IJPSR (2026), Volume 17, Issue 3 (Research Article)

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 03 October 2025; received in revised form, 08 December 2025; accepted, 10 January 2026; published 01 March 2026

EVALUATION OF PRESCRIPTION PATTERNS AND ANTIBIOTIC UTILIZATION IN LRTI PATIENTS: A CROSS-SECTIONAL STUDY

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Keywords:

LRTI, Antibiotic Utilization, Prescription Pattern, Rural Hospital, WHO Indicators, Antimicrobial Stewardship

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ABSTRACT: Lower Respiratory Tract Infections (LRTIs) remain a major cause of morbidity and mortality, especially in rural healthcare settings where diagnostic limitations influence antibiotic prescribing behaviour. **Aim:** To evaluate the prescription pattern and antibiotic utilization among patients diagnosed with Lower Respiratory Tract Infections (LRTIs) in a rural hospital setting and to assess the rationality of antibiotic use based on WHO and ICMR guidelines. **Objective:** To identify the types of antibiotics prescribed, determine the proportion of broad- and narrow-spectrum agents, and assess adherence to rational prescribing practices in a government-managed rural hospital. **Methodology:** A prospective observational study was conducted at a rural hospital in Latur, Maharashtra, from August 2024 to March 2025. Fifty patients clinically diagnosed with LRTIs were enrolled. Data were collected using a structured form and analysed using WHO prescribing indicators to evaluate antibiotic utilization patterns and supporting medications. **Results:** Out of 50 prescriptions analysed, 81% contained broad-spectrum antibiotics, while only 19% contained narrow-spectrum agents. Cephalosporins and β-lactam/β-lactamase inhibitor combinations were most frequently used. Supportive drugs such as pantoprazole, paracetamol, and ondansetron were prescribed in all cases. **Conclusion:** The study revealed predominant empirical use of broad-spectrum antibiotics due to limited diagnostic facilities. Implementation of antimicrobial stewardship programs, periodic prescription audits, and promotion of narrow-spectrum therapy are essential to ensure rational antibiotic use and prevent antimicrobial resistance.

INTRODUCTION: Lower respiratory tract infections (LRTIs), including pneumonia, bronchitis, and acute exacerbations of chronic respiratory diseases, remain a major public health concern worldwide. They continue to be one of the primary causes of morbidity and mortality, particularly in developing and low-resource settings where infectious disease control remains challenging [1, 3, 6].

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.17(3).977-83

This article can be accessed online on www.ijpsr.com

DOI link: https://doi.org/10.13040/IJPSR.0975-8232.17(3).977-83

According to recent global health surveillance, LRTIs consistently rank among the top three causes of death, with the highest vulnerability observed in children under five years and the elderly [6]. In India, the burden of LRTIs is exceptionally high, largely attributed to factors such as population overcrowding, inadequate sanitation, limited access to healthcare, and the growing problem of antimicrobial resistance (AMR) [1, 3, 4, 6, 10].

The over-the-counter availability of antibiotics, coupled with insufficient diagnostic facilities and the absence of effective antimicrobial stewardship programs, has intensified inappropriate antibiotic consumption in both community and hospital settings [4, 5, 6, 7]. Antibiotics remain the cornerstone of LRTI management; however, inappropriate

prescribing practices, including empirical therapy without microbiological confirmation, irrational combination therapy, and overuse of broad-spectrum agents, have become a significant contributor to AMR [2, 4, 6, 7, 8]. National and international stewardship guidelines advocate the use of narrow-spectrum antibiotics once the causative pathogen is identified, as this approach minimizes disruption of normal flora and curbs the emergence of resistant strains [6]. Despite these recommendations, numerous studies in India continue to report a preference for broad-spectrum antibiotics such as cephalosporins, carbapenems, and β-lactam/β-lactamase inhibitor combinations [1, 3, 5, 6, 9,10]. The challenges in rural healthcare settings are further compounded by limited laboratory infrastructure, shortage of trained personnel, and lack of continuous audit systems [5, 6].

