

Assessment of Antibiotic Utilization in Acute Respiratory Infection Patients Based on Rational Drug Use Indicators at Teluk Merbau Primary Health Care Center

Penilaian Penggunaan Antibiotik pada Pasien Infeksi Saluran Pernapasan Akut Berdasarkan Indikator Penggunaan Obat Rasional di Puskesmas Teluk Merbau

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Abstract

Infeksi saluran pernapasan akut (ISPA) masih menjadi salah satu penyebab utama morbiditas di seluruh dunia dan berkontribusi secara signifikan terhadap kunjungan rawat jalan di fasilitas pelayanan kesehatan primer. Penggunaan antibiotik yang tidak tepat dalam penatalaksanaan ISPA dapat mempercepat terjadinya resistensi antimikroba, yang saat ini menjadi salah satu masalah kesehatan masyarakat global. Oleh karena itu, pemantauan penggunaan antibiotik melalui indikator Penggunaan Obat Rasional (POR) sangat penting untuk mendorong praktik peresepan yang tepat. Penelitian ini bertujuan untuk mengevaluasi pola peresepan antibiotik dan menilai kesesuaiannya dengan indikator Penggunaan Obat Rasional pada pasien ISPA di Puskesmas Teluk Merbau. Penelitian ini menggunakan desain deskriptif potong lintang retrospektif dengan memanfaatkan data resep pasien yang didiagnosis ISPA selama periode Januari hingga Desember 2022. Teknik total sampling digunakan dengan melibatkan seluruh resep yang memenuhi kriteria penelitian. Data dianalisis secara deskriptif menggunakan frekuensi dan persentase berdasarkan indikator Penggunaan Obat Rasional yang ditetapkan oleh Kementerian Kesehatan Republik Indonesia. Sebanyak 261 resep pasien ISPA dianalisis. Pasien perempuan merupakan kelompok terbanyak (55,94%), sedangkan kelompok usia dewasa mendominasi kasus ISPA (62,07%). Dari seluruh resep yang dianalisis, 90 resep mengandung antibiotik. Amoksisilin merupakan antibiotik yang paling sering diresepkan (56,13%), diikuti sefiksime (18,33%), siprofloksasin (11,83%), sefadroksil (10,10%), kotrimoksazol (2,02%), dan metronidazol (1,59%). Persentase penggunaan antibiotik mencapai 26,97%, melebihi target nasional Penggunaan Obat Rasional yang ditetapkan kurang dari 20%. Penggunaan antibiotik pada pasien ISPA di Puskesmas Teluk Merbau masih melebihi indikator Penggunaan Obat Rasional yang ditetapkan oleh Kementerian Kesehatan Republik Indonesia. Pemantauan penggunaan antibiotik secara berkelanjutan, kepatuhan terhadap pedoman terapi, dan implementasi program stewardship antimikroba perlu ditingkatkan untuk mendukung penggunaan antibiotik yang lebih rasional.

Keywords: infeksi saluran pernapasan akut, peresepan antibiotik, penggunaan obat rasional, stewardship antimikroba, pelayanan kesehatan primer.

Abstrak

Acute respiratory infections (ARIs) remain one of the leading causes of morbidity worldwide and contribute substantially to outpatient visits in primary healthcare facilities. Inappropriate antibiotic use in ARI management may accelerate antimicrobial resistance, a major global public health concern. Therefore, monitoring antibiotic utilization through Rational Drug Use (RDU) indicators is essential to promote appropriate prescribing practices. This study aimed to evaluate antibiotic prescribing patterns and assess compliance with Rational Drug Use indicators among ARI patients at Teluk Merbau Primary Health Care Center. A retrospective descriptive cross-sectional study was conducted using prescription records of patients diagnosed with ARIs from January to December 2022. Total sampling was applied, and all eligible prescriptions were included in the analysis. Data were analyzed descriptively using frequencies and percentages based on the Rational Drug Use indicators established by the Indonesian Ministry of Health. A total of 261 ARI prescriptions were analyzed. Female patients accounted for 55.94% of cases, while adults represented the largest age group (62.07%). Among all prescriptions, 90 contained antibiotics. Amoxicillin was the most frequently prescribed antibiotic (56.13%), followed by cefixime (18.33%), ciprofloxacin (11.83%), cefadroxil (10.10%), cotrimoxazole (2.02%), and metronidazole (1.59%). The proportion of antibiotic prescribing was 26.97%, exceeding the national RDU target of less than 20%. Antibiotic prescribing among ARI patients at Teluk Merbau Primary Health Care Center exceeded the recommended RDU indicator. Continuous monitoring, adherence to clinical guidelines, and implementation of antimicrobial stewardship programs are necessary to promote rational antibiotic use.

