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# ASSESSMENT OF PRESCRIPTION PATTERN AND ANTIBIOTIC USES IN LRTI PATIENTS IN A RURAL HOSPITAL

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## ABSTRACT

**Objective:** Lower respiratory tract infections (LRTIs) are among the leading causes of illness and death worldwide, with the burden being particularly high in rural areas of developing countries. Antibiotics form the backbone of therapy, but their inappropriate use contributes significantly to antimicrobial resistance. The present study was undertaken to evaluate the pattern of antibiotic prescribing in patients with LRTIs admitted to a government-managed rural hospital in Latur, Maharashtra, with the aim of identifying trends in drug utilization and opportunities for promoting rational use. **Methods**: A prospective observational study was conducted over eight months, from August 2024 to March 2025. Fifty inpatients with clinically diagnosed LRTIs were included after obtaining informed consent. Data were collected using a structured patient profile form, which documented demographic details, clinical characteristics, and complete prescription information. The prescribing pattern of antibiotics was analysed with respect to class, spectrum of activity, and associated supportive medications. **Results**: Out of the 50 patients studied, 24 (48%) were female and 26 (52%) were male. The largest proportion of patients fell within the 18–39 years' age group (34%), followed by those aged 60 years and above (26%). A total of 48 broad-spectrum antibiotics (81%) and 11 narrow-spectrum antibiotics (19%) were prescribed, reflecting a predominance of empirical therapy. Pantoprazole was prescribed to all patients as a proton pump inhibitor, and Ondansetron was

also universally used as an antiemetic. Paracetamol was commonly prescribed as an antipyretic, Cetirizine as an antihistamine, and antiplatelet agents such as Aspirin and Clopidogrel were used in patients with cardiovascular comorbidities. **Conclusion**: The findings demonstrate that broad-spectrum antibiotics are extensively prescribed for the treatment of LRTIs in the rural hospital setting, while narrow-spectrum antibiotics remain underutilized. Although the empirical use of broad-spectrum agents ensures prompt management in the absence of diagnostic support, it may accelerate the development of antimicrobial resistance. There is a need to strengthen stewardship initiatives, improve access to diagnostic facilities, and encourage guideline-based, patient-centred prescribing to achieve safer and more rational antibiotic use in rural healthcare.

**KEYWORDS:** Lower respiratory tract infections; Antibiotic utilization; Broad-spectrum antibiotics; Narrow-spectrum antibiotics; Prescription analysis; Rural healthcare; Antimicrobial stewardship.

## INTRODUCTION

Lower respiratory tract infections (LRTIs) such as pneumonia, bronchitis, and acute exacerbations of chronic respiratory diseases remain one of the leading causes of morbidity and mortality worldwide, particularly in low- and middle-income countries. According to the World Health Organization, LRTIs are consistently among the top three causes of death globally, with children under five years and the elderly being the most vulnerable groups.[4,5] In India, the burden of LRTIs is especially high due to factors such as overcrowding, poor sanitation, limited access to healthcare, and rising antimicrobial resistance.[4,6,10,12,13,14,15,19]

Antibiotics are the mainstay of LRTI management; however, inappropriate prescribing practices—including overuse of broad-spectrum antibiotics, empirical therapy without culture guidance, and use in viral infections—contribute significantly to antimicrobial resistance. Narrow-spectrum antibiotics are generally recommended when the causative pathogen is identified, as they minimize disruption of normal flora and slow the development of resistance. Despite this, studies from India and other developing countries show a preference for broad-spectrum agents such as cephalosporins, carbapenems, and penicillin-β-lactamase inhibitor combinations.[5–15]

In rural settings, these issues are further complicated by limited diagnostic facilities, a shortage of trained staff, and a lack of antibiotic stewardship programs.[10,13,15,16,19] Physicians

in such areas often rely on empirical therapy, leading to widespread use of broad-spectrum antibiotics regardless of disease severity. Indian studies have reported frequent prescription of higher-generation antibiotics even in mild cases of LRTI, both in adults and children, which not only raises treatment costs but also accelerates resistance.[5,10,11,12,13,20]

