



## Monaldi Archives for Chest Disease

eISSN 2532-5264

<https://www.monaldi-archives.org/>

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Monaldi Arch Chest Dis 2026 [Online ahead of print]

*To cite this Article:*

Bhupathiraju SS, Goudar LM, Srujan Manjunath S, et al. **Prescription trends and antibiotic utilization in pneumonia: an observational study at a tertiary teaching hospital.** *Monaldi Arch Chest Dis* doi: 10.4081/monaldi.2026.3664

*Submitted: 25-07-2025*

*Accepted: 31-03-2026*

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**Prescription trends and antibiotic utilization in pneumonia:  
an observational study at a tertiary teaching hospital**

Sai Sowmya Bhupathiraju, Latha Maregouda Goudar, Srujan Manjunath, Subhojit Paul,  
Viswanatha Swamy Agadi Hiremath, Jayasheela Siddhalingayya Hiremath

Department of Pharmacy Practice, KLE College of Pharmacy, Vidyanagar, Hubballi,  
Karnataka, India

**Correspondence:** Dr. Jayasheela Siddhalingayya Hiremath, Department of Pharmacy Practice,  
KLE College of Pharmacy, Vidyanagar, Hubballi, India.

Tel.: +917259234788. E-mail: [jayashiremath24@gmail.com](mailto:jayashiremath24@gmail.com)

**Contributions:** each author had equal responsibility for the study's conception, literature review's execution, manuscript writing, and revision. The final draft of the paper has been read and authorized by all writers, who have also promised to take responsibility for the entire project.

**Conflict of interest:** the authors declare no competing interests.

**Ethics approval and consent to participate:** the KLE College of Pharmacy Ethical Committee gave its approval to the study. IEC Reference Number: KLECOPH/IEC/2024-25/04.

**Informed consent:** all patients provided written informed consent.

**Patient consent for publication:** the study's purpose was conveyed to the patients and their families. All of the patients provided written informed consent ensuring that their personal details would remain confidential.

**Availability of data and materials:** data and materials are available from the corresponding author upon request.

**Acknowledgments:** the authors express their gratitude to the KLE Academy of Higher Education and Research, Belagavi. They would also want to thank patients, physicians, and hospital personnel of Vivekananda Hospital for their invaluable contribution to the study.

## **Abstract**

Pneumonia is a significant cause of morbidity and mortality, particularly among 5-year-olds, the elderly population, and those with comorbid conditions. As antibiotics are the most commonly used drugs, they need to be selected rationally to improve the therapeutic outcomes as well as to limit the emergence of antimicrobial resistance (AMR). This prospective observational study was carried out at Vivekananda Hospital, Hubballi, Karnataka, India, from October 2024 to March 2025. The data, such as demographics, laboratory values, patterns of prescription, and utilization trends from 200 study subjects, were collected, analyzed, and statistically tested using descriptive analysis. The World Health Organization core drug prescribing indicators revealed an average of 9775 drugs per prescription, of which antibiotics constitute 28.51%, with all prescriptions containing at least one antibiotic. Also, there is a high prevalence of polypharmacy, with the majority of prescriptions containing two or more antibiotics. The most commonly prescribed antibiotic was azithromycin, followed by ceftriaxone and piperacillin + tazobactam and the highest defined daily dose (DDD)/1000/days was observed in azithromycin (9.85), indicating potential overuse, whereas linezolid and cefixime had a prescriber daily dose value equal to DDD. The study emphasizes the need for improvement in generic prescribing, including the use of culture sensitivity tests for selection of appropriate antibiotics and implementation of an Antimicrobial Stewardship Program to optimize the antibiotic use and minimize the development of AMR.

**Key words:** pneumonia, prescribing indicators, drug utilization evaluation, antimicrobial resistance, antibiotics.

## **Introduction**

Pneumonia is an inflammation of lung parenchymal tissue associated with consolidation induced by infection that causes purulent exudate to eliminate the alveolar air gap [1,2]. Regardless of innovations in science and medicine, pneumonia remains a leading cause of death globally. It is a complex condition caused by various species, including bacteria, viruses, and fungus. Pneumonia presents with a wide range of symptoms and complications from mild to severe, depending on the causative organisms, the patient's health status, age, gender, and their medical condition. In the year 2021, Lower Respiratory Tract Infections (LRTIs) including pneumonia, caused 2.18 million deaths primarily affecting children among 5 year and those over 70 are more prone to get infection [3].

Infections contribute significant obstacles to treatment that may lead to poor prognosis. Appropriate infection management is critical to alleviating morbidity and mortality. Antibiotics are key in controlling disease condition because they conflict with infections by providing mutual and reciprocal effects [4,5]. Empiric therapy for infections is referred to as 'best guess' therapy because no information regarding the underlying organism or its possible antibiotic susceptibility is offered due to microbiological test results are often unavailable for 48-72 hours. When the bacteria causing infection is identified, definitive therapy, or focused treatment, can be used to reduce side effects, optimize treatment, limit resistance and reduce costs [6]. Response to treatment can be evaluated using clinical and microbiological markers [7]. Examining antibiotic prescribing patterns is crucial for maintaining high clinical practice standards and quality. Overuse of antibiotics leads to undesirable outcomes such as increased morbidity and mortality, drug toxicity, prolonged hospitalization, cost inflation, resistant bacteria, and associated infections [5]. This evaluation aims to minimize irrational antibiotic use and promote cautious prescribing practices [4].