Consequently, physicians in rural hospitals often rely on empirical treatment to ensure timely intervention, resulting in frequent prescription of higher-generation antibiotics even in mild or moderate cases of LRTI [2, 6, 9]. Although this practice offers immediate clinical benefits, it also contributes to the long-term risk of resistance and increased treatment costs [6, 10]. Global surveillance initiatives such as the Global Point Prevalence Survey (PPS) have demonstrated the value of systematic antibiotic use monitoring in improving prescribing behaviour and guiding evidence-based interventions [6]. However, such large-scale antibiotic stewardship and prescription surveillance systems remain limited in rural India. Periodic evaluation of prescription trends in these areas can generate essential evidence to support training, policy development, and the implementation of antibiotic stewardship programs at the regional level [5, 6, 10].

Therefore, the present study was designed to assess the prescription pattern of antibiotics among patients with LRTIs admitted to a government-managed rural hospital in Latur, Maharashtra. By documenting the pattern of drug use, identifying the balance between narrow- and broad-spectrum therapy, and comparing it with existing WHO and ICMR recommendations, this study aims to contribute to rational antibiotic use and promote antimicrobial stewardship in rural healthcare practice.

MATERIALS AND METHODS:

Study Design: A prospective, observational study was conducted to evaluate the prescription pattern of antibiotics among patients diagnosed with Lower Respiratory Tract Infections (LRTIs) at a government-managed rural hospital in Latur, Maharashtra, India. The study was carried out in both inpatient and outpatient departments over eight months, from August 2024 to March 2025. This rural healthcare facility provides essential medical services to surrounding villages and primarily caters to patients from low socioeconomic backgrounds, reflecting real-world clinical and prescribing practices in a resource-limited setting.

Study Population: All patients diagnosed with LRTIs and admitted to the hospital during the study period were screened for inclusion. The diagnosis of LRTI was established based on clinical evaluation, radiological findings, and physician assessment, in accordance with standard treatment guidelines. Patients were enrolled after obtaining informed consent, and their prescriptions were prospectively analysed for antibiotic utilization patterns and adherence to rational drug use indicators recommended by the World Health Organization (WHO)

Inclusion Criteria: Patients of all age groups and genders diagnosed with LRTIs and receiving antibiotic therapy were included in the study. Both empirically treated cases and those with confirmed microbiological evidence were considered eligible.

Exclusion Criteria: Patients who were unwilling to provide consent or unable to cooperate during data collection were excluded from the study. Prescriptions of patients with an incomplete medical record, those admitted for less than 24 hours, and pregnant women were not considered. In addition, patients who had already received antibiotic therapy before admission were excluded to minimize uncertainty and ensure accuracy in evaluating prescribing patterns.

Study Setting: The study was conducted in the inpatient and outpatient departments of a government-managed rural hospital located in Latur, Maharashtra. The hospital provides essential primary and secondary healthcare services to the

surrounding rural population and admits patients with a wide range of conditions, including respiratory tract infections. Being a government healthcare facility, it plays a vital role in delivering affordable and accessible medical care to the community.

Data Collection: Data were collected prospectively using a structured patient profile form, adapted from previous Indian and WHO-based prescribing indicator studies. The form captured demographic details (age, gender, weight, comorbidities), clinical diagnosis, and complete drug-related information. Each prescription was carefully reviewed to document:

1. Name, class, dosage, and frequency of each antibiotic.
2. Duration of therapy and route of administration.
3. Concomitant medications such as bronchodilators, corticosteroids, mucolytics, and supportive agents like proton pump inhibitors and antipyretics.

For patients who received multiple antibiotic regimens during hospitalization, changes in therapy were documented throughout the treatment course. Empirical versus targeted use of antibiotics was also recorded, reflecting real-time physician decision-making in rural clinical settings.

Data Management: All collected data were entered into Microsoft Excel (Version 2021**)** for compilation and analysis. Descriptive statistics, including frequencies, percentages, and mean values, were used to assess prescribing trends and drug utilization patterns. The antibiotics were classified into broad-spectrum and narrow-spectrum categories based on ICMR and WHO guidelines (WHO-prescribing indicators such as the average number of drugs per encounter, percentage of antibiotics prescribed, and adherence to essential medicines list were calculated to evaluate rational prescribing practices The results were compared with findings from similar national and international studies to interpret prescribing behaviours in the context of rural healthcare environments.

