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Original Article

Antibiotic prescribing in acute exacerbations of COPD: a study at Cho Ray Hospital in 2023

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ABSTRACT

This study was conducted to identify the proportion of antibiotic types used in treating acute exacerbations of COPD and to evaluate the treatment outcomes of antibiotic use for acute COPD exacerbations at Cho Ray Hospital in 2023. A total of 306 patients were included in the analysis. Males accounted for 88.9% of the study population. The mean age was 71.87 ± 9.91 years. Most participants were hospitalized due to moderate to severe acute COPD exacerbations (38.6% and 61.1%, respectively). Microbiological analysis showed a wide variety of common bacterial pathogens, with Pseudomonas aeruginosa and other community-acquired bacteria frequently identified. Beta-lactams and Quinolones were the most commonly used and effective antibiotics. The study results show that most COPD patients had positive treatment effects. The analysis of treatment outcomes by antibiotic groups showed significant differences in symptom improvement, unchanged status, and worsening conditions, reflecting both the effectiveness and limitations of each antibiotic group in treating acute COPD. Overall, antibiotic selection appeared appropriate, with high adherence to guidelines in mild and moderate cases and slightly lower appropriateness in severe cases. These findings highlight the importance of individualized treatment based on patient severity, microbiological results, and careful antibiotic selection to optimize outcomes.

Keywords: Antibiotic use, Acute exacerbations, COPD, Cho Ray, Hospital

Introduction

Chronic obstructive pulmonary disease (COPD) causes early death, high mortality, and a heavy burden on the healthcare system [1]. It is the third leading cause of death worldwide, with 3.23 million deaths in 2019, and more than 80% of these occurred in low- and middle-income countries [2, 3]. In Vietnam, COPD affects 7.1% of men and 1.9% of women aged 40 and older [4]. Smoking is the main risk factor, along withjob-related exposures, infections, and air pollution [5, 6]. COPD is also linked with many other health conditions [1]. Its burden is expected to rise, and by 2030, more than 5.8 million people may die each year from COPD and related diseases [1, 6].

Infections are the main cause of COPD exacerbations, with reported rates from 26% to 81% [7, 8]. One study found that among patients hospitalized for acute COPD exacerbations who required mechanical ventilation, the mortality rate was 40%. Long-term outcomes are also poor, with a 5-year mortality rate of up to 50% [9, 10]. Therefore, preventing, detecting early, and promptly treating exacerbations can improve the disease course, enhance quality of life, and reduce the risk of death.

Worldwide and in Vietnam, treatment for acute COPD exacerbations mainly includes bronchodilators, glucocorticoids, and antibiotics [11, 12]. Antibiotic therapy plays an important role in improving patients' health and quality of life. It is also recommended for patients who need mechanical ventilation, as

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it helps reduce mortality and the risk of secondary pneumonia [13, 14].

Many types of antibiotics are used for acute COPD exacerbations. However, with rising antibiotic resistance and the urgent nature of these episodes, it is essential to choose the right antibiotic and dosage for each patient and clinical situation.

Cho Ray Hospital is a special-class referral hospital and a leading center for respiratory diseases. Most patients transferred here are severe, with complicated conditions and infections that have already been treated with multiple antibiotics at lower-level hospitals without success. This creates major challenges for clinicians in selecting effective antibiotics while also limiting resistance and preserving last-line therapies.

Therefore, this study was conducted to identify the proportion of antibiotic types used in treating acute exacerbations of COPD and to evaluate the treatment outcomes of antibiotic use for acute COPD exacerbations at Cho Ray Hospital in 2023.

Materials and Methods

Study design

This is a cross-sectional descriptive study based on retrospective data from medical records of inpatients treated for acute exacerbations in the Respiratory Internal Medicine Department at Cho Ray Hospital from March 2024 to December 2023.