Globally, several surveillance systems in developed nations have shown the value of antibiotic use monitoring in improving prescribing practices.[9,18] Such systems are largely absent in rural India, where continuous evaluation of prescription trends could provide essential data to guide policy, prescriber training, and the introduction of antimicrobial stewardship programs.[10,12,13,19]

Therefore, the present study was undertaken to assess the prescription pattern of antibiotics in patients with LRTIs admitted to a government-managed rural hospital in Latur, Maharashtra. By documenting prescribing practices, evaluating the balance between broad- and narrow-spectrum use, and comparing them with existing guidelines, this study aims to generate evidence that can support rational antibiotic use and reduce the threat of resistance in rural healthcare settings.

## MATERIALS AND METHODS

The present study was conducted to evaluate the prescription pattern in patients diagnosed with Lower Respiratory Tract Infections (LRTIs) attending a rural hospital in Latur, Maharashtra, India. Data were collected from inpatient departments where LRTI cases were diagnosed and treated. This was a prospective, observational study conducted over an 8-month study period from August 2024 to March 2025. Prescriptions of patients with clinically confirmed LRTI were included after obtaining informed consent. A structured patient profile form was used to collect relevant demographic details (age, sex), clinical diagnosis, and prescription-related information. The prescriptions were carefully analysed to record the number and category of drugs prescribed, with a special focus on antibiotics, bronchodilators, corticosteroids, mucolytic, and supportive therapy. The choice of antibiotics was classified into broad-spectrum and narrow-spectrum categories. Prescribing indicators recommended by the World Health Organization (WHO) were used to evaluate rational drug utilization. The data obtained were entered into Microsoft Excel and subjected to descriptive statistical analysis. Results were expressed in terms of frequencies, percentages, and mean values to assess prescribing trends.

**Study Design**

A prospective, observational study was conducted to evaluate the prescription pattern in patients diagnosed with Lower Respiratory Tract Infections (LRTIs) at a rural hospital in Latur, Maharashtra. The study was carried out over a period of eight months, from August 2024 to March 2025. During this period, prescriptions of patients with clinically confirmed LRTIs were reviewed at the time of hospital admission and throughout their course of treatment. Data were collected prospectively using a structured patient profile form, which included demographic details, diagnosis, and prescribed medications. Particular attention was given to the use of antibiotics, classified as broad-spectrum or narrow-spectrum, along with other supportive drugs such as bronchodilators, corticosteroids, and mucolytics. All prescriptions meeting the inclusion criteria were documented and analysed to assess drug utilization patterns and adherence to standard treatment guidelines.

**Inclusion Criteria**

All patients diagnosed with Lower Respiratory Tract Infections (LRTIs) and admitted to the rural hospital during the study period were prospectively evaluated. Patients who received antibiotic therapy, either empirically or based on clinical confirmation of infection, were included in the study. Prescriptions containing complete demographic details, clinical diagnosis, and drug therapy information were considered eligible for further analysis.

**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**

At the time of admission, data were collected prospectively using a structured questionnaire that was adapted from previously published studies. The questionnaire was divided into two sections. The first section captured socio-demographic details of the patients, including age, gender, weight, and associated comorbidities. The second section recorded clinical information, including the type of admission, diagnosis, antibiotics prescribed, and duration of hospital stay. Only patients who provided informed consent and were willing to participate were included. Pharm.D interns carried out data collection under the supervision of clinical preceptors. For each eligible patient, details of antibiotic prescriptions were documented, including whether the therapy was empirical or based on a confirmed diagnosis. Patient interviews were conducted to gather information regarding presenting complaints, the clinical diagnosis made by the physician, and any history of antibiotic use before hospital admission. All data were first entered into a patient profile form and subsequently transcribed into a Microsoft Excel spreadsheet for further analysis. A pre-designed form was used to record comprehensive prescription details, including the name of the antibiotic, class, dosage form, strength, dose, frequency, duration, and number of units prescribed. For patients who were initiated on a new antibiotic regimen during hospitalization, these parameters were recorded throughout the treatment period until completion.