Ethical Approval: Before data collection, ethical clearance was obtained from the rural hospital in Ausa, Maharashtra. Written informed consent was taken from each participant. All procedures were conducted in accordance with the Declaration of Helsinki (2013 revision) and ICMR National Ethical Guidelines (2019). Patient anonymity and confidentiality were strictly maintained throughout the study period.

RESULTS: A total of 50 patients clinically diagnosed with Lower Respiratory Tract Infections (LRTIs) were enrolled in the study during the period from September 2024 to January 2025. Among these, 28 (56%) were male, and 22 (44%) were female, indicating a nearly equal gender distribution with a slight male predominance **Fig. 1.** Similar gender distribution patterns have been observed in recent hospital-based Indian studies on LRTI, which reported a comparable male-to-female ratio.

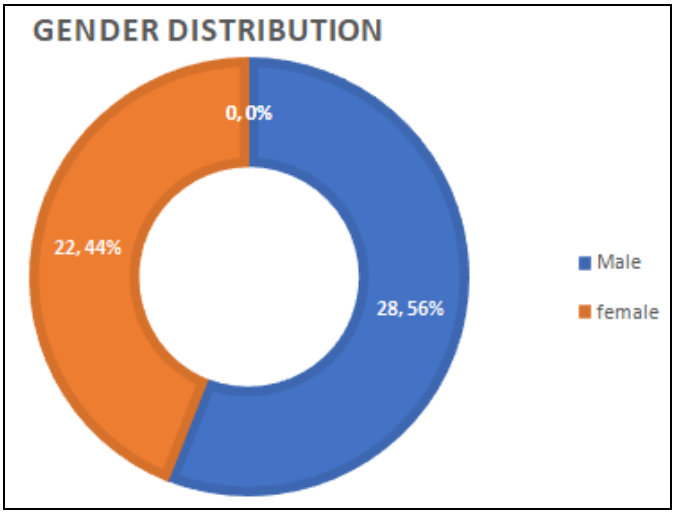

FIG. 1: DISTRIBUTION OF PATIENTS ACCORDING TO GENDER

The study population was categorized into five age groups. The majority of patients belonged to the 18–39 years' age group (n = 15; 30%), followed by those aged ≥60 years (n = 14; 28%). Patients aged 40–59 years constituted 10 (20%), while the 6–17 years' group included 8 (12%) participants. The youngest group (≤5 years) represented 4 (8%) of the total sample **Fig. 2.**

These findings suggest that LRTIs were more common among adults and elderly individuals, aligning with national data showing a higher burden of respiratory infections in middle-aged and older populations due to comorbidities and decreased immunity.