Participants and sample size

The study included patients who met the following criteria:

Inclusion criteria: (1) Inpatient medical records of patients diagnosed with acute exacerbation of chronic obstructive pulmonary disease (COPD); (2) Treated with antibiotics; (3) Corresponding to ICD-10 codes: J44.0; J44.1.

Exclusion criteria: (1) Medical records showing antibiotic use for less than 2 days during treatment in the department; (2) Patients who voluntarily transferred to another hospital during treatment; (3) Medical records that could not be accessed during data collection due to damage, blurring, or other reasons.

The sample size was calculated by the formula for estimating a single proportion in the study:

$$n = \frac{z^2_{1-\alpha/2}\, p(1-p)}{d^2} \quad (1)$$

Where:

- n: minimum sample size to be determined.
- $Z_{1-\alpha/2}$: value from the standard normal distribution, calculated based on the significance level ($Z_{1-\alpha/2}$ = 1.96 if the significance level = 5%).
- p: estimated proportion of the unknown population parameter. It was estimated based on the study on antibiotic use in acute COPD exacerbations by Tran Xuan Bach (2022), with an average rate of 75% [15], therefore p = 0.7;
- d: allowable margin of error for the study (d=0.052).

Using this formula, the expected sample size is 298 medical records. In reality, the study collected 306 medical records that met the specified criteria.

Data collection

All medical records that met the inclusion and exclusion criteria from March to December 2023 were selected. Data were collected until the required sample size was reached, following two steps:

Step 1: Using the hospital management software at Cho Ray Hospital, a list of patients diagnosed with COPD during the study period was obtained, along with their medical record numbers.

Step 2: These medical records were retrieved from the hospital's data system and screened to include only those meeting the study criteria. All required information was then entered into a data collection form based on predefined variables, including:

1. General patient information.
2. Antibiotic use:
   - Monthly data on the number of antibiotics used in the Respiratory Internal Medicine Department (March–December 2023) extracted from the eHospital system.
   - Types of antibiotics prescribed, recorded in an antibiotic-use table.
3. Antibiotic regimens and antibiotic groups documented in the medical records.

For records no longer available in the department, the necessary data were obtained from the eHospital system through the Planning and General Affairs Department, based on the predefined study variables.

Data analysis

The collected data were processed using Microsoft Excel 365 and SPSS version 22.0. Descriptive statistics were used. Normally distributed continuous variables were reported as mean and standard deviation; non-normal continuous variables as median and interquartile range; and qualitative variables as frequencies and percentages.

Ethical considerations

The study protocol was approved by the Medical Ethics Committee of Cho Ray Hospital before data collection. All information collected was used solely for scientific research purposes. The research was conducted with honesty and objectivity. During data analysis, careful attention was given to ensure accuracy and minimize errors. The results were interpreted cautiously to avoid misinterpretation. All findings were fully verified, and sources of information and data were accurately cited.

Results and Discussion

Patients' characteristics

Table 1 shows the patients' demographic characteristics. In our study, 88.9% were male, giving a male-to-female ratio of about 8:1. This is similar to previous research. Tran Xuan Bach (2022) reported 82.3% male patients [15, 16], Tran Thuy Huong (2019) reported 89.4% [17], and an international study by Hurst (2010) found 65% [18, 19]. This difference is likely due to the higher smoking rate in men, as smoking is a major risk factor for COPD and other respiratory diseases.

The patients in our study showed the typical older age pattern of those with acute COPD exacerbations. Most (65.7%) were 61–80 years old. The mean age was 71.87 ± 9.91 years, which is higher than the international study by Hurst *et al*. (2010), where the mean age was 63 ± 7 years. Our result is similar to Vietnamese studies: Tran Xuan Bach (2022) reported a median age of 72 years [15], and Tran Thuy Huong (2019) reported a median age of 70 years [17, 20].