**Data Management**

For each participant, data were recorded on a structured patient profile sheet designed specifically for the study. The collected information was carefully entered into Microsoft Excel to create a digital database. This dataset served as the basis for organizing, managing, and interpreting the findings. The processed data were then utilized to evaluate prescription patterns and generate meaningful conclusions for the study.

**Ethical Approval**

Before the commencement of the study, ethical clearance was obtained from the institutional ethics committee of the government rural hospital in Latur, Maharashtra. Only those patients who voluntarily agreed to participate and provided written informed consent were enrolled. The privacy and confidentiality of all participants were safeguarded throughout the study, and all procedures were performed in compliance with established ethical standards for clinical research.

## RESULTS

A total of 50 patients diagnosed with Lower Respiratory Tract Infections (LRTIs) were enrolled in the study during the period from August 2024 to March 2025. Among these, 26.52% were male and 24.48% were female. The study population thus showed a nearly equal gender distribution, with a slightly higher proportion of male patients.

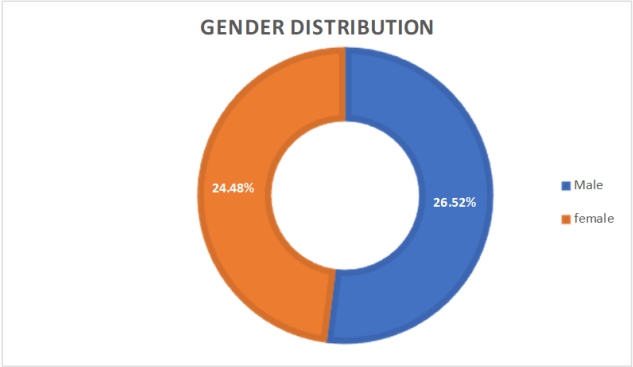


**Fig.1: Distribution of patients according to Gender.**

In the present study, a total of 50 patients diagnosed with Lower Respiratory Tract Infections (LRTIs) were categorized into different age groups. The majority of patients belonged to the 18–39 years' age group (n = 17; 34%), followed by those aged ≥60 years (n = 13; 26%). Patients in the 40–59 years' group accounted for 9 cases (18%), while the 6–17 years' group included 8 patients (16%). Only 3 patients (6%) were ≤5 years of age.

This distribution highlights that LRTIs were more frequently observed among adults in the 18–39-year age group and in the elderly population aged 60 years and above.

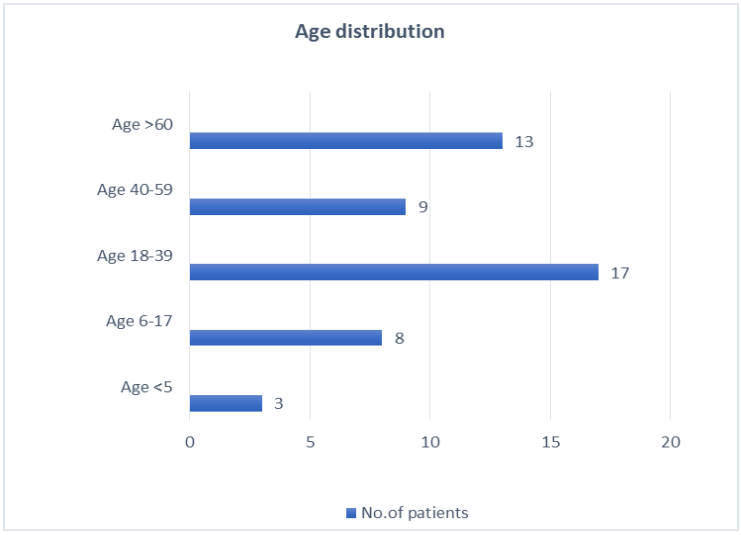


**Fig. 2: Distribution according to age of patients.**

In this study, a total of 50 antibiotic prescriptions were analysed, out of which 48 were broad-spectrum antibiotics and 11 were narrow-spectrum antibiotics. Broad-spectrum antibiotics constituted 81%, while narrow-spectrum antibiotics accounted for 19% of the overall usage.

Narrow-spectrum antibiotics are directed against a limited group of bacteria and are generally preferred when the causative pathogen is identified with certainty. Their selective activity helps reduce the risk of disturbing the patient's normal microbial flora.