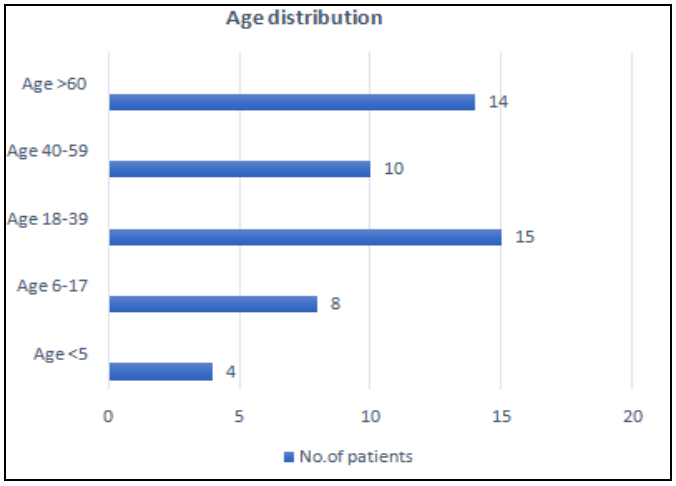

FIG. 2: DISTRIBUTION ACCORDING TO AGE OF PATIENTS

In total, 60 antibiotic prescriptions were analysed. Of these, 50 prescriptions (83%) contained broad-spectrum antibiotics, whereas 10 prescriptions (17%) contained narrow-spectrum antibiotics **Fig. 3.** The predominance of broad-spectrum antibiotic use is consistent with multicentre Indian and global studies, where cephalosporins, carbapenems, and β-lactam/β-lactamase inhibitor combinations were most frequently prescribed for LRTIs. Broad-spectrum antibiotics were commonly chosen for empirical therapy to ensure prompt clinical coverage, particularly in the absence of microbiological confirmation. This approach is often preferred in rural healthcare settings where diagnostic limitations restrict pathogen identification [5, 6, 18]. However, narrow-spectrum antibiotics were prescribed only when the specific pathogen was identified or when patients showed improvement with targeted therapy. Recent studies have emphasized the need to increase the use of narrow-spectrum agents to promote antimicrobial stewardship and minimize resistance development

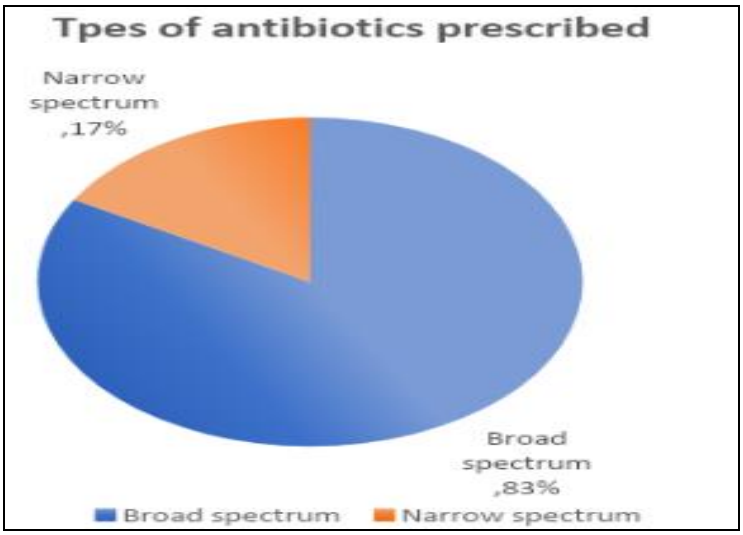

FIG. 3: TYPES OF ANTIBIOTICS USED IN PRESCRIPTION BASED ON THE SPECTRUM OF ACTIVITY

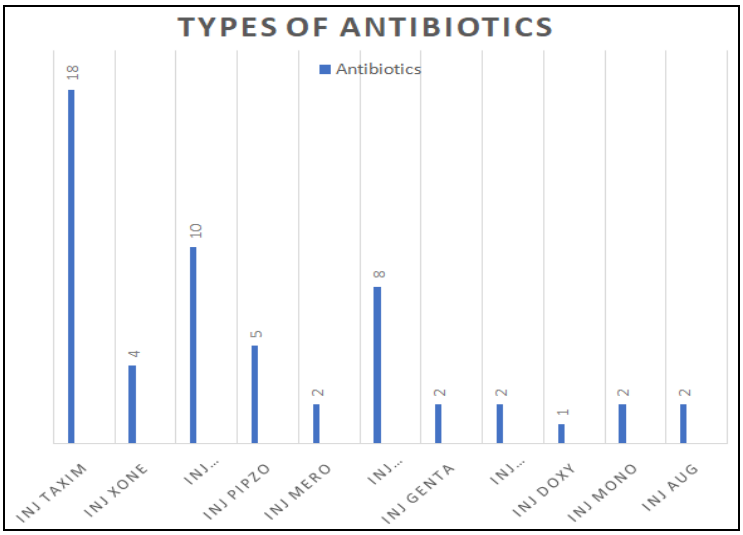

FIG. 4: DIFFERENT TYPES OF ANTIBIOTICS USED IN PATIENTS' PRESCRIPTIONS

In addition to antibiotic therapy, all 50 patients (100%) received Pantoprazole as a proton pump inhibitor (PPI) for gastric protection and Ondansetron as an antiemetic agent to manage nausea and vomiting. Paracetamol was administered to all patients as an antipyretic to manage fever, while Cetirizine was prescribed as an antihistamine to alleviate allergic symptoms such as cough and cold.