Comorbidity data showed that most patients in the study had at least one comorbidity, mainly between 1 and 3 conditions. Among these, cardiovascular disease was the most common (60.1%), followed by gastrointestinal disease (56.5%) and endocrine disease (44.1%). Compared with other studies, such as the study by Tran Xuan Bach (2022), the most common comorbidities reported were primary hypertension, cor pulmonale, and bronchiectasis, with rates of 32.1%, 14.0%, and 12.8%, respectively [15, 21]. In the study by Miravitlles *et al*. the proportion of patients with acute exacerbation of COPD who had hypertension and diabetes was 34.1% and 14.2%, respectively [22]. Thus, both our study and previous studies show that the proportion of patients with COPD who have hypertension is relatively high.

The rate of pneumonia as a comorbidity in our study was 1%, which is lower than the 9.8% reported by Tran Thuy Huong (2019) [17] and 5.3% by Tran Xuan Bach (2022) [15, 23]. According to several authors, community-acquired pneumonia is one of the common infections in patients with COPD. This may be due to structural changes in the lung parenchyma, frequent use of antibiotics and corticosteroids (oral or inhaled), or alterations in both local and systemic immune responses.

In our study, 77.5% of COPD patients had a history of smoking, representing the majority of the sample. This indicates that cigarette smoking is the leading cause of COPD. The toxic substances in cigarette smoke induce chronic inflammation and structural damage to lung tissue. Over time, this damage accumulates, leading to narrowing of the small airways and destruction of the alveoli, which impairs gas exchange. Long-term smoking not only causes symptoms such as cough, dyspnea, and increased sputum production but also contributes to the progressive worsening of the disease. Notably, passive smokers who are regularly exposed to secondhand smoke may also develop COPD. Smoking cessation is considered the most important measure in the prevention and management of COPD. Although the structural damage in the lungs cannot be completely reversed, quitting smoking slows disease progression and improves patients' quality of life. In summary, cigarette smoking is both the primary risk factor and a key driver of disease progression in COPD. Therefore, reducing and eliminating smoking is essential for protecting lung health and preventing the development and worsening of COPD [24-27].

The results of this study show that the majority of patients had severe COPD, accounting for 61.1% (n = 187). This finding suggests that many patients are diagnosed or treated only when the disease has already progressed to an advanced stage, possibly due to challenges in early detection or inadequate disease control. Patients with moderate COPD also represented a considerable proportion, at 38.6% (n = 118), indicating that a significant number of individuals had not yet progressed to severe stages but still require close monitoring to prevent further deterioration. COPD is a chronic and progressive disease that often develops silently. Early symptoms - such as chronic cough, mild dyspnea, or sputum production - are easily overlooked or mistaken for other respiratory conditions. As a result, many patients seek medical care only when their symptoms become severe.

Table 1. Patient Characteristics in the Study Sample

Characteristics	Frequency (n)	Percentage (%)
Gender		
Male	272	88.9
Female	34	11.1
Age groups		
<60 years	39	12.7
61-70 years	99	32.4
71-80 years	102	33.3
>80 years	66	21.6
Mean age ± SD [Min-Max]	71.87 ± 9.91 [45-99]	
Number of comorbidities		
0	35	11.4
1-3	249	81.4
>3	22	7.2
Type of comorbidities		
Gastrointestinal	173	56.5
Cardiovascular	184	60.1
Respiratory	3	1
Endocrine (Diabetes, Cushing's)	135	44.1
Renal	24	7.8
Other comorbidities	32	10.5
Smoking		
Yes	237	77.5
No	42	13.7
No information	27	8.8
Severity of acute COPD exacerbation		
Mild	1	0.3
Moderate	118	38.6
Severe	187	61.1

Microbiological characteristics

The results of microbial cultures are presented in **Table 2**. Current treatment guidelines do not recommend performing culture tests on all patients. In accordance with GOLD guidelines, sputum cultures or other pulmonary specimens should only be performed for patients who frequently experience exacerbations, have severe airway obstruction, and/or require

mechanical ventilation during the current exacerbation [28]. NICE guidelines recommend sputum cultures only when there are signs of purulent sputum, and blood specimen cultures if patients have a fever [29].