In contrast, broad-spectrum antibiotics were prescribed more frequently in the current study. This preference can be explained by their ability to provide rapid therapeutic coverage in cases where the specific pathogen was not identified at the time of diagnosis. Such an approach is particularly significant in patients with lower respiratory tract infections, where timely initiation of treatment is crucial to prevent disease progression and complications. Broad-spectrum antibiotics are therefore often used as the first-line or "empirical therapy" in uncertain or severe conditions, ensuring early clinical benefit until microbiological confirmation is available.

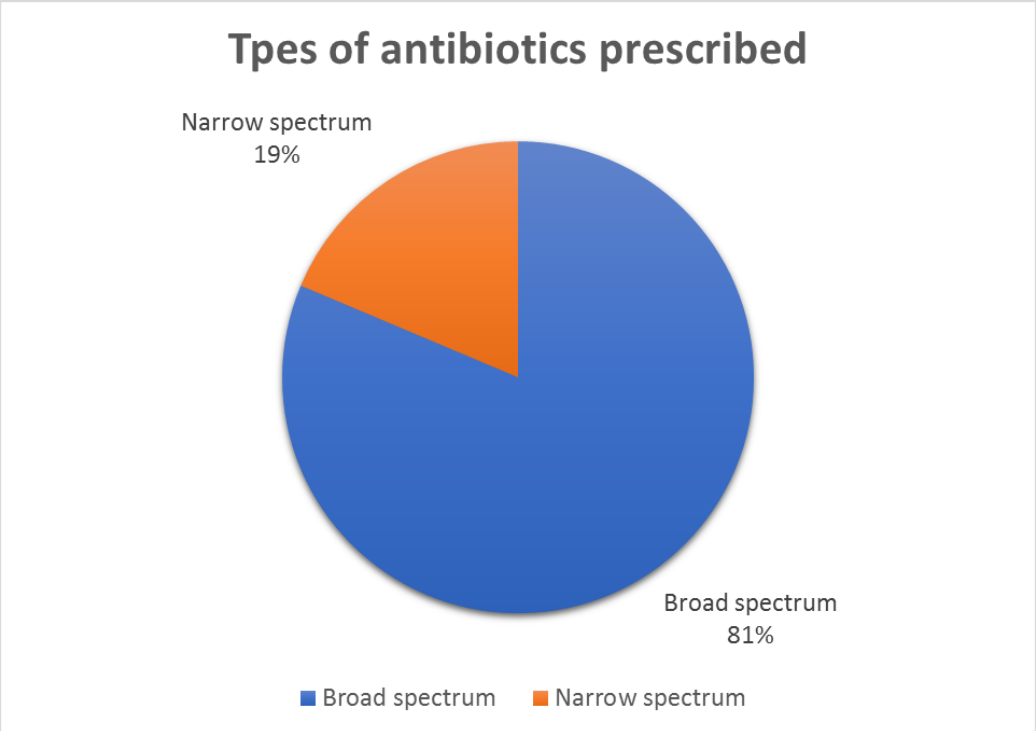


**Fig.3: Types of antibiotics used in prescription based on the spectrum of activity.**

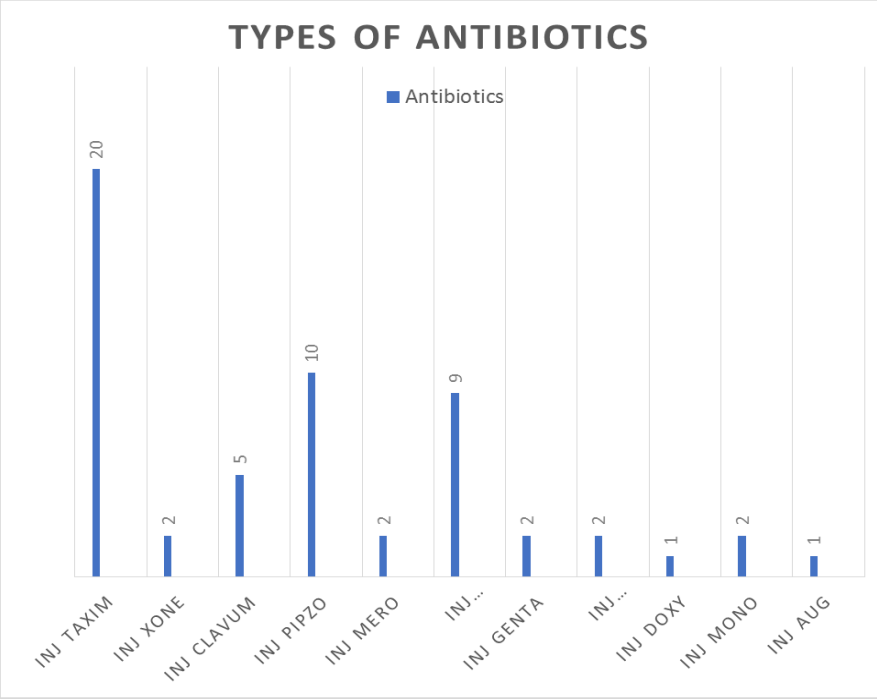


**Fig.4: Different types of antibiotics used in patients' prescriptions**.

In the present study, a total of 50 patients with LRTI were evaluated for concomitant drug usage along with antibiotics. All 50 patients were prescribed Pantoprazole as a proton pump inhibitor (PPI) for gastric protection, and Ondansetron (Emset) was also prescribed in all cases as an antiemetic agent to manage nausea and vomiting.

Additionally, Paracetamol tablets were administered as an antipyretic for the management of fever, while Cetirizine was prescribed as an antihistamine to provide relief from symptoms such as a cold and allergic manifestations. Furthermore, Aspirin and Clopidogrel (Clopitab) were prescribed in selected patients as antiplatelet agents, primarily for those with associated cardiovascular comorbidities, to prevent thrombotic complications during the course of treatment.

## DISCUSSION

This study provides important insights into the prescription pattern of antibiotics in patients with Lower Respiratory Tract Infections (LRTIs) managed at a government-run rural hospital in Latur. The hospital plays a central role in providing affordable and accessible healthcare to the rural population, often serving as the first point of contact for patients. Evaluating prescribing practices in this setting not only reflects physician decision-making but also highlights the hospital's contribution to rational patient care in resource-limited conditions.