Furthermore, Aspirin and Clopidogrel (Clopitab) were prescribed selectively to patients with coexisting cardiovascular comorbidities as antiplatelet agents, aiming to prevent thrombotic complications during hospitalization. This practice aligns with prior observational studies that reported frequent co-prescription of supportive drugs in respiratory infections to ensure symptomatic relief and prevention of secondary complications.

The findings from this study indicate a predominant reliance on broad-spectrum antibiotic therapy, accompanied by widespread use of supportive medications. These results reflect prescribing patterns observed in similar rural hospital-based studies in India, where empirical treatment is frequently adopted due to limited access to diagnostic facilities and culture-based testing. While the empirical use of broad-spectrum antibiotics provides immediate therapeutic benefits, such practices underscore the need for stricter adherence to WHO and ICMR guidelines to ensure rational antibiotic utilization and to mitigate antimicrobial resistance.

DISCUSSION: This study provides valuable insights into the prescription pattern of antibiotics among patients with Lower Respiratory Tract Infections (LRTIs) treated at a government-managed rural hospital in Latur, Maharashtra. The findings reflect the real-world prescribing behaviour in a rural healthcare setting and highlight the need for evidence-based antibiotic stewardship. The predominance of broad-spectrum antibiotic use observed in this study is consistent with recent multicentre surveys and hospital-based studies across India, which reported similar trends in both tertiary and secondary care facilities. Physicians often rely on broad-spectrum agents such as third-generation cephalosporins, carbapenems, and β-lactam/β-lactamase inhibitor combinations as first-line empirical therapy due to diagnostic limitations and the need for rapid clinical response. In rural hospitals, where laboratory and culture facilities are often unavailable, this approach ensures early coverage of likely pathogens and helps prevent disease progression. However, the overuse of broad-spectrum antibiotics contributes to the emergence of antimicrobial resistance (AMR), a growing global and national public health threat.

The relatively low proportion of narrow-spectrum antibiotic use in this study further emphasizes the limited practice of targeted therapy in rural environments. Several Indian studies have suggested that enhancing diagnostic capacity and implementing antimicrobial stewardship programs (ASPs) can significantly increase the proportion of narrow-spectrum prescriptions and improve clinical outcomes. Strengthening these stewardship initiatives would not only promote rational antibiotic use but also align local prescribing practices with ICMR and WHO guidelines.

Another encouraging finding was the consistent use of supportive therapy, including proton pump inhibitors, antiemetics, antipyretics, and antihistamines. This reflects a holistic treatment approach that addresses both infection management and patient comfort, similar to findings from other Indian rural hospital studies. Nonetheless, polypharmacy should be periodically reviewed to ensure that only clinically necessary adjunctive drugs are prescribed. A crucial aspect to be considered in the management of LRTIs, particularly in environments with high pollution and environmental triggers, is the potential role of inhalational corticosteroids (ICS) as part of early and supportive therapy. ICS helps reduce airway inflammation, improve respiratory function, and mitigate symptom severity in patients with inflammatory LRTIs or chronic bronchitis components. Their use has been associated with shorter hospital stays, earlier symptom relief, and prevention of recurrent episodes when initiated judiciously in patients with environmental or allergic triggers. Integrating ICS into treatment protocols, especially for at-risk populations such as smokers, industrial workers, and the elderly, could improve recovery outcomes while reducing the burden on rural healthcare systems.

This aligns with current evidence suggesting that early and localized anti-inflammatory therapy can enhance antibiotic effectiveness and improve patient prognosis. To further optimize antibiotic prescribing, it is essential to introduce hospital-specific antibiotic policies and periodic prescription audits. Continuous medical education programs and stewardship-based training for healthcare professionals can improve adherence to national guidelines and reduce unnecessary empirical therapy. Periodic surveillance using WHO prescribing indicators and participation in national initiatives such as ASPIRE-II would help benchmark antibiotic use and resistance trends across similar healthcare facilities. Despite its strengths, including prospective data collection and real-world evaluation, the study acknowledges several challenges, such as limited diagnostic capacity, small sample size, and absence of microbiological correlation. However, the findings remain significant as they provide baseline evidence for future interventional studies aimed at improving antibiotic stewardship in rural healthcare systems.