Kata Kunci: acute respiratory infection; antibiotic prescribing; rational drug use; antimicrobial stewardship; primary healthcare..



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Introduction

Acute respiratory infections (ARIs) remain one of the most common infectious diseases encountered in primary healthcare facilities and contribute significantly to outpatient visits worldwide. Although ARIs are highly prevalent, most uncomplicated upper respiratory tract infections are caused by viral pathogens and are self-limiting; therefore, antibiotic therapy is generally not recommended unless there is evidence of bacterial infection [1]. Inappropriate antibiotic prescribing for ARIs remains a major concern because unnecessary antibiotic exposure accelerates antimicrobial resistance (AMR), increases treatment costs, and reduces the effectiveness of available antimicrobial agents [2], [3]. The rational use of antibiotics in primary healthcare facilities requires adherence to evidence-based clinical guidelines. In Indonesia, the Ministry of Health has issued guidelines for Rational Drug Use (RDU) monitoring as an effort to improve prescribing quality and reduce inappropriate medication use. One of the prescribing indicators specifically monitored is antibiotic use in patients with non-specific acute respiratory infections, where the proportion of antibiotic prescribing should not exceed 20% of total ARI cases [4]. This indicator serves as a national benchmark to evaluate the appropriateness of antibiotic prescribing practices and supports antimicrobial resistance control programs in primary healthcare settings.

Furthermore, the Indonesian clinical practice guideline for primary healthcare facilities emphasizes that management of uncomplicated ARIs should focus mainly on symptomatic therapy, while antibiotics should only be administered when bacterial infection is suspected based on clinical findings [5]. This recommendation is consistent with the WHO AWaRe (Access, Watch, Reserve) framework, which promotes the appropriate selection of antibiotics and prioritizes the use of Access-group antibiotics to minimize the development of antimicrobial resistance [6], [7]. Despite the availability of national and international recommendations, inappropriate antibiotic prescribing for ARIs remains frequently reported, particularly in primary healthcare settings. Several factors, including diagnostic uncertainty, limited laboratory confirmation, prescriber habits, and patient expectations, may contribute to unnecessary antibiotic use [8]. Therefore, regular evaluation of antibiotic utilization patterns based on Rational Drug Use indicators is essential to identify prescribing problems and support antimicrobial stewardship interventions. [9]. Monitoring antibiotic utilization using these indicators is essential to identify prescribing patterns, evaluate compliance with national standards, and support antimicrobial stewardship initiatives in healthcare facilities.

Although several studies in Indonesia have evaluated antibiotic use among ARI patients, data regarding antibiotic prescribing practices in rural primary healthcare facilities remain limited. Therefore, this study aimed to evaluate antibiotic prescribing patterns among ARI patients and assess compliance with the antibiotic prescribing indicator of Rational Drug Use at Teluk Merbau Primary Health Care Center.

Experimental Section

Study design

This study employed a retrospective descriptive cross-sectional design to evaluate antibiotic prescribing patterns among patients diagnosed with acute respiratory infections (ARIs). The assessment focused specifically on the antibiotic prescribing indicator as one component of the Rational Drug Use (RDU) indicators established by the Indonesian Ministry of Health. This study did not evaluate other RDU indicators, such as the average number of medicines per prescription, percentage of generic medicines, formulary compliance, or patient care indicators, due to the limitation of available retrospective data.