Based on the microbiological culture results, sputum was the most common type of specimen, accounting for 85.71% of all samples, followed by bronchial fluid (8.57%) and nasopharyngeal fluid (4.29%). In our study, *Acinetobacter baumannii* was the most frequently isolated pathogen, representing 6.5%, followed by *Pseudomonas aeruginosa* (2.3%) and *Klebsiella pneumoniae* (1.6%). In addition, several other bacterial species were also detected, though at lower frequencies. These findings indicate a wide diversity of causative pathogens, with a notable presence of drug-resistant bacteria such as *A. baumannii* and *P. aeruginosa*. This highlights their important role in infectious exacerbations among COPD patients and the challenges they pose in antibiotic selection. Compared with the study by Tran Xuan Bach (2022), the positive culture rates for hospital-acquired pathogens such as *P. aeruginosa*, *A. baumannii*, and *K. pneumoniae* in our study were lower. In Bach's study, these bacteria accounted for 12.8%, 7.7%, and 2.6%, respectively. Similarly, findings from Tran Thuy Huong (2019) also showed that hospital-acquired bacteria were the most frequently isolated pathogens in COPD patients. The most common isolates included *P. aeruginosa*, *A. baumannii*, *S. maltophilia,* and *K. pneumoniae*, with respective rates of 4.3%, 2.0%, 1.5%, and 1.1% [17]. The positive culture rates for community-acquired bacteria such as *S. pneumoniae*, *H. influenzae*, and *M. catarrhalis* were very low in our study. This finding is consistent with previous microbiological studies conducted in Europe and the United States. For example, E. Sapey and colleagues reviewed data from four different studies and found that *P. aeruginosa* accounted for approximately 4% of isolates [30]. Many other studies have also reported that the most common pathogens responsible for acute COPD exacerbations are *H. influenzae*, *S. pneumoniae*, *M. catarrhalis*, and *P. aeruginosa*. However, the findings of our study differ from several studies conducted in Vietnam and in other Asian countries. A study from China in 2013 reported higher rates of *P. aeruginosa* (21.7%), *K. pneumoniae* (12.3%), and *H. influenzae* (14.2%). Similarly, the study by Pascual Guardia S (2023) showed that the most frequently isolated pathogens in COPD patients were *Streptococcus pneumoniae* (8%), *P. aeruginosa* (7%), and *Haemophilus influenzae* (3%) [31]. The bacterial culture results from the REAL 2016-2017 study conducted by Pham Hung Van in Vietnam also showed a similar proportion of hospital-acquired bacteria compared with our findings [32, 33]. This difference may be due to variations in epidemiological characteristics across different geographical regions. Thus, based on the current findings, the microbiological profile of pathogens causing COPD exacerbations is still not fully consistent or clearly defined across healthcare settings in Vietnam and worldwide. More in-depth microbiological studies are needed to accurately determine the frequency of causative pathogens in COPD exacerbations. This will help guide the selection of appropriate initial antibiotic regimens.