In our study, most patients were prescribed broad-spectrum antibiotics, while narrow-spectrum agents were used less frequently. The higher use of broad-spectrum drugs can be explained by the hospital's emphasis on early and effective therapy, which is critical in rural areas where laboratory support and culture facilities are often limited. This approach ensures timely treatment, preventing complications and demonstrating the hospital's commitment to safeguarding patient outcomes. At the same time, excessive reliance on broad-spectrum agents may increase the risk of antimicrobial resistance (AMR), underlining the need to encourage narrow-spectrum antibiotics when the causative organism is confirmed.

Another positive aspect of the hospital's prescribing pattern is the consistent use of supportive therapy. Proton pump inhibitors, antiemetics, and antipyretics were routinely prescribed, reflecting a holistic approach to patient management that addresses both infection and associated symptoms, thereby improving comfort and recovery. However, this also highlights the importance of monitoring polypharmacy to avoid unnecessary medication burden.

To improve further, there is a clear need for access to different antibiotic classes, allowing physicians to choose the most appropriate agent based on patient condition and severity of infection. A personalized treatment approach should be emphasized, taking into account age, comorbidities, immune status, and likely pathogens. Such a patient-centred strategy will not only optimize outcomes but also reduce unnecessary antibiotic use and slow the spread of resistance.

The strength of this study lies in its focus on real-world prescribing behaviour in a government-managed rural hospital, a setting often overlooked in published research. Despite resource constraints, the hospital demonstrates its ability to provide timely, effective, and comprehensive care. With the integration of WHO and ICMR guidelines, regular prescription audits, and better access to diagnostic facilities, the hospital can set an example for rational antibiotic use in similar rural healthcare institutions across India.

