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Drug Utilization Evaluation of Antibiotic Prescribing Practices in Patients with Lower Respiratory Tract Infections: A Cross-Sectional Observational Study

Dr. Juwaria Masood[1], Dr. Nabiha Subhani Misbah[2], Dr Syed Tariq Mansoor[3]

[1]*Assistant Professor, Department of Pharmacology, Dr.VRK Womens Medical College, Teaching Hospital & Research Centre, Aziznagar, R.R. District, Telangana, India.*

[2]*Assistant Professor, Department of Pharmacology, Government Medical College, Nagarkurnool, Telangana, India*

[3]*IIIrd Year Resident, Department of Cardiothoracic and Vascular Surgery, Osmania Medical College, Hyderabad, Telangana, India*

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Corresponding Author:

Dr. Juwaria Masood
Assistant Professor,
Department of Pharmacology,
Dr.VRK Womens Medical College, Teaching Hospital & Research Centre,
Aziznagar, R.R. District,
Telangana, India.

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ABSTRACT

Background: Lower respiratory tract infections are among the most frequent causes of antibiotic use in routine clinical practice. Inappropriate selection, unnecessary combinations, excessive parenteral use, and poor microbiological guidance contribute to antimicrobial resistance and irrational drug utilization.

Objectives: To evaluate antibiotic prescribing practices in patients with lower respiratory tract infections and to assess selected drug utilization indicators, including prescribing pattern, route, duration, culture-guided therapy, generic prescribing, essential medicines list use, and guideline concordance.

Methods: This hospital-based cross-sectional observational study was conducted on one hundred adult patients diagnosed with lower respiratory tract infections were included. Data on demographic profile, diagnosis, comorbidities, symptoms, antibiotic prescriptions, microbiological testing, and prescription indicators were recorded in a structured proforma and analyzed using descriptive statistics.

Results: The mean age was 49.8 ± 16.2 years, and 58.0% were males. Community-acquired pneumonia was the commonest diagnosis. A total of 148 antibiotics were prescribed, giving an average of 1.48 antibiotics per prescription. Empirical therapy accounted for 89.0% of cases, and monotherapy was used in 60.0%. Intravenous administration was more frequent than oral use. Amoxicillin-clavulanate, ceftriaxone, azithromycin, and piperacillin-tazobactam were the leading antibiotics prescribed. Culture testing was performed in 36.0% of patients, and overall guideline-concordant prescribing was noted in 74.0%.

Conclusion: Antibiotic use in lower respiratory tract infections was predominantly empirical, with substantial reliance on broad-spectrum agents and limited culture-guided optimization. The findings support the need for stronger antimicrobial stewardship, improved adherence to treatment recommendations, and greater emphasis on rational prescribing indicators in routine hospital practice.

Keywords*: lower respiratory tract infection; antibiotics; drug utilization evaluation; antimicrobial stewardship; prescribing indicators.*

INTRODUCTION

Lower respiratory tract infections [LRTIs] remain a major clinical problem across outpatient departments, emergency services, and inpatient wards because they account for substantial morbidity, frequent physician encounters, and a large share of antibiotic consumption worldwide [1,2]. The term LRTI includes a heterogeneous group of conditions such as community-acquired pneumonia, acute bronchitis, bronchopneumonia, and infective exacerbations of chronic obstructive pulmonary disease [COPD]. These illnesses differ in etiology and severity, yet they are commonly managed with empirical antimicrobial therapy at the point of first contact, especially when the immediate concern is clinical deterioration, fever, dyspnea, or radiological suspicion of pneumonia [1,2]. In routine practice, therefore, antibiotic prescribing for LRTI represents an important interface between urgent patient care and antimicrobial stewardship.

Although antibiotics are indispensable in bacterial pneumonia and selected infective COPD exacerbations, inappropriate use remains common, particularly in syndromes such as uncomplicated acute bronchitis where the clinical benefit is limited and many episodes are self-limiting [3,8]. Earlier observational work from primary care and multicenter practice settings has shown considerable variation in the decision to prescribe antibiotics, the class of agents selected, and the extent to which prescriptions align with accepted recommendations [5-8]. Broad-spectrum drugs, injectable agents, and combination regimens are often chosen even when microbiological confirmation is unavailable. Such practices increase treatment cost, expose patients to avoidable adverse effects, and accelerate the emergence of antimicrobial resistance, which continues to threaten the long-term effectiveness of standard anti-infective therapy [9,10].