The small sample size in our study may not fully reflect the actual distribution of isolated bacterial strains. It should also be noted that traditional sputum culture methods may have limited sensitivity in detecting pathogens. Therefore, applying molecular techniques such as PCR could help more accurately identify the role of pneumococci and other bacteria in COPD exacerbations. The study by Aydemir *et al*. (2014) demonstrated that PCR detected bacteria at a significantly higher rate compared to culture ($p = 0.01$) [34]. The study by Pham Hung Van in Vietnam also reported similar findings [33, 35]. This highlights a second challenge in identifying the microbiological causes of COPD exacerbations. This low detection rate is likely due to the fact that the most common bacteria causing lower respiratory tract infections are difficult to culture. These organisms require not only appropriate culture media but also immediate inoculation after sample collection. However, these conditions are often not fully met in clinical microbiology laboratories at hospitals, which leads to a reduced ability to identify the causative pathogens. In addition, another possible reason is that many patients had already used antibiotics beforehand. As a result, although the pathogens may still be present in the epithelial lining fluid of the alveoli, they may have died in the sputum samples, which are the main type of specimen collected in this study [7]. The third challenge in microbiological practice relates to the reliability of culture results. The primary specimens used to detect pathogens in COPD exacerbations are patients' sputum samples. These specimens are not sterile, as they must pass through the oropharynx during collection. Therefore, isolating the true causative bacteria without contamination from other microbes is a significant challenge [36]. For blood specimens, the main challenge is the typically low positive rate, as not all respiratory pathogens can invade the bloodstream, and many patients have already received antibiotics before blood culture is performed. In addition, blood culture results are often false-positive due to contamination caused by technical errors during the culture and monitoring processes.

Table 2. Microbiological culture results

	Frequency (n)	Percentage (%)
Acinetobacter baumannii	20	6.5
Pseudomonas aeruginosa	7	2.3
Klebsiella pneumoniae	5	1.6
Escherichia coli	3	1
Pseudomonas putida	3	1
Candida tropicalis	3	1
Streptococcus agalactiae	1	0.3
Staphylococcus aureus	1	0.3
Corynebacterium striatum	1	0.3
Acinetobacter nosocomialis	1	0.3
Cronobacter sakazakii group	1	0.3
Proteus mirabilis	1	0.3
Candida albicans	1	0.3
Haemophilus influenzae	1	0.3

Proportion of antibiotics used

Data on antibiotics used in treatment regimens showed a diversity of choices, including both monotherapy and combination therapy. **Table 3** shows the rates of antibiotic use in treating acute COPD episodes. Among the antibiotic groups, Beta-lactams and Quinolones were the most commonly used. In the Beta-lactam group, Cefoperazon + Sulbactam had the highest rate at 31.7%, followed by Piperacillin + Tazobactam at 21.9%. In the Quinolone group, Levofloxacin was the main antibiotic, accounting for 50.6%, making it the most used antibiotic in the whole study. Other antibiotic groups, such as Glycopeptides, Tetracyclines, Sulfonamides, Polymyxins, Macrolides, Aminoglycosides, and Oxazolidinones, were used less often, ranging from 0.3% to 3.3%. These results show that in treating acute COPD, doctors usually prefer broad-spectrum antibiotics and Quinolones, while other antibiotics are only used in special cases or when there is drug resistance. Data on the number of antibiotics prescribed per patient showed that most patients received 1 or 2 antibiotics. Specifically, 56.9% of patients were prescribed 2 antibiotics, representing the highest proportion, followed by patients prescribed 1 antibiotic (40.5%). Only a small proportion received 3 antibiotics (2.3%), and very few were prescribed 4 antibiotics (0.3%). The study by Nguyen Thang (2024), which evaluated antibiotic use for acute exacerbations of COPD at a hospital in the Mekong Delta region from 2022 to 2023, showed that Cephalosporins were the most commonly used antibiotics (47.9%). Most patients (91.1%) were treated with combination antibiotic regimens from the beginning [37].

Table 3. Proportion of Antibiotics Used in Acute COPD Exacerbations

Group	Name of antibiotics	Frequency (n)	Percentage (%)
Beta-lactam antibiotics	Ampicilin + Sulbactam	1	0.3
	Amoxicillin + acid clavulanic	4	1.3
	Piperacilin + Tazobactam	67	21.9
	Cefoperazon + Sulbactam	97	31.7
	Imipenem + Cilastatin	22	7.2
	Ceftazidim	12	3.9
	Ceftriaxon	2	0.7
	Meropenem	51	16.7
	Ertapenem	8	2.6
Quinolone antibiotics	Ciprofloxacin	40	13.1
	Levofloxacin	155	50.6
	Moxifloxacin	5	1.6
Glycopeptide	Vancomycin	3	1
	Teicoplanin	1	0.3
Tetracycline	Doxycyclin	1	0.3
	Tigecyclin	1	0.3
Sulfonamide	Sulfamethoxazol + Trimethoprime	1	0.3
Polymyxin	Colistin	8	2.6
Macrolide	Azithromycin	2	0.7
Aminoglycoside	Amikacin	4	1.3
Oxazolidinone	Linezolid	10	3.3