In conclusion, the study highlights the predominance of broad-spectrum antibiotic use in LRTI patients, while also recognizing the hospital's significant role in ensuring early and holistic treatment. By adopting guideline-based prescribing, promoting narrow-spectrum antibiotic use when appropriate, and implementing personalized treatment strategies, the

hospital can continue to deliver high-quality care while contributing to the fight against antimicrobial resistance.

## LIMITATIONS

The present study has certain limitations that should be considered while interpreting the results. First, the study was conducted in a single rural hospital with a relatively small sample size, which may limit the generalizability of the findings to other healthcare settings or larger populations. Second, microbiological investigations, such as culture and sensitivity testing, were not routinely available, restricting the ability to directly correlate prescribing patterns with the causative organisms. Third, the study design was limited to a short duration, which may not fully capture seasonal variations in LRTI incidence and prescribing behaviour. Fourth, the evaluation was primarily based on prescription records, and clinical outcomes such as treatment success or failure were not assessed. Finally, patient-related factors such as adherence to prescribed therapy and prior antibiotic exposure in the community were not fully explored.

Despite these limitations, the study provides meaningful insights into antibiotic prescribing practices in a rural healthcare setting and highlights areas for improvement in antimicrobial stewardship.

## CONCLUSION

Broad-spectrum antibiotics were predominantly prescribed in this study for the management of lower respiratory tract infections, whereas narrow-spectrum antibiotics were underutilized. This reflects the common reliance on empirical therapy in rural healthcare settings, where diagnostic resources such as culture and sensitivity testing are often limited. While broad-spectrum agents provide early therapeutic benefits, especially when the causative pathogen is uncertain, their frequent use increases the risk of antimicrobial resistance. Narrow-spectrum agents, although clinically effective and more targeted, were less frequently used, possibly due to prescriber preference, limited availability, or cost-related factors.

Surveillance programs in developed countries have shown that monitoring prescribing patterns can guide rational antibiotic use and encourage stewardship practices. Implementing similar initiatives in rural hospitals across India would help promote appropriate utilization of antibiotics. Aligning treatment choices with established guidelines such as WHO and ICMR recommendations is essential to ensure consistency, improve treatment outcomes, and limit

resistance. The present study revealed that prescribing practices were not fully consistent with standard recommendations, emphasizing the need for better awareness and stricter adherence among prescribers.

Quality use of antibiotics remains one of the most effective strategies to combat the growing threat of antimicrobial resistance. Prescriptions should be based on a clear rationale, with priority given to targeted therapy rather than generalized broad-spectrum use. Personalized treatment approaches that account for patient age, comorbidities, and safety profile should be encouraged. Developing hospital-specific antiprograms will further guide physicians in making evidence-based choices.

Finally, the findings highlight the importance of introducing antimicrobial stewardship programs in rural hospitals. Policymakers and healthcare administrators should prioritize such initiatives to support rational prescribing, optimize clinical outcomes, and reduce the future burden of resistance. The methodology applied in this study also demonstrates that reliable surveillance data can be collected in rural healthcare facilities, which will be valuable for planning future strategies at both the regional and national levels.

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## AUTHORS CONTRIBUTIONS

Conceptualization, methodology, investigation, data curation, data collection, visualization, Manuscript writing, and original draft: Kabra Vinay S.

Data curation, data collection, formal analysis, methodology, and validation: Bhadarge Amit H., Jadhav Akanksha B., Waghmare Swapnali R., data analysis, and data interpretations: Dr. Ashok Giri

Final approval of manuscript: Kabra Vinay, Bhadarge Amit, Jadhav Akanksha, Waghmare Swapnali, Dr. Ashok Giri