Study site and period

The study was carried out at Teluk Merbau Primary Health Care Center, Rokan Hilir Regency, Riau Province, Indonesia. Data were retrospectively collected from prescription records of ARI patients during the period of January–December 2022. All eligible records meeting the inclusion criteria were included in the analysis.

Population and sample

The population of this study consisted of all patients diagnosed with acute respiratory infections (ARIs) who received healthcare services at Teluk Merbau Primary Health Care Center, Rokan Hilir Regency, during the period of January to December 2022. A total sampling technique was employed in this study, whereby all patient records that met the predetermined eligibility criteria were included in the analysis. A total of 261 prescription records were identified and analyzed to evaluate antibiotic prescribing patterns among ARI patients.

Inclusion and exclusion criteria

The inclusion criteria comprised all prescription records of patients diagnosed with acute respiratory infections (ARIs) during the study period, with complete demographic and medication information available in the medical records. Eligible records included patients of all age groups and both sexes who received treatment at Teluk Merbau Primary Health Care Center between January and December 2022. The exclusion criteria included prescription records with incomplete or missing information regarding patient identity, diagnosis, prescribed medications, or treatment details. Records that could not be clearly identified or contained insufficient information for data analysis were excluded from the study.

Data collection

Data were collected retrospectively from prescription records and medical records of patients diagnosed with acute respiratory infections at Teluk Merbau Primary Health Care Center. All eligible records during the study period were reviewed, and relevant information was extracted using a structured data collection form.

The collected variables included patient demographic characteristics (age and sex), diagnosis of ARI, prescribed medications, antibiotic utilization, antibiotic classes, and the number of prescriptions containing antibiotics. Antibiotic prescribing was evaluated by calculating the percentage of ARI prescriptions containing antibiotics and comparing the result with the antibiotic prescribing indicator recommended in the Rational Drug Use (RDU) monitoring guideline issued by the Indonesian Ministry of Health. Due to the retrospective nature and availability of prescription data, this study was limited to evaluating antibiotic prescribing patterns and did not assess other RDU components, including generic prescribing rate, formulary compliance, patient care indicators, or clinical appropriateness of antibiotic therapy.

Statistical analysis

Data were analyzed using descriptive statistical methods. Patient demographic characteristics, antibiotic prescribing patterns, antibiotic classes, and non-antibiotic medication profiles were summarized using frequencies and percentages. The percentage of antibiotic prescribing was calculated by dividing the number of prescriptions containing antibiotics by the total number of prescriptions reviewed and multiplying by 100%.

This study aimed to describe antibiotic utilization patterns and evaluate compliance with the antibiotic prescribing indicator of Rational Drug Use (RDU) established by the Indonesian Ministry of Health. Therefore, no inferential statistical analysis was performed. Due to the retrospective nature of the study and the use of aggregated prescription data, further association analysis between patient-related factors and antibiotic prescribing using statistical tests such as the Chi-square test could not be performed.

Study Limitation

This study has several limitations. First, the retrospective design relied on available prescription records, which limited access to individual-level clinical information. Second, the analysis was limited to descriptive evaluation of antibiotic prescribing patterns and the antibiotic prescribing indicator of Rational Drug Use. The association between patient characteristics, such as age and sex, and antibiotic prescribing could not be evaluated because individual-level antibiotic exposure data were unavailable. Future studies

should include patient-level data to allow inferential analysis and identification of factors associated with inappropriate antibiotic use.

Results and Discussion

Characteristics of ARI patients

The monthly distribution of ARI cases according to age group is summarized in Table 1. During the study period, a total of 261 ARI patient prescriptions were identified, comprising 78 children (29.89%), 21 adolescents (8.05%), and 162 adults (62.07%). The highest number of cases was recorded in September and October, whereas the lowest number was observed in April.

