected individual as the disease host. Meanwhile, the third factor involves environmental aspects, including the child's age, gender, birth weight, breastfeeding habits, nutritional status, vitamin A adequacy, immunization history, socioeconomic status, and a history of asthma (Yusran et al., 2024).

In recent decades, cases of Acute Respiratory Tract Infections (ARI) have shown an increasing trend both globally and nationally, as infectious diseases like ARI constitute a significant global health threat. Every year, nearly 4 million people die from this disease, with lower respiratory infections being the main cause (around 98%), and the worst impacts are felt by infants, children, and the elderly, especially in countries with limited economic resources (Akbar et al., 2023). Acute Respiratory Tract Infection (ARI) is one of the most common diseases affecting children, especially those under five years of age. It is estimated that approximately 20–30% of total deaths in this age group are caused by ARI. Several factors that can increase the likelihood of toddlers suffering from ARI include age less than two months, poor nutritional status, low birth weight, lack of optimal breastfeeding, exposure to air pollution, living in areas with high population density, incomplete immunization, vitamin A deficiency, premature introduction of complementary foods, and inadequate home ventilation. In Indonesia, the number of ARI cases in toddlers is still relatively high, while in developing countries the mortality rate due to ARI in toddlers even exceeds 40 cases per 1,000 live births with an annual mortality rate ranging from 15% to 20%. Globally, ARI is one of the main causes of death in toddlers, with an estimated 7 million children dying each year from this disease. Meanwhile, the 2018 Basic

Health Research (RISK) recorded the prevalence of acute respiratory infections (ARI) diagnosed by healthcare workers in Indonesia at 4.4%, which later increased to 9.3% (Growth et al., 2022)

Infections caused by bacteria are generally treated with antibiotics. Although antibiotics are effective in treating bacterial infections, they are often used inappropriately, even for non-bacterial diseases. This increases the risk of antibiotic resistance, a global health issue that is also a challenge in Indonesia (Nurawaliah et al., 2023)

Antibiotics are still frequently administered to patients with acute respiratory infections (ARI) by medical professionals, despite the fact that not all cases of acute respiratory infections require antibiotics. Antibiotics should only be given if the infection is caused by bacteria, and the use of antibiotics in patients with acute respiratory infections not caused by bacteria is considered irrational drug use. This practice can increase medical costs, increase the risk of antibiotic resistance, and increase the likelihood of side effects (Wulandari et al., 2024).

Antibiotic resistance is the inability of antibiotics to treat bacterial infections, which can prolong treatment, increase costs, and increase the risk of death. Resistance arises naturally or through mutation and gene transfer. Its mechanisms include antibiotic destruction, target alteration, decreased drug absorption, and modification of metabolic pathways. Inappropriate use of antibiotics, especially broad-spectrum antibiotics without clear indications, accelerates the development of resistance. Antibiotic use must be rational, considering indications, effectiveness, safety, dosage, duration, route of administration, and costs (Sadli et al., 2023).

Based on these issues, researchers are interested in conducting a study on "analyzing the rationality of antibiotic use in ARI cases at Siti Fatimah Regional Hospital from January to June 2025." This information can be obtained through research on the use of antibiotics in patients with acute respiratory infections (ARI) as a basis for rationality in treatment.

RESEARCH METHODS

This is a descriptive observational study with a retrospective approach that aims to assess the rationality (accuracy of indication, correct patient, correct drug, correct dose, correct method, and correct time/frequency) of antibiotic use in patients suffering from Acute Respiratory Tract Infections (ARI) at Siti Fatimah Regional Hospital, Palembang. The data used were taken from patient medical records from January to December 2024. The sample of this study was selected by total sampling, namely 100 patients, based on inclusion criteria. The inclusion criteria included patients diagnosed with acute respiratory tract infections based on medical record data, according to medical record data that includes information on age, gender, clinical condition, diagnosis, and drug details including drug name and dosage given. The main objective is to display data characteristics, such as frequency, percentage, or distribution. In this study, the rationality of antibiotic use in ARI patients was used to describe basic data of respondents, such as gender, age, type of antibiotic, and the level of rationality of its use. The results are generally presented in tabular form as an illustration of a more in-depth analysis. This has been registered with an ethical number KEP/UMP/197/VI/2025.