## 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.

## REFERENCES

1. GBD 2016 Lower Respiratory Infections Collaborators. Estimates of the global, regional, and national morbidity, mortality, and aetiologies of lower respiratory infections in 195 countries, 1990-2016: a systematic analysis for the Global Burden of Disease Study 2016. Lancet Infect Dis., Nov. 2018; 18(11): 1191-1210. doi: 10.1016/S1473-3099(18)30310-4. Epub 2018 Sep 19. PMID: 30243584; PMCID: PMC6202443. https://pubmed.ncbi.nlm.nih.gov/30243584/
2. Walker CLF, Rudan I, Liu L, Nair H, Theodoratou E, Bhutta ZA, O'Brien KL, Campbell H, Black RE. Global burden of childhood pneumonia and diarrhoea. Lancet, Apr. 20, 2013; 381(9875): 1405-1416. doi: 10.1016/S0140-6736(13)60222-6. Epub 2013 Apr 12. PMID: 23582727; PMCID: PMC7159282. https://pubmed.ncbi.nlm.nih.gov/23582727/
3. World Health Organization (WHO) (2020) Global Health Estimates 2020: Deaths by Cause, Age, Sex, by Country and by Region, 2000-2019. World Health Organization, Geneva. http://who.int/data/gho/data/themes/mortality-and-global-health-estimates/ghe-leading-causes-of-death
4. Waghmode R, Jadhav S, Nema V. The Burden of Respiratory Viruses and Their Prevalence in Different Geographical Regions of India: 1970-2020. Front Microbiol, Aug. 31, 2021; 12: 723850. doi: 10.3389/fmicb.2021.723850. PMID: 34531842; PMCID: PMC8438434. https://pmc.ncbi.nlm.nih.gov/articles/PMC8438434/

5. Choudhury DK, Bezbaruah BK. Antibiotic prescription patterns in paediatric in-patient department, Gauhati Medical College and Hospital, Guwahati. J Appl Sci. 2013 Aug. https://www.researchgate.net/publication/259948733_Choudhury_DK_andBezbaruah_BK_Antibiotic_Prescriptions_Pattern_in_Paediatric_In-Patient_Department_Gauhati_Medical_College_and_Hospital_Guwahati
6. Farooqui, H. H., Selvaraj, S., Mehta, A., & Heymann, D. L. Community-level antibiotic utilization in India and its comparison vis-à-vis European countries: Evidence from pharmaceutical sales data. *PLOS ONE*, 2018; *13*(10): e0204805. https://doi.org/10.1371/journal.pone.0204805
7. Llor C, Bjerrum L. Antimicrobial resistance: risk associated with antibiotic overuse and initiatives to reduce the problem. Ther Adv Drug Saf., Dec. 2014; 5(6): 229-41. doi: 10.1177/2042098614554919. PMID: 25436105; PMCID: PMC4232501. https://pmc.ncbi.nlm.nih.gov/articles/PMC4232501/
8. Shankar RP, Partha P, Shenoy NK, Easow JM, Brahmadathan KN. Prescribing patterns of antibiotics and sensitivity patterns of common microorganisms in the Internal Medicine ward of a teaching hospital in Western Nepal: a prospective study. Ann Clin Microbiol Antimicrob, Jul. 16, 2003; 2: 7. Doi: 10.1186/1476-0711-2-7. PMID: 12904265; PMCID: PMC179888. https://pmc.ncbi.nlm.nih.gov/articles/PMC179888/
9. Goossens H, Ferech M, Vander Stichele R, Elseviers M; ESAC Project Group. Outpatient antibiotic use in Europe and association with resistance: a cross-national database study. Lancet, Feb. 12-18, 2005; 365(9459): 579-87. doi: 10.1016/S0140-6736(05)17907-0. PMID: 15708101. https://pubmed.ncbi.nlm.nih.gov/15708101/
10. Khare S, Purohit M, Sharma M, Tamhankar AJ, Lundborg CS, Diwan V, Pathak A. Antibiotic Prescribing by Informal Healthcare Providers for Common Illnesses: A Repeated Cross-Sectional Study in Rural India. Antibiotics (Basel), Sep. 5, 2019; 8(3): 139. doi: 10.3390/antibiotics8030139. PMID: 31491900; PMCID: PMC6783982. https://pubmed.ncbi.nlm.nih.gov/31491900/
11. Suwitha S, Suriya P, Senthilvelan M, Baburaj K, Elaiyaraja A. A study on the prescribing pattern of antibiotics in lower respiratory tract infection among adults in a tertiary care teaching hospital. The Pharma Innovation Journal [Internet], Jan. 1, 2019; 8(7): 169–74. Available from: https://www.thepharmajournal.com/archives/?year=2019&vol=8&issue=7&ArticleId=3767 https://scispace.com/papers/a-study-on-prescribing-pattern-of-antibiotics-in-lower-53b0907723