Table 1. Characteristics of Acute Respiratory Infection (ARI) Patients by Age Group and Month of Visit at Teluk Merbau Primary Health Care Center During 2022

No	Total Prescription				
	Month	Total Prescription (n)	Children	Adolescents	Adults
1	January	29	6	3	20
2	February	30	10	2	18
3	March	30	6	-	24
4	April	8	1	-	7
5	May	15	7	2	6
6	June	18	8	-	10
7	August	25	9	3	13
8	September	31	9	5	17
9	October	31	7	2	22
10	November	19	6	2	11
11	December	25	9	2	14
	Total	261	78	21	162

Note: No antibiotic prescriptions for acute respiratory infection (ARI) patients were recorded in July 2022

As presented in Table 1, a total of 261 ARI cases were recorded at Teluk Merbau Primary Health Care Center during the study period. Adult patients constituted the largest age group, accounting for 162 cases (62.07%), followed by children with 78 cases (29.89%) and adolescents with 21 cases (8.05%). The highest number of ARI cases was observed in September and October, with 31 cases each, whereas the lowest number was reported in April with only 8 cases. The predominance of adult patients in this study may be associated with increased exposure to environmental and occupational risk factors. Adults are generally more active outside the home and are frequently exposed to air pollution, cigarette smoke, dust, and other respiratory irritants that may increase susceptibility to respiratory tract infections [10]. In addition, occupational activities often require close interpersonal interactions, which facilitate the transmission of infectious respiratory pathogens [11]. The relatively high proportion of ARI cases among children is also consistent with previous epidemiological studies. Children are considered a vulnerable population due to the immaturity of their immune systems and their increased exposure to infectious agents in schools and community settings [12]. Respiratory infections remain one of the leading causes of outpatient visits among pediatric populations worldwide [13].

The monthly variation observed in ARI incidence may be influenced by environmental and climatic factors. Previous studies have demonstrated that changes in temperature, humidity, rainfall patterns, and air quality can affect the transmission dynamics of respiratory pathogens [14]. Seasonal increases in respiratory infections have been reported in tropical countries, particularly during periods characterized by high humidity and increased population mobility [15]. Overall, the findings indicate that adults represent the most affected age group within the study population, highlighting the importance of preventive strategies aimed at reducing exposure to respiratory infection risk factors in productive-age individuals.

Patient demographic characteristics are important for understanding the epidemiological profile of ARIs. As shown in Table 2, female patients represented the majority of ARI cases, accounting for 55.94% of the total study population, while male patients accounted for 44.06%. This finding suggests a relatively balanced distribution of ARI cases between sexes, although a slightly higher healthcare utilization rate was observed among female patients.

Table 2 shows that female patients accounted for 146 cases (55.94%), while male patients accounted for 115 cases (44.06%). Although the difference between the two groups was not substantial, female patients

represented a slightly higher proportion of ARI cases during the study period. Several studies have reported that women generally utilize healthcare services more frequently than men, resulting in higher rates of healthcare visits and disease detection [16]. Women tend to demonstrate greater health awareness and are more likely to seek medical attention when experiencing symptoms, including respiratory complaints [17]. Consequently, healthcare facility data often show a slightly higher proportion of female patients compared with male patients. The observed difference may also be influenced by sociocultural and behavioral factors rather than biological susceptibility alone. Previous research has suggested that health-seeking behavior, access to healthcare services, and perception of illness play important roles in determining healthcare utilization patterns among different population groups [18].

Table 2. Demographic Characteristics of Acute Respiratory Infection (ARI) Patients Based on Sex

No	Sex	Number of Patients (n)	Percentage (%)
1	Male	115	44.06
2	Female	146	55.94

Nevertheless, acute respiratory infections can affect individuals regardless of sex. The relatively balanced distribution observed in this study indicates that both males and females remain vulnerable to ARIs. Similar findings have been reported in community-based epidemiological studies, which demonstrated that sex-related differences in ARI incidence are generally small and often influenced by environmental exposure and healthcare utilization patterns rather than intrinsic biological factors [19]. These findings suggest that ARI prevention programs should target both male and female populations equally while promoting health education and early healthcare-seeking behavior to reduce disease burden and improve treatment outcomes.