RESULTS AND DISCUSSION

Table 1. Patient Demographic Data

Character	Catergy	Frequency n=100	Persentase (%)
Gender	Women	57	57%
	Man	43	43%

Age	0-5 th	20	20%
	6-17 th	37	37%
	18-39 th	30	30%
	>40 th	13	13%
Occupation	Not Working	79	79%
	TNI/POLRI/BUMN	13	13%
	Farmers	5	5%
	Laborers	3	3%
	Employees/Private Sector	2	2%
	Self-Employed	1	1%

Based on Table 1, Acute Respiratory Tract Infection (ARI) patients for the January–December 2024 period consisted of 57% females and 43% males, indicating a higher proportion of females. The 6–17 age group comprised the largest number of patients, at 37%, followed by those aged 18–39 at 30%, those aged 0–5 at 20%, and those over 40 at 13%. The largest number of ARI patients, 79%, came from the unemployed group, which includes children to adults, with varying levels of ARI risk. Meanwhile, the employed group had a smaller proportion, namely TNI/Polri/PNS/BUMN at 13%, farmers at 5%, laborers at 3%, employees/private sector at 2%, and self-employed at 1%.

Table 2. Use Of Antibiotics

Antibiotik	Jumlah Pasien	Persentase (%)
Amoxicillin	11	11%
Ampicilin	7	7%
Azitromycin	6	6%
Cefixime	18	18%
Cefotaxime	4	4%
Ceftriaxone	42	42%
Ceftazidime	6	6%
Chloramphenicol	1	1%
Levofloxacin	5	5%
Total	100	100%

Based on Table 2, the use of Ceftriaxone antibiotics dominates the use with the highest percentage of 42 (42%) this indicates that Ceftriaxone is the most frequently prescribed or used antibiotic in the study period, in second place is Cefixime as much as 18% (18%) of the total use, followed by Amoxicillin as much as 11 (11%), and ampicillin as many as 7 patients (7%). The use of azithromycin was recorded in as many as 6 patients (6%) as well as ceftazidime as many as 6 patients (6%), other antibiotics used less include levofloxacin as many as 5 patients (5%), cefotaxime as many as 4 patients (4%), and chloramphenicol which was only used by 1 patient (1%). In Ceftriaxone, Cefixime, and Amoxicillin cumulatively contributed the most to the total use of antibiotics, indicating that these antibiotics were the main use in the antibiotic therapy regimen applied. In Ceftriaxone, Cefixime, and Amoxicillin cumulatively accounted for the largest share of total antibiotic use, indicating that they were the primary uses in the antibiotic therapy regimens implemented.

Table 3. Length of Stay (LOS)

Month	Number of patients	LOS (day)	Average LOS (day/patient)
January	3	11	3,67
February	4	10	2,5
March	16	50	3,13
April	7	21	3
May	9	25	2,78
June	7	23	3,29
July	5	13	2,6

August	10	32	3,2
September	7	15	2,14
October	19	67	3,53
November	4	23	5,75
December	9	15	1,67
Total	100	305	3,05

Based on table 3, The total length of stay (LOS) for Acute Respiratory Infection (ARI) patients during the January-December 2024 period was 100 patients with a total LOS of 305 days, resulting in an average length of stay per patient of 3.05 days. The number of patients per month varied, with the highest number in October (19 patients) and March (16 patients), while the lowest number of patients was in January (3 patients). The average LOS also showed variations each month, with the highest LOS occurring in November at 5.75 days/patient despite the small number of patients, while the lowest LOS occurred in December at 1.67 days/patient. This may reflect differences in case severity, the effectiveness of antibiotic therapy, and the speed of patient healing response in each period.