Data on treatment regimens in **Table 4** showed that the majority of patients (84.6%) were treated according to regimens targeting *Pseudomonas aeruginosa*, while 15.4% followed regimens for community-acquired bacteria. In the study by Tran Xuan Bach (2022), regimens targeting *P. aeruginosa* accounted for 66.4% of initial regimens and 80.3% of alternative regimens, with an overall proportion of 71.5% [15, 38]. These results are similar to the findings of Tran Thuy Huong, in which regimens targeting *Pseudomonas aeruginosa* accounted for 55.7% of initial regimens, 85.9% of alternative regimens, and 65.0% overall [17, 39]. The proportion in our study is also quite similar to the findings of Planquette *et al*. In their 10-year retrospective study from 2000 to 2010, the use of Pseudomonas-targeted antibiotic regimens in COPD exacerbations increased from 22% (2000-2006) to 60.7% (2006-2010) ($p<0.001$). This change may have been influenced by the diagnosis of hospital-acquired pneumonia in COPD exacerbation patients, as 2005 was the year the ATS issued guidelines for the management of hospital-acquired pneumonia. Patients diagnosed with hospital-acquired pneumonia were four times more likely to be prescribed Pseudomonas-targeted antibiotics compared with those without this diagnosis, although the difference was not statistically significant. Another reason for the increased use of Pseudomonas-targeted antibiotics may be due to the subjective perception of physicians [40, 41].

Most patients did not require any change in their initial treatment regimen, accounting for 93.5% of cases. Among those who needed a regimen change, 5.2% of patients had their regimen changed once, and 1.3% had it changed twice. These results are consistent with the findings of Tran Xuan Bach (2022), in which the majority of patients were treated with a single regimen throughout their treatment period (61.5%). Among the 102 patients who required a regimen change (38.5%), most underwent a single change (24.2%) [15, 42]. These results are similar to the study by Tran Thuy Huong (2019), in which the proportions of patients with no regimen change and those with a regimen change were 67.4% and 32.6%, respectively, with patients who had their regimen changed once accounting for 22.9% [17]. Most patients received 1 or 2 antibiotic regimens throughout their treatment. This reflects physicians' prescribing patterns: they often start with monotherapy based on experience and monitor clinical response. If the patient shows a poor response, the regimen is usually adjusted to include more antibiotics, broader-spectrum, or stronger combinations than the initial regimen. In practice, changes are guided by clinical response over time. Moreover, most patients in our study did not undergo microbiological culture or susceptibility testing. Therefore, if the patient's condition does not improve, physicians tend to switch to regimens targeting more difficult-to-treat pathogens, such as *Pseudomonas aeruginosa*.

Table 4. Microbiological Targets and Changes in Treatment Regimens

	N	%
Microbiological Targets		
Pseudomonas aeruginosa	259	84.6
Community-acquired bacteria	47	15.5
Changes in Treatment Regimens		
One times	16	5.2
Two times	4	1.3
Three times	0	0
Four times	0	0
No Regimen Change	286	93.5