Antibiotic prescribing patterns among ARI patients

The proportion of antibiotic use among patients with acute respiratory infections (ARIs) is presented in Table 3. Of the 261 ARI prescriptions evaluated, 90 prescriptions contained at least one antibiotic, resulting in an overall antibiotic prescribing rate of 26.97%. This percentage exceeds the Rational Drug Use (RDU) indicator established by the Indonesian Ministry of Health, which recommends that antibiotic prescribing for non-specific ARI cases should not exceed 20% [20].

Table 3. Distribution of ARI Patients Receiving Antibiotic Therapy According to Age Group and Month of Visit at Teluk Merbau Primary Health Care Center During 2022

Month	Total Prescriptions (n)	Children n (%)	Adolescents n (%)	Adults n (%)
January	29	6 (2.3)	3 (1.1)	20 (7.7)
February	30	10 (3.8)	2 (0.8)	18 (6.9)
March	30	6 (2.3)	0 (0)	24 (9.2)
April	8	1 (0.4)	0 (0)	7 (2.7)
May	15	7 (2.7)	2 (0.8)	6 (2.3)
June	18	8 (3.1)	0 (0)	10 (3.8)
August	25	9 (3.4)	3 (1.1)	13 (5.0)
September	31	9 (3.4)	5 (1.9)	17 (6.5)
October	31	7 (2.7)	2 (0.8)	22 (8.4)
November	19	6 (2.3)	2 (0.8)	11 (4.2)
December	25	9 (3.4)	2 (0.8)	14 (5.4)
Total	261	78 (29.9)	21 (8.0)	162 (62.1)

Note: Children = 1–12 years; Adolescents = 13–18 years; Adults = >18 years

As shown in Table 3, adult patients accounted for the highest proportion of antibiotic use (62.1%), followed by children (29.9%) and adolescents (8.0%). The predominance of antibiotic prescribing among adults may be associated with the higher incidence of respiratory symptoms in the productive-age population, which is frequently exposed to occupational activities, environmental pollutants, cigarette smoke, and other risk factors that increase susceptibility to respiratory tract infections [12]. Moreover, healthcare providers may be more likely to prescribe antibiotics to adults when bacterial infection is suspected due to the presence of comorbidities or more severe clinical manifestations. The monthly distribution of antibiotic prescribing demonstrated variations throughout the study period. The highest proportions were observed in September and October (11.9%), whereas the lowest proportion occurred in April (3.1%). Seasonal fluctuations in respiratory infections have been reported in many tropical countries and are often associated with changes in

environmental conditions, humidity, rainfall patterns, and population mobility [15]. These factors may influence the transmission of respiratory pathogens and subsequently affect healthcare utilization and prescribing practices. Although antibiotics remain an essential component of therapy for bacterial respiratory infections, their use in ARI patients should be carefully evaluated because most ARIs are caused by viral pathogens. Previous studies have shown that viruses such as rhinovirus, influenza virus, respiratory syncytial virus (RSV), adenovirus, and coronavirus are responsible for the majority of uncomplicated upper respiratory tract infections [11]. Consequently, routine antibiotic administration for uncomplicated ARIs is generally not recommended.