Table 4. DDD Calculation of Antibiotic Use

Kode ATC	Antibiotic Name	Rute	DDD WHO (g)	Amount Used (g)	LOS	DDD/100 HR
J01DD04	Ceftriaxone	P	2g	82g		13,44g
J01DD04	Cefixime	O	0,4g	29,6g		24,26g
J01MA12	Levofloxacin	O	0,5g	12,5g		8,2g
J01FA10	Azitromycin	O	0,5g	8g		5,24g
J01CA04	Amoxicillin	O	1g	29,,2g		9,58g
J01CA01	Ampicilin	P	2g	11,4g		1,86g
J01DD02	Ceftazidime	P	3g	14g		1,53g
J01DB01	Cefotaxime	P	3g	7g		0,76g
J01BA01	Chloramphenicol	O	3g	2,25g		0,24g
Total					305	65,11g

Description :

O = oral

P = Parenteral

Based on Table 4, Antibiotic use at Siti Fatimah Regional Hospital showed that antibiotic consumption varied based on the type, route of administration, and amount used. Ceftriaxone by the parenteral route was the most commonly used antibiotic, at 82g with a DDD/100 hospital days of 13.44g, indicating a dominant intravenous administration. Cefixime (oral route) was used at 29.6g with a DDD/100 HR of 24.26g, indicating a relatively high oral use. Other antibiotics such as levofloxacin (12.5g, DDD/100 HR 8.2g), azithromycin (8g, DDD/100 HR 5.24g), and amoxicillin (29.2g, DDD/100 HR 9.58g) were also widely used by the oral route. In contrast, ampicillin (11.4 g, DDD/100 HR 1.86 g), ceftazidime (14 g, DDD/100 HR 1.53 g), cefotaxime (7 g, DDD/100 HR 0.76 g), and chloramphenicol (2.25 g, DDD/100 HR 0.24 g) were used in smaller amounts. Total antibiotic use reached 305 g with a total DDD/100 HR of 65.11 g, reflecting the diverse distribution of antibiotic use according to the type and route of administration.

Table 5. Profile DU90%

Kode ATC	Antibiotic Name	Rute	DDD/100 HR	DU (%)	DU cumulative (%)	Segmen DU
J01DD04	Cefixime	O	24,26g	37,26%	37,26%	90%
J01DD04	Ceftriaxone	P	13,44g	20,64%	57,9%	90%
J01MA12	Levofloksasin	O	8,2g	12,6%	70,5%	90%
J01FA10	Azithromycin	O	5,24g	14,71%	85,21%	90%
J01CA04	Amoksisilin	O	9,58g	8,05%	89,51%	90%
J01CA01	Ampicilin	P	1,86g	2,87%	93,26%	10%
J01DD02	Ceftazidime	P	1,53g	2,35%	95,61%	10%

J01DB01	Cefotaxime	P	0,76g	1,17%	96,78%	10%
J01BA01	Kloramfenikol	O	0,24g	0,37%	97,18%	10%

Based on Table 5, antibiotics included in the DU90% segment at Siti Fatimah Regional Hospital include cefixime (37,26%), ceftriaxone (20,64%), levofloxacin (12,6%), azithromycin (14,71%), and amoxicillin (8,05%). Meanwhile, the DU10% segment consists of ampicillin (2,87%), ceftazidime (2,35%), cefotaxime (1,17%), and chloramphenicol (0,37%).

Table 6. Criteria for Rationality of Antibiotic Appropriateness

Criteria for Rationality	n = 100	Persentase
Correct Diagnosis	99	99%
Correct Dose	95	95%
Correct Indication	100	100%
Correct Medication	100	100%
Correct Duration of Administration	100	100%
Correct Patient	100	100%

Based on table 6, the results of an analysis of the rationality of antibiotic use in 100 patients at Siti Fatimah Regional Hospital showed a high level of compliance with antibiotic use guidelines. Of the 100 patients, 99 (99%) received therapy according to their diagnosis, and 1% received therapy that was not appropriate. In 95 patients (95%) the dose was appropriate, and 5% were inappropriate. In the study, the recorded diagnosis was ARI, which indicated antibiotics.