Drug utilization evaluation offers a structured approach for examining how medications are prescribed and used in real clinical settings. It helps determine whether prescriptions are rational with respect to indication, dosage form, duration, route, essential medicines list use, generic prescribing, and conformity with treatment guidance [9-12]. Prescription audit studies from India and other countries have shown that deviations from recommended indicators remain frequent, including inadequate generic prescribing, underuse of microbiological testing, and excessive empirical therapy [11-14]. These observations are especially relevant for respiratory infections, where diagnostic uncertainty often drives early antimicrobial use.

In this context, evaluation of antibiotic use in LRTI is clinically meaningful because it identifies local prescribing behavior, highlights targets for corrective intervention, and provides a baseline for future stewardship measures. The present study was undertaken to assess antibiotic prescribing practices among patients with lower respiratory tract infections at a teaching hospital and to describe the associated drug utilization indicators. The specific objectives were to analyze the demographic and clinical profile of patients with LRTI, evaluate the pattern of antibiotic selection and use, and assess selected markers of rational prescribing, including empirical versus definitive therapy, route and duration of treatment, culture-guided modification, generic prescribing, essential medicines list use, and overall guideline concordance.

METHODOLOGY

Study design and setting: This hospital-based cross-sectional observational study was carried out at Dr. VRK Women's Medical College, Moinabad, Azeeznagar, Hyderabad, India. The study was designed as a drug utilization evaluation of antibiotic prescribing practices in adult patients presenting with lower respiratory tract infections in inpatient and outpatient care. The analysis was descriptive in nature and focused on real-world prescribing behavior rather than therapeutic intervention.

Study population: Adult patients aged 18 years and above with a clinical diagnosis of lower respiratory tract infection were eligible for inclusion. Diagnoses included community-acquired pneumonia, acute bronchitis, bronchopneumonia, infective exacerbation of chronic obstructive pulmonary disease, and infective exacerbation of bronchial asthma, as recorded by the treating clinician in the case sheet or prescription. Patients with incomplete documentation of diagnosis or antibiotic therapy were not included in the final analysis. A total of 100 eligible patients formed the study sample.

Sampling and data collection: Consecutive eligible cases were reviewed using a structured data collection proforma. Information was extracted from prescription records and case files, including age, sex, diagnosis, comorbidities, presenting symptoms, type of care, number of antibiotics prescribed, specific agents used, route of administration, duration of therapy, culture and sensitivity testing, and subsequent modification of treatment after microbiological reporting. Drug names were entered exactly as prescribed and later categorized into pharmacological groups for analysis.

Study variables and prescribing indicators: The primary study variables were the pattern of antibiotic prescribing and indicators of rational drug use. These included the average number of antibiotics per prescription, frequency of monotherapy and combination therapy, empirical versus definitive treatment, intravenous versus oral administration, duration of treatment, prescribing by generic name, use of antibiotics from the essential medicines list, and proportion of prescriptions judged guideline-concordant. Guideline concordance was assessed by comparing the chosen regimen with standard adult LRTI treatment principles reported in published guidance and prescription audit literature, with particular attention to indication, spectrum, route, and duration [1-4,9-12].

Statistical analysis: Data were compiled in a master sheet and analyzed using descriptive statistical methods. Continuous variables were summarized as mean with standard deviation, while categorical variables were expressed as frequencies and percentages. Because the objective of the study was to describe prescribing patterns and utilization indicators in a defined sample, inferential comparisons were not planned.

Ethical considerations: Patient confidentiality was maintained throughout the study by excluding personal identifiers from the data abstraction sheet. The study was performed as an observational prescription audit using anonymized clinical records, and the analysis was restricted to aggregate reporting for academic purposes.

RESULTS

A total of 100 patients with lower respiratory tract infections were included in the study. The mean age of the study population was 49.8 ± 16.2 years. Most patients belonged to the 46-60 years and >60 years age groups, each accounting for 30.0%. Males constituted 58.0% of the study population. Community-acquired pneumonia was the most common diagnosis, followed by infective exacerbation of chronic obstructive pulmonary disease and acute bronchitis [Table 1].