The antibiotic prescribing rate observed in this study is comparable to findings from several healthcare facilities in developing countries, where antibiotic utilization for respiratory tract infections frequently exceeds recommended standards [21]. Similar studies have reported that diagnostic uncertainty, limited access to microbiological testing, and patient expectations for antibiotic treatment are among the primary factors contributing to excessive antibiotic prescribing in primary healthcare settings [22]. Excessive antibiotic use is a major contributor to antimicrobial resistance (AMR), which has emerged as one of the most significant global public health threats. According to the World Health Organization, antimicrobial resistance is associated with prolonged hospitalization, increased healthcare costs, treatment failure, and elevated mortality rates [11]. The inappropriate use of antibiotics may accelerate the selection of resistant microorganisms, thereby reducing the effectiveness of available antimicrobial agents. The findings of the present study suggest that antibiotic prescribing practices at Teluk Merbau Primary Health Care Center have not yet fully met the Rational Drug Use indicator established by the Indonesian Ministry of Health. Therefore, strengthening antimicrobial stewardship programs, improving adherence to clinical practice guidelines, and conducting regular prescription audits are necessary to promote more rational antibiotic use in primary healthcare settings [23]. Educational interventions targeting both healthcare professionals and patients may also contribute to reducing unnecessary antibiotic prescribing and minimizing the risk of antimicrobial resistance.

Distribution of antibiotic types

Among 261 ARI prescriptions evaluated, 90 prescriptions contained antibiotics. The total number of antibiotic items prescribed during the study period was 693, indicating that antibiotic utilization varied according to the quantity and type of antibiotic prescribed. The distribution of antibiotic classes and individual antibiotics is presented in Table 4.

Table 4. Frequency Distribution of Antibiotics Prescribed for Acute Respiratory Infection (ARI) Patients

No	Antibiotic Class	Antibiotic	Frequency (n)	Percentage (%)
1	Penicillins	Amoxicillin	389	56.13
2	First-Generation Cephalosporins	Cefadroxil	70	10.10
3	Third-Generation Cephalosporins	Cefixime	127	18.33
4	Fluoroquinolones	Ciprofloxacin	82	11.83
5	Sulfonamides	Cotrimoxazole	14	2.02
6	Nitroimidazoles	Metronidazole	11	1.59
Total			693	100

Note : Frequency represents the total number of antibiotic units prescribed during the study period

The predominance of amoxicillin in this study is consistent with current treatment recommendations for respiratory tract infections. Amoxicillin belongs to the Access category of the World Health Organization (WHO) AWaRe (Access, Watch, Reserve) classification and is recommended as a first-line antibiotic for common bacterial infections because of its effectiveness, favorable safety profile, affordability, and lower potential for promoting antimicrobial resistance compared with broader-spectrum antibiotics [24], [25]. The high utilization of amoxicillin may indicate that prescribers generally adhere to recommended empirical treatment guidelines for respiratory infections. Similar prescribing patterns have been reported in primary healthcare facilities where amoxicillin remains the preferred antibiotic because it provides adequate coverage against common respiratory bacterial pathogens while minimizing the risk of resistance development associated with broader-spectrum agents [21], [26]. The high proportion of Access antibiotics observed in this study indicates a positive prescribing pattern when antibiotic therapy is clinically required. However, it should be emphasized that most uncomplicated ARI cases are caused by viral infections, in which antibiotic therapy provides no clinical benefit. Therefore, antibiotic prescribing should be based on clinical assessment, bacterial infection suspicion, and national treatment guidelines to prevent unnecessary antimicrobial

exposure. In addition to amoxicillin, this study found relatively frequent utilization of cefixime (18.33%) and ciprofloxacin (11.83%). These findings require particular attention because both antibiotics belong to the Watch category in the WHO AWaRe classification. Watch antibiotics have broader antimicrobial activity and a higher potential for selecting resistant bacterial strains. Therefore, their use should be limited to specific clinical indications and should not be routinely prescribed for uncomplicated ARIs

The second most frequently prescribed antibiotic was cefixime (18.33%), followed by ciprofloxacin (11.83%) and cefadroxil (10.10%). Cefixime and ciprofloxacin are included in the Watch category of the WHO AWaRe classification. Watch-group antibiotics possess a broader antimicrobial spectrum and are associated with a higher risk of selecting resistant bacterial strains when used excessively. Therefore, WHO recommends that these antibiotics be prescribed cautiously and reserved for situations where narrower-spectrum alternatives are not appropriate [25]. The relatively frequent use of cefixime and ciprofloxacin deserves attention because inappropriate utilization of broad-spectrum antibiotics has been identified as one of the major contributors to antimicrobial resistance worldwide. Studies evaluating antibiotic prescribing practices in outpatient settings have shown that respiratory tract infections remain among the leading causes of unnecessary antibiotic use, particularly when diagnostic uncertainty exists or when antibiotics are prescribed empirically without strong evidence of bacterial infection [27], [28].