Discussion

The results show that the majority of Acute Respiratory Tract Infection (ARI) patients during the January-December 2024 period were women (57%), and men (43%). The results show that female patients have a higher proportion than men in cases of ARI being treated. This is in line with research by Mugopal et al., (2021), which states that female patients have a higher risk of experiencing acute respiratory infections due to the influence of a decreased immune system. This factor is influenced by differences in the X and Y chromosomes as well as the hormone estrogen which plays a role in modulating the immune system in women. In fact, gender is not the only risk factor for ARI, this can also be caused by bacterial infections in addition to genetic factors, immunity, environment, and a person's lifestyle including their diet (Wulandari et al., 2024).

In patients with Acute Respiratory Tract Infections (ARI), the majority of patients aged 6-17 years were the largest group of patients with 37 patients (37%) of productive age, while the age group > 40 years was 13 patients (13%). This shows that cases of acute respiratory infections are more common in the age group of children to adults, while in the elderly the proportion is relatively smaller. This is in line with research by (Desi & Priyono, 2019), stated that the age group of children to adults is more at risk of experiencing health problems due to high physical activity, mobility, social interaction, as well as exposure to air pollution, cigarette smoke, and an unhealthy work environment (Anton, 2024).

The majority of Acute Respiratory Tract Infection (ARI) patients (79%) are classified as unemployed, ranging in age from children to adults, so this group has varying exposure to the risk of ARI. Factors such as education, experience, socioeconomic conditions, and environment influence mothers' knowledge in preventing ARI in toddlers. Prevention can be achieved through maintaining nutrition, complete immunizations, maintaining personal and environmental hygiene, and avoiding contact with ARI sufferers (Puspita et al., 2023). Meanwhile, the distribution of other occupations shows a smaller proportion, with 13% of patients recorded as working in the TNI/Polri/PNS/BUMN sectors, indicating that only a small portion comes from the public sector or state-owned companies. Farmers account for 3% of the total patients, while laborers make up 2%, employees/private sector employees 2%, and self-employed individuals 1%. This occupational distribution pattern can be an important indicator in assessing various aspects such as access to health insurance, economic capacity

to finance treatment, and the possibility of exposure to health risks based on the type of work undertaken.

The use of antibiotics in Acute Respiratory Tract Infection (ARI) patients Ceftriaxone dominates the use with the highest percentage of 42 (42%) this indicates that Ceftriaxone is the most frequently prescribed or used antibiotic in the study period, in second place is Cefixime as much as 18% (18%) of the total use, followed by Amoxicillin as much as 11 (11%), and ampicillin as many as 7 patients (7%). The use of azithromycin was recorded in as many as 6 patients (6%) as well as ceftazidime as many as 6 patients (6%), other antibiotics used less include levofloxacin as many as 5 patients (5%), cefotaxime as many as 4 patients (4%), and chloramphenicol which was only used by 1 patient (1%). In Ceftriaxone, Cefixime, and Amoxicillin cumulatively contributed the most to the total use of antibiotics, indicating that antibiotics are the main use in the antibiotic therapy regimen applied. The most frequently used antibiotics are third-generation cephalosporins such as ceftriaxone and cefixime. This group of antibiotics has a broad spectrum so it can be given in cases of ARI with an unknown cause (Yuliati & Maulina, 2023).

The length of stay (LOS) of Acute Respiratory Infection (ARI) patients at Siti Fatimah Regional Hospital during the period of January-December 2024 was a total of 100 patients with a total LOS of 305 days, resulting in an average length of stay per patient of 3.05 days. The number of patients per month varied, with the highest number of patients in October being 19 and March being 16, while the lowest number of patients was in January being 3. The average LOS also varied each month, with the highest LOS occurring in November at 5,75 days/patient despite the small number of patients, while the lowest LOS was in December at 1.67 days/patient. This indicates that most ARI patients require short-term care, but some patients require longer care, which affects the average monthly LOS. Overall, the average annual LOS of around 3 days per patient indicates that ARI care in the hospital tends to be short and in accordance with the acute nature of the disease (Eskandari et al., 2022).