Treatment outcomes in patients with acute COPD

Managing antibiotic use in the treatment of acute COPD is very important to prevent drug resistance, shorten hospital stays, and improve patient outcomes. The study results show that most COPD patients had positive treatment effects, reflecting the effectiveness of the current treatment protocols. Specifically, in our study, 77.8% of patients were discharged, indicating that their condition had improved enough so they did not need to continue treatment in the hospital. This is the highest rate and clearly shows the success of the treatment methods used. However, a notable 16% of patients had to leave the hospital against medical advice when their condition was still severe. This may be due to many factors, including complex medical conditions or personal reasons. This is an important point to consider and could be an opportunity to improve support for these patients, such as providing additional home care services or more detailed counseling. In addition, 5.9% of patients were referred to local healthcare facilities, which can be seen as part of a long-term treatment strategy to continue monitoring or treating the disease closer to home. Only one patient (0.3%) needed a specialist referral, showing that most patients were treated effectively without requiring intervention from other specialties **(Table 5)**.

In an overall assessment of 306 patients, 262 (85.6%) showed favorable treatment outcomes, indicating the clear effectiveness of the treatment protocol. However, 39 patients (12.7%) had a worsening condition after treatment, which is noteworthy. Although this number is not very large, it suggests the need for closer monitoring and possibly reviewing treatment methods for these more severe cases, to ensure all patients have the best chance of achieving good outcomes **(Table 5)**.

Table 5. Treatment outcomes in general

Outcome	N	%
Discharge outcomes		
Discharged	238	77.8
Referred to a specialist	1	0.3
Transferred to a local facility	18	5.9
Left against medical advice	49	16
Overall treatment outcome assessment		
Improved	262	85.6
No change	5	1.6
Worsened	39	12.7

These results show that most patients achieved good treatment results, but a small proportion had no improvement or even worsened, which should be carefully considered to optimize treatment methods in the future. The average duration of antibiotic use during acute episodes in our study was 6.3 days, with a standard deviation of 3.6 days. The median was 5 days, with an interquartile range of 4 to 7 days. The shortest duration was 2 days, and the longest was 25 days, which is lower than the median of 9 days reported by Tran Thuy Huong (2019) [17]. Tran Xuan Bach (2022) reported a median of 12 days, with a maximum of 28 days [15, 43]. This duration is relatively long compared to most guidelines and recommendations. According to GOLD, the recommended duration of antibiotic use is 5-7 days [28]. According to the Ministry of Health guidelines, for mild acute episodes treated on an outpatient basis, the average duration of antibiotic treatment is 5-7 days. For moderate to severe acute episodes, the average duration of antibiotic treatment is 7-10 days [13]. This may be explained by the fact that most patients in this study were hospitalized with moderate or severe acute episodes. They had been treated at lower-level facilities without improvement, so doctors often tended to extend the duration of antibiotic use. The Ministry of Health guidelines also recommend that the duration of antibiotic treatment should be adjusted based on the severity of the acute episode and the patient's response [13, 44].

Table 6. Treatment outcomes by antibiotic groups

Antibiotic groups	Treatment outcomes	N	%
Beta - lactam	Improved	160	87.4
	No change	4	2.2
	Worsened	19	10.4
F-quinolon	Improved	160	83.3
	No change	5	2.6
	Worsened	27	14.1
Carbapenem	Improved	57	75
	No change	1	1.3
	Worsened	18	23.7
Glycopeptide	Improved	3	75.0
	Worsened	1	25.0
Tetracycline	Improved	1	50.0
	Worsened	1	50.0
Sulfonamide	Improved	1	100
Polymyxin	Improved	6	75.0
	Worsened	2	25.0
Macrolide	Improved	2	100
Aminoglycoside	Improved	3	100
Oxazolidinone	Improved	5	62.5
	No change	1	12.5
	Worsened	2	25.0