Cefadroxil represented 10.10% of antibiotic prescriptions in this study. As a first-generation cephalosporin, cefadroxil is generally effective against susceptible Gram-positive organisms and is commonly used for mild to moderate bacterial infections. Nevertheless, antibiotic selection should always be guided by clinical presentation, local treatment guidelines, and antimicrobial susceptibility patterns to ensure optimal therapeutic outcomes and minimize the emergence of resistant microorganisms. The use of cotrimoxazole (2.02%) and metronidazole (1.59%) was relatively low. Cotrimoxazole has historically been used in respiratory tract infections; however, increasing bacterial resistance has limited its role in empirical therapy in many healthcare settings [8]. Meanwhile, metronidazole is primarily indicated for anaerobic bacterial and protozoal infections rather than uncomplicated respiratory tract infections. Therefore, its use in ARI cases should be carefully evaluated to ensure that prescriptions are supported by appropriate clinical indications [25]. Although only 90 prescriptions contained antibiotics, the total number of antibiotic items reached 693 because the calculation was based on the total quantity of antibiotics dispensed rather than the number of prescriptions. Therefore, the findings represent antibiotic utilization volume during the study period. The predominance of amoxicillin indicates that Access-group antibiotics remained the primary choice for ARI treatment, which aligns with the WHO AWaRe recommendation prioritizing narrow-spectrum antibiotics when antimicrobial therapy is indicated. The utilization of Watch-group antibiotics in primary healthcare facilities may indicate several challenges, including diagnostic uncertainty, limited microbiological examination, and empirical prescribing practices. Excessive use of broad-spectrum antibiotics such as third-generation cephalosporins and fluoroquinolones has been associated with increased antimicrobial resistance, treatment failure, and higher healthcare costs [5]. Therefore, regular evaluation of antibiotic prescribing patterns is necessary to ensure compliance with rational antibiotic use principles.

The findings of this study are consistent with previous studies reporting that amoxicillin remains the most commonly prescribed antibiotic for respiratory tract infections in primary healthcare settings. However, the use of broad-spectrum antibiotics, particularly cephalosporins and fluoroquinolones, continues to be observed despite recommendations to prioritize narrow-spectrum agents whenever possible [6,7]. According to the Indonesian Ministry of Health guideline on Rational Drug Use, antibiotic prescribing for non-specific ARI cases should not exceed 20%. In the present study, the antibiotic prescribing rate was 26.97%, indicating that antibiotic utilization exceeded the recommended national indicator. This finding highlights the need to strengthen antimicrobial stewardship strategies, including adherence to clinical guidelines, prescription audits, prescriber education, and continuous monitoring of antibiotic utilization at the primary healthcare level.

Overall, the findings demonstrate that amoxicillin remained the dominant antibiotic prescribed for ARI patients, which is generally consistent with international recommendations favoring Access-group antibiotics. Nevertheless, the substantial use of Watch-group antibiotics such as cefixime and ciprofloxacin highlights the need for continuous monitoring of prescribing practices and strengthening antimicrobial stewardship programs. Antimicrobial stewardship interventions, including prescription audits, adherence to treatment guidelines, and prescriber education, have been shown to improve antibiotic prescribing quality and reduce unnecessary use of broad-spectrum agents.

Distribution of non-antibiotic medications

Table 5 presents the distribution of non-antibiotic medications prescribed for acute respiratory infection (ARI) patients at Teluk Merbau Primary Health Care Center during 2022. A total of 1,876 medication items were prescribed. Ambroxol was the most frequently prescribed medication (637.5 items), followed by paracetamol (576 items), chlorpheniramine maleate (CTM) (195 items), guaifenesin (121.5 items), cetirizine (118 items), vitamin C (107 items), ibuprofen (78 items), B-complex vitamins (24 items), and vitamin B1 (19 items).