Antibiotic use at Siti Fatimah Regional Hospital showed that antibiotic consumption varied based on the type, route of administration, and amount used. Ceftriaxone was the most commonly used antibiotic by the parenteral route, at 82g with a DDD/100 hospital days of 13,44g, indicating a predominance of intravenous administration. Cefixime (oral route) was used at 29.6g with a DDD/100 HR of 24,26g, indicating a relatively high oral use. Other antibiotics such as levofloxacin (12,5g, DDD/100 HR 8,2g), azithromycin (8g, DDD/100 HR 5,24g), and amoxicillin (29,2g, DDD/100 HR 9,58g) were also widely used by the oral route. In contrast, ampicillin (11.4g, DDD/100 HR 1.86g), ceftazidime (14g, DDD/100 HR 1,53g), cefotaxime (7g, DDD/100 HR 0,76g), and chloramphenicol (2,25g, DDD/100 HR 0,24g) were used in smaller amounts. The total use of all antibiotics reached 305 grams with a total DDD/100 HR of 65,11g. This is in line with research by Lakoh (2023) which showed that cephalosporins, especially cefixime and ceftriaxone, are the most dominant antibiotics used in hospitals. In contrast, the use of amoxicillin as a first-line antibiotic in PNPk ARI is relatively low, indicating a tendency for clinicians to choose new generation broad-spectrum antibiotics (Limato et al., 2022).

In the DU90% segment, cefixime accounted for 37,26%, followed by ceftriaxone at 20,64%, levofloxacin at 12,6%, and azithromycin at 14,71%, while amoxicillin was 8,05%. Meanwhile, in the DU10% segment, the antibiotics used were ampicillin at 2,87%, ceftazidime at 2,35%, cefotaxime at 1,17%, and chloramphenicol at 0,37%. According to (Hanifah et al., 2022), antibiotic use in patients is predominantly dominated by third-generation cephalosporins. The cumulative DU value is used to determine the DU90% and DU10% segments, where antibiotics included in the DU90% are the most widely used and cover 90% of total consumption, while antibiotics included in the DU10% are the ones used the least, covering only 10% of total use (Kaur et al., 2025).

The results of the analysis of the rationality of antibiotic use in 100 patients at Siti Fatimah Regional Hospital showed that the level of compliance with antibiotic use guidelines was quite high. It was found that 99 patients (99%) of 100 patients received therapy according to the diagnosis, and 1% were inappropriate. The results in 95 patients (95%) were appropriate for the dose and 5% were

inappropriate. In the study, the recorded diagnosis was ARI indicated by antibiotics. The accuracy of the duration and dose of antibiotic administration also had a very high percentage in proving rationality. In the study of Dhakal et al., 2019, the recorded diagnosis was ARI indicated by antibiotics. The accuracy of the duration and dose of antibiotic administration also had a very high percentage in proving rationality. The most widely used antibiotics were third-generation cephalosporins, namely ceftriaxone and cefixime, with rational use according to indications. Ceftriaxone was given 2×1 g and cefixime 2×500 mg for the therapy of Acute Upper Respiratory Infection, Unspecified. (Gunnlaugsdottir, 2021) also reported the rationality of antibiotic use in all patients (100%) with bacterial diagnoses, such as *Streptococcus pneumoniae* (Mambo et al., 2023). These findings indicate high levels of medical personnel compliance with antibiotic therapy guidelines at Siti Fatimah Regional Hospital and the effectiveness of supervision in preventing inappropriate therapy and antimicrobial resistance.

CONCLUSIONS

Antibiotic use in patients with acute respiratory infections (ARI) at Siti Fatimah Regional Hospital, Palembang, in 2024 showed a rationality analysis of 99% of patients receiving antibiotics according to their diagnosis, 95% receiving the correct dose, 100% receiving the correct indication, 100% receiving the correct type, 100% receiving the correct duration, and 100% receiving the correct patient. To improve the rationality of antibiotic use, maintain and improve quality by maintaining the already high level of rationality and increasing accuracy. Routinely monitor the use of frequently used antibiotics, such as cefixime and ceftriaxone, to prevent resistance. Integrating qualitative approaches can also be used to uncover in-depth factors, such as clinical considerations or hospital policies, that influence prescribing decisions by medical personnel. Furthermore, extending the study period, for example, beyond one year, allows for more accurate identification of antibiotic use and provides more stable data for evaluation.

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