The analysis of treatment outcomes by antibiotic groups showed significant differences in symptom improvement, unchanged status, and worsening conditions, reflecting both the

effectiveness and limitations of each antibiotic group in treating acute COPD **(Table 6)**. The Beta-lactam group had the highest improvement rate among the main antibiotic groups (87.4%), with unchanged and worsening rates of 2.2% and 10.4%, respectively. This is a common first-choice antibiotic group due to its broad spectrum and good tolerance. The F-quinolone group had an improvement rate of 83.3%, slightly lower than Beta-lactam, but a significantly higher worsening rate (14.1%). This may be related to its use in cases with drug resistance or more complex conditions. The Carbapenem group showed a 75% improvement rate but had the highest worsening rate among the main groups (23.7%). This could be because it is usually prescribed for severe or multidrug-resistant patients, increasing the risk of treatment failure. The Glycopeptide and Polymyxin groups both had a 75% improvement rate, but a worsening rate of 25%. This reflects that these antibiotics are mainly used for severe drug-resistant cases and may cause more serious side effects, affecting treatment outcomes. The Tetracycline group had only a 50% improvement rate, with 50% of patients worsening, indicating that it is less recommended or may be less effective for acute COPD treatment. The Sulfonamide, Macrolide, and Aminoglycoside groups achieved a 100% improvement rate, showing high suitability when prescribed appropriately. Macrolides and aminoglycosides are particularly important in antibiotic regimens due to stable results and relatively low side effects. The Oxazolidinone group showed only a 62.5% improvement rate, with 12.5% unchanged and 25% worsening, suggesting that it is more suitable for special drug-resistant cases, but further study is needed **(Table 6)**. Overall, these results clearly reflect the diversity in treatment responses among antibiotic groups. Beta-lactam, Macrolide, and Aminoglycoside are more effective and safer choices, while Carbapenem, Glycopeptide, and Oxazolidinone should be prescribed more cautiously in severe cases. The results also highlight the importance of individualizing treatment based on disease severity and drug resistance factors to optimize effectiveness and minimize the risk of treatment failure.

Implications

It is important to ensure that all doctors strictly follow the Ministry of Health (2018) treatment guidelines to reduce inappropriate antibiotic use, which is currently 8.2%. Regular monitoring and supervision of antibiotic prescribing and use should be established to detect inappropriate use early. In addition, training sessions and updates for medical staff on acute COPD treatment guidelines and effective antibiotic use should be organized regularly. Measures should also be taken to control the duration of antibiotic use according to the guidelines, reducing unnecessary prolonged use, which is currently 52.78%. Regular studies are encouraged to evaluate the effectiveness of these interventions and improve the quality of care for COPD patients. Finally, treatment plans should consider individual factors, such as the causative bacteria and the patient's health status, to optimize treatment outcomes.

Strengths and limitations

Our study investigated the use of antibiotics in treating acute COPD episodes at Cho Ray Hospital. It not only provides an overview of the current antibiotic use but also lays the foundation for future studies analyzing and evaluating antibiotic use. One of the main limitations of our study is that it was conducted using a retrospective descriptive method. Although this method is cost- and time-efficient, it has significant limitations. It does not allow us to collect all necessary data, such as the severity of COPD at admission, patients' medication history, or the reasons for changing antibiotic regimens. In addition, tracking previous acute episodes is difficult because each hospital admission may have different medical records. This may affect the choice and duration of antibiotics used in the current episode. However, overall, this study provides important information on trends and characteristics of antibiotic use in acute COPD at Cho Ray Hospital. These results can help guide the optimization of antibiotic use and reduce misuse that leads to antibiotic resistance in clinical practice.

Conclusion

This study provides important insights into the patterns and characteristics of antibiotic use in acute COPD episodes at Cho Ray Hospital. Beta-lactams and Quinolones were the most commonly used antibiotics, while other groups were used less frequently. The findings highlight the need for strict adherence to the Ministry of Health treatment guidelines, regular monitoring of antibiotic prescribing, and ongoing training for medical staff to optimize antibiotic use. Controlling the duration of antibiotic therapy and considering individualized treatment based on patient condition and causative bacteria can help reduce inappropriate use and the risk of antibiotic resistance. This study offers valuable evidence to guide future interventions and improve the quality of care for COPD patients.

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