Table 5. Frequency Distribution of Non-Antibiotic Medications Prescribed for Acute Respiratory Infection (ARI) Patients

No	Medication	Frequency (n)
1	Paracetamol	576
2	Ambroxol	637.5
3	Vitamin B complex	24
4	Guaifenesin	121.5
5	Chlorpheniramine maleate	195
6	Ibuprofen	78
7	Cetirizine	118
8	Vitamin C	107
9	Vitamin B1	19
	Total	1876

The predominance of ambroxol in this study reflects the high prevalence of respiratory symptoms associated with excessive mucus production among ARI patients. Ambroxol is a mucolytic and secretolytic agent that promotes mucus clearance by reducing sputum viscosity and enhancing mucociliary transport. These pharmacological properties make ambroxol widely used in the management of respiratory disorders characterized by productive cough and impaired mucus clearance [25]. Previous clinical studies have demonstrated that ambroxol may improve respiratory symptoms and facilitate expectoration in both acute and chronic respiratory tract diseases [24].

Paracetamol was the second most frequently prescribed medication. This finding is expected because fever and discomfort are common clinical manifestations of ARIs. Paracetamol is recommended as a first-line antipyretic and analgesic agent due to its effectiveness and favorable safety profile when used at therapeutic doses [26]. Similarly, ibuprofen was prescribed to alleviate fever, inflammation, and mild-to-moderate pain associated with respiratory infections [21]. Antihistamines, including chlorpheniramine maleate (CTM) and cetirizine, were also commonly prescribed. These agents are frequently used to relieve symptoms such as rhinorrhea, sneezing, and nasal congestion, particularly in patients presenting with upper respiratory tract symptoms. Although antihistamines do not shorten the duration of viral infections, they may contribute to symptomatic relief and improve patient comfort [28].

Guaifenesin was another commonly prescribed medication in this study. As an expectorant, guaifenesin enhances the hydration of respiratory secretions and facilitates mucus clearance from the airways. The frequent use of guaifenesin together with ambroxol suggests that cough with sputum production was a predominant symptom among patients receiving treatment [27]. The prescription of vitamin C, vitamin B complex, and vitamin B1 may reflect efforts to support general health and recovery during illness. However, current evidence regarding the routine use of vitamin supplementation in uncomplicated ARI cases remains limited. While vitamin C may slightly reduce the duration of common cold symptoms in certain populations, its role in preventing or treating respiratory infections remains controversial.

Overall, the predominance of symptomatic medications compared with antibiotics suggests that healthcare providers primarily focused on symptom management, which is consistent with current recommendations for most uncomplicated ARI cases. Since viral pathogens are responsible for the majority of ARIs, supportive therapy remains the cornerstone of treatment, whereas antibiotic therapy should be reserved for cases with clear evidence of bacterial infection. Appropriate symptomatic management may improve patient comfort while minimizing unnecessary antibiotic exposure and reducing the risk of antimicrobial resistance.

Conclusions

The proportion of antibiotic prescribing among ARI patients at Teluk Merbau Primary Health Care Center was 26.97%, exceeding the Rational Drug Use indicator recommended by the Indonesian Ministry of Health. Amoxicillin was the most frequently prescribed antibiotic, while ambroxol was the most commonly prescribed non-antibiotic medication. These findings indicate the need for continuous monitoring of antibiotic utilization, implementation of antimicrobial stewardship programs, and greater adherence to clinical practice guidelines to promote rational antibiotic use and reduce the risk of antimicrobial resistance in primary healthcare settings. Future studies should evaluate the appropriateness of antibiotic prescribing based on clinical indications, dosage, and treatment outcomes.

Conflict of Interest

The authors declare that there is no conflict of interest related to this study.

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