Table 1. Sociodemographic and clinical profile of study participants [n = 100]

Variable	Category	n	%
Age group [years]	18-30	16	16.0
Age group [years]	31-45	24	24.0
Age group [years]	46-60	30	30.0
Age group [years]	>60	30	30.0
Sex	Male	58	58.0
Sex	Female	42	42.0
Clinical diagnosis	Community-acquired pneumonia	38	38.0
Clinical diagnosis	Infective exacerbation of COPD	24	24.0
Clinical diagnosis	Acute bronchitis	20	20.0
Clinical diagnosis	Bronchopneumonia	10	10.0
Clinical diagnosis	Infective exacerbation of bronchial asthma	8	8.0

Diabetes mellitus, hypertension, and chronic obstructive pulmonary disease were the leading comorbid conditions. Cough, fever, dyspnea, and sputum production were the most frequently reported presenting symptoms. Most patients were managed as inpatients [Table 2].

Table 2. Comorbidities, presenting symptoms, and type of care [n = 100]

Variable	Category	n	%
Comorbidity*	Diabetes mellitus	26	26.0
Comorbidity*	Hypertension	22	22.0
Comorbidity*	COPD	20	20.0
Comorbidity*	Bronchial asthma	12	12.0
Comorbidity*	No comorbidity	30	30.0
Presenting symptom*	Cough	92	92.0
Presenting symptom*	Fever	74	74.0
Presenting symptom*	Dyspnea	68	68.0
Presenting symptom*	Sputum production	63	63.0
Presenting symptom*	Wheeze	28	28.0
Type of care	Inpatient	64	64.0
Type of care	Outpatient	36	36.0

**Multiple responses were possible.*

Antibiotic prescribing was predominantly empirical. A total of 148 antibiotics were prescribed for 100 prescriptions, with an average of 1.48 antibiotics per prescription. Monotherapy was the most common prescribing pattern, followed by dual

therapy. Intravenous route was used more often than oral route, and the commonest duration of therapy was 5-7 days [Table 3].

Table 3. Pattern of antibiotic prescribing [n = 100]

Variable	Category	n	%
Number of antibiotics per prescription	One	60	60.0
Number of antibiotics per prescription	Two	32	32.0
Number of antibiotics per prescription	Three	8	8.0
Nature of therapy	Empirical	89	89.0
Nature of therapy	Definitive	11	11.0
Initial route of administration	Intravenous	62	62.0
Initial route of administration	Oral	38	38.0
Duration of therapy	5-7 days	54	54.0
Duration of therapy	8-10 days	34	34.0
Duration of therapy	>10 days	12	12.0

Amoxicillin-clavulanate, ceftriaxone, azithromycin, and piperacillin-tazobactam were the most frequently prescribed antibiotics. Culture testing was performed in a little more than one-third of patients, and overall guideline concordance was noted in nearly three-fourths of prescriptions [Table 4].

Table 4. Antibiotic utilization pattern and prescribing indicators

Variable	Category/Value	n	%
Total antibiotics prescribed	148		
Average number of antibiotics per prescription	1.48		
Most commonly prescribed antibiotics	Amoxicillin-clavulanate	26	17.6
Most commonly prescribed antibiotics	Ceftriaxone	24	16.2
Most commonly prescribed antibiotics	Azithromycin	20	13.5
Most commonly prescribed antibiotics	Piperacillin-tazobactam	16	10.8
Most commonly prescribed antibiotics	Levofloxacin	15	10.1
Most commonly prescribed antibiotics	Cefixime	10	6.8
Most commonly prescribed antibiotics	Doxycycline	8	5.4
Most commonly prescribed antibiotics	Amikacin	7	4.7

Variable	Category/Value	n	%
Most commonly prescribed antibiotics	Meropenem	6	4.1
Most commonly prescribed antibiotics	Others	16	10.8
Culture sent	Yes	36	36.0
Culture positive among tested	18/36	18	50.0
Antibiotic changed after culture report	Yes	11	11.0
Generic prescribing	Yes	41	41.0
Antibiotics from essential medicines list	Yes	82	82.0
Guideline-concordant prescriptions	Yes	74	74.0
Inappropriate use indicators present	Yes	26	26.0

Overall, the findings demonstrated that antibiotic prescribing for lower respiratory tract infections was predominantly empirical, with frequent use of broad-spectrum agents and moderate adherence to guideline-based practice. Although monotherapy was the most common prescribing pattern, culture-guided optimization remained limited, indicating the need for stronger antimicrobial stewardship in the management of adult LRTIs.