Overall, the study underscores the need for judicious antibiotic use, integration of inhalational corticosteroids for inflammatory or environmentally triggered cases, and implementation of antimicrobial stewardship programs. Such strategies will help minimize resistance, improve therapeutic outcomes, and ensure the sustainable use of antibiotics in community and hospital settings.

Limitations: This study has certain limitations. It was conducted in a single rural hospital with a small sample size, which may limit the generalizability of findings. Microbiological confirmation of infections was not available, restricting correlation between antibiotic choice and causative organisms. The study duration of eight months may not reflect seasonal variations in LRTI incidence. Additionally, the study did not assess treatment outcomes, patient adherence, or prior antibiotic use, which could influence prescribing trends. Despite these constraints, the study provides valuable baseline data on antibiotic utilization in a rural healthcare setting and highlights the urgent need to strengthen diagnostic support and antimicrobial stewardship programs.

CONCLUSION: This study demonstrated a clear predominance of broad-spectrum antibiotic use in the management of Lower Respiratory Tract Infections (LRTIs) at a rural government hospital in Maharashtra. Such prescribing patterns reflect the dependence on empirical therapy in settings with limited diagnostic infrastructure. While this approach ensures prompt treatment initiation, it contributes to the growing problem of antimicrobial resistance (AMR). Encouraging the use of narrow-spectrum antibiotics, guided by clinical evidence and culture reports, is crucial to achieving rational and cost-effective therapy in accordance with WHO and ICMR guidelines.

The findings also highlight an emerging clinical need for the judicious use of inhalational corticosteroids (ICS) in specific LRTI patients, particularly those with environmentally triggered or inflammatory airway conditions. Incorporating ICS as part of early and supportive therapy can help reduce airway inflammation, enhance respiratory recovery, and shorten hospital stay, ultimately improving overall patient outcomes.

Moving forward, the implementation of antimicrobial stewardship programs, routine prescription audits, and improved access to diagnostic facilities should be prioritized in rural healthcare institutions. Such measures will strengthen prescriber awareness, optimize antibiotic selection, and promote sustainable practices to curb the progression of AMR. This study provides a valuable foundation for future multicentre research aimed at improving antibiotic utilization and respiratory care in resource-limited settings.

ACKNOWLEDGMENT: The authors express their sincere gratitude to the Rural Hospital, Ausa, Latur, Maharashtra, India, for providing the necessary facilities, clinical access, and continuous cooperation throughout the data collection process. The authors deeply acknowledge the guidance and supervision of Dr. Sunita Patil, whose valuable insights and encouragement were instrumental at every stage of this research. We extend heartfelt thanks to Dr. Murde Pravin for his constructive feedback, constant motivation, and technical support, which significantly contributed to the successful completion of this study.

The authors are grateful to all hospital collaborators, nursing staff, and supporting personnel for their invaluable cooperation in patient data collection and management.

Funding: The authors declare that no specific grant, financial assistance, or external funding was received from any agency, institution, or organization for the conduct of this research work. The study was carried out independently without any financial support.

Authors Contributions: Conceptualization, methodology, investigation, data curation, data collection, visualization, Manuscript writing, and original draft: Kabra Vinay S. Bhadarge, Amit H. Jadhav, Akanksha B. Waghmare, Swapnali R. Data curation, data collection, formal analysis, methodology, and validation: Kabra Vinay S., data analysis, and data interpretations: Kabra Vinay S., Dr. Ashok Giri. Final approval of manuscript: Kabra Vinay, Dr. Ashok GiriBhadarge, Amit H. Jadhav, Akanksha B. Waghmare, Swapnali R.

CONFLICT OF INTERESTS: The authors declare that there are no financial interests, professional affiliations, or personal relationships that could have influenced the design, conduct, or outcomes of this research.

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How to cite this article:
Vinay SK, Ashok BG, Amit HB, Akanksha BJ and Swapnali RW: Evaluation of prescription patterns and antibiotic utilization in LRTI patients: a cross-sectional study. Int J Pharm Sci & Res 2026; 17(3): 977-83. doi: 10.13040/IJPSR.0975-8232.17(3).977-83.