12. Singh SK, Sengupta S, Antony R, Bhattacharya S, Mukhopadhyay C, Ramasubramanian V, Sharma A, Sahu S, Nirkhiwale S, Gupta S, Rohit A, Sharma S, Raghavan V, Barman P, Sood S, Mamtora D, Rengaswamy S, Arora A, Goossens H, Versporten A. Variations in antibiotic use across India: multi-centre study through Global Point Prevalence survey. J Hosp Infect, Nov. 2019; 103(3): 280-283. doi: 10.1016/j.jhin.2019.05.014. Epub 2019 Jun 3. PMID: 31170422. https://pubmed.ncbi.nlm.nih.gov/31170422/
13. Kumar R, Indira K, Rizvi A, Rizvi T, Jeyaseelan L. Antibiotic prescribing practices in primary and secondary health care facilities in Uttar Pradesh, India. J Clin Pharm Ther., Dec. 2008; 33(6): 625-34. doi: 10.1111/j.1365-2710.2008.00960.x. PMID: 19138240. https://pubmed.ncbi.nlm.nih.gov/19138240/
14. Kotwani A, Holloway K. Trends in antibiotic use among outpatients in New Delhi, India. BMC Infect Dis., Apr. 20, 2011; 11: 99. Doi: 10.1186/1471-2334-11-99. PMID: 21507212; PMCID: PMC3097160. https://pubmed.ncbi.nlm.nih.gov/21507212/
15. Patel V, Vaidya R, Naik D, Borker P. Irrational drug use in India: a prescription survey from Goa. J Postgrad Med., Jan-Mar. 2005; 51(1): 9-12. PMID: 15793331. https://pubmed.ncbi.nlm.nih.gov/15793331/
16. Khare, Shweta & Purohit, Manju & Sharma, Megha & Tamhankar, Ashok & Stålsby Lundborg, Cecilia & Diwan, Vishal & Pathak, Ashish. (2019). Antibiotic Prescribing by Informal Healthcare Providers for Common Illnesses: A Repeated Cross-Sectional Study in Rural India. Antibiotics, 8: 139. 10.3390/antibiotics8030139. https://www.researchgate.net/publication/335658230_Antibiotic_Prescribing_by_Informal_Healthcare_Providers_for_Common_Illnesses_A_Repeated_Cross-Sectional_Study_in_Rural_India
17. ICMR. Treatment Guidelines for Antimicrobial Use in Common Syndromes. New Delhi: ICMR; 2019.
18. Versporten A, Zarb P, Caniaux I, Gros MF, Drapier N, Miller M, Jarlier V, Nathwani D, Goossens H; Global-PPS network. Antimicrobial consumption and resistance in adult hospital inpatients in 53 countries: results of an internet-based global point prevalence survey. Lancet Glob Health, Jun. 2018; 6(6): e619-e629. doi: 10.1016/S2214-109X(18)30186-4. Epub 2018 Apr 23. Erratum in: Lancet Glob Health, Sep. 2018; 6(9): e968. doi: 10.1016/S2214-109X(18)30347-4. PMID: 29681513. https://pubmed.ncbi.nlm.nih.gov/29681513/
19. Alvarez-Uria G, Zachariah S, Thomas D. High prescription of antimicrobials in a rural district hospital in India. Pharm Pract (Granada), Apr. 2014; 12(2): 384. doi:

10.4321/s1886-36552014000200003. Epub 2014 Mar 15. PMID: 25035714; PMCID: PMC4100948. https://pmc.ncbi.nlm.nih.gov/articles/PMC4100948/

20. Kumar, Rajaseger & Selva, Preetha. Analysis of prescription patterns of antibiotics among patients with respiratory tract infections at a tertiary care hospital. Biomedical & Pharmacology Journal, 2019; 12: 1595-1602. 10.13005/bpj/1790. https://www.researchgate.net/publication/336608870_Analysis_of_prescription_pattern_of_antibiotics_among_patients_with_respiratory_tract_infections_at_a_tertiary_care_hospital