DISCUSSION

The present study showed that lower respiratory tract infections in adults were managed predominantly with empirical antibiotic therapy, and community-acquired pneumonia formed the largest diagnostic subgroup. This pattern is clinically understandable because pneumonia remains the LRTI phenotype most strongly associated with antibiotic treatment in adult practice, whereas infective exacerbations of COPD and acute bronchitis create greater uncertainty regarding the need for immediate antimicrobial use [4]. The age distribution and male predominance observed in this series also reflect the common epidemiological profile of adults presenting with respiratory infections in hospital-based settings [11,13].

A total of 148 antibiotics were prescribed for 100 patients, yielding an average of 1.48 antibiotics per prescription. Monotherapy was the dominant strategy, which is reassuring, but the use of two or three antibiotics in 40% of patients indicates a continued reliance on combination treatment in a substantial minority. Similar concerns regarding unnecessary breadth of prescribing and imperfect alignment with guidelines have been described in observational studies of acute cough, bronchitis, and lower respiratory tract infection in Europe and other settings [5-8]. In the present study, amoxicillin-clavulanate, ceftriaxone, azithromycin, piperacillin-tazobactam, and levofloxacin were the most commonly used agents, suggesting a preference for broad empirical coverage. This pattern is partly consistent with adult CAP and COPD guidance, yet it also signals a tendency toward broader-spectrum therapy than is always required [4].

Intravenous antibiotics were used more frequently than oral therapy, which corresponds with the high inpatient proportion in the sample. A similar dominance of injectable prescribing and empirical treatment was reported in the Indian antimicrobial utilization study by Ravi et al., where ceftriaxone-based therapy was especially frequent and respiratory infections were the leading indication for antimicrobial use [11]. In the current study, however, culture testing was performed in only 36% of cases and treatment modification after culture was documented in just 11%. This limited microbiological confirmation reflects a persistent stewardship gap, because narrower and more targeted therapy depends on timely diagnostic support. Evidence from COPD studies has shown that biomarker- or evidence-guided strategies can reduce unnecessary antibiotic exposure without compromising short-term safety [4].

Generic prescribing in this study was 41%, while 82% of antibiotics were drawn from the essential medicines list. These results indicate partial adherence to rational prescribing norms but still leave room for improvement. WHO-oriented prescription audits from India and other developing settings have likewise highlighted deficits in generic prescribing and incomplete conformity to optimal indicators [11,12]. The overall guideline-concordant rate of 74% in the present study is better than the substantial inappropriateness reported in Tunisian respiratory infection prescribing, yet the remaining 26% of prescriptions with irrational features remains important [13]. Given the strong evidence that unnecessary antibiotic use for respiratory illness can be reduced without major harm when stewardship is implemented carefully, local prescribing audits such as this study provide a practical basis for corrective education, protocol reinforcement, and ongoing surveillance [9,10,14].

LIMITATIONS

This study has several limitations. It was conducted at a single teaching hospital with a modest sample size of 100, which restricts external validity. The cross-sectional design captured prescribing at one point of care and did not evaluate clinical outcomes, antimicrobial resistance patterns, or follow-up response. Microbiological confirmation was available in only a subset of patients, limiting organism-specific interpretation of prescribing appropriateness.

CONCLUSION

This study demonstrates that antibiotic prescribing for lower respiratory tract infections in the study setting was largely empirical and centered on broad-spectrum agents, with moderate adherence to rational prescribing standards. Monotherapy remained the predominant approach, yet combination treatment, frequent intravenous use, limited microbiological testing, and suboptimal generic prescribing indicate clear opportunities for improvement. The proportion of prescriptions judged guideline-concordant was encouraging but not sufficient to ignore the quarter of encounters showing avoidable deviation. Regular prescription audit, reinforcement of standard treatment recommendations, better use of culture-supported de-escalation, and integration of antimicrobial stewardship principles into daily clinical practice are essential to improve the quality, safety, and rationality of antibiotic use in adult LRTI management.

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