Prescription Pattern Monitoring Studies (PPMS) examine drug utilization, including prescribing, dispensing, and administering, in order to encourage responsible drug use and avoid abuse or misuse of monitored medications. It seeks to promote responsible drug use among individuals [8]. Drug Utilization Evaluation (DUE) is a crucial tool for clinical use of pharmaceuticals in the population and their influence on the healthcare system it is typically measured by PDD and DDD [9,10]. DDD is defined as the assumed average daily maintenance dose for drug used for its primary indications in adults and PDD is defined as the average amount of drug prescribed according to physician in an appropriate number of prescriptions [11]. DUE program will continue to offer interventions to improve patient outcomes. It can help detect existing and potential drug problems, reduce the spread of drug-resistant organisms, and manage treatment costs. DUE particularly aids in the reduction of AMR and the likelihood of harmful effects. Bacteria have a high burden of Multidrug Resistance

(MDR), which has been identified as a significant issue worldwide [12,13]. There are various approaches for determining irrational use. Data on drug consumption can identify costly drugs with low efficacy and anatomical issues. The Anatomical Therapeutic Classification system (ATC)/ DDD is used to determine drug use among patients and it classifies medications based on their anatomical, therapeutic, and pharmacological features, whereas the DDD denotes the estimated daily maintenance dose for a drug's principal indication in human. Each ATC code and Route of Administration (ROA) is allocated a single DDD, allowing for precise monitoring of drug consumption independent of factors such as price, package size, and strength. This uniform technique makes it easier to evaluate drug usage patterns and compare them across different population groups. Using the ATC/DDD system, researchers can get insights into shifting medication use patterns and make informed decisions about antibiotic prescribing practices to tackle the rising risk of AMR [11,13]. The purpose of the study is to assess the DUE and Prescription Pattern Analysis (PPA) among pneumonia patients by WHO core drug prescribing indicators, ATC classification, calculation of PDD and DDD values as well as comparison of PDD and DDD.

Formula

$$\text{DDD}/1000 \text{ inhabitants}/\text{day} = [\text{Total amount of drug used (mg)}/\text{DDD (mg)}] \times [1000/\text{Population size} \times \text{number of days}]$$

## **Materials and Methods**

### ***Study design***

A Prospective observational study was conducted from October 2024 to March 2025. The sample size was determined using a pilot study; following these 200 patients were enrolled in the research admission to Vivekananda Hospital, Hubballi, Karnataka, India.

### ***Ethical considerations***

The intent of research was explained to the patients, and their families were educated about the study. All participants were signed to informed consent form. The study was approved by the Ethical Committee of the KLE College of Pharmacy (IEC Reference number: KLECOPH/IEC/2024-2025/04).

### ***Study population***

Inclusion criteria: Patients above the age group of 18 years, admitted to Inpatient General Medicine with Pneumonia, with or without Co-morbid condition and history of Pneumonia.

Exclusion criteria: Case sheets with incomplete data and Discharge Against Medical Advice (DAMA) cases, Patients who were not willing to participate in the study, Subjects who are

attending the Outpatient Department (OPD), Vulnerable Groups- Breast feeding, Lactating women and Pediatrics are excluded, and Prescriptions not having any antibiotics prescribed. The results were analyzed by MS Excel 2021.

## **Results**

### ***Characteristics of the study subjects***

A total of 200 study patients diagnosed with pneumonia were enrolled in the study among them 91 (45.5%) were male and 109 (54.5%) were female indicating that females were more affected. Largest proportion of the patients 71 (35.5%) was aged from 63-77 years, followed by 66 (33%) from 48-62 years, 27 (13.5%) from age group of 33-47 while age groups such as 78-92 years and 18-32 years each constitute 18 (9%) of the study population demonstrating that older age groups were affected predominantly. More than half of the study population 111 (55.5%) belong to rural category whereas 89 (44.5%) were from urban category suggesting rural population were more affected with pneumonia. A considerable portion 175 (87.5%) had existing comorbidities, with only 25 (12.5%) reporting no associated comorbid condition. Social history illustrated that 148 (74%) patients had no smoking or alcohol related habits whereas 15 (7.5%) engaged in both smoking and alcohol use with 26 (13%) had a history of alcohol consumption and 11 (5.5%) were smokers. Tobacco history revealed that 52 (26%) had a history of tobacco use while 148 (74%) had no history of tobacco chewing reflecting a notable number of patients were exposed to a known risk factor. Significant proportion of the patients 111 (55.5%) were hospitalized for 4-6 days, followed by 43 (21.5%) for 7-9 days, with 26 (13%) and 14 (7%) hospitalized for 1-3 days and 10-12 days respectively while only 3 (1.5%) were hospitalized for 13-15 days and 16-19 days in each (Table 1).

### ***Prescribing pattern in study population***

#### *WHO core drug prescribing indicators*

By using WHO core drug prescribing indicators, we identified average number of drugs per prescription 9.775 with 38.85% drugs prescribed by generic name and every prescription contain at least one antibiotic. Among 1955 drugs prescribed 28.51% of the drugs were antibiotics. Injections were prescribed in 61.78% of encounters while the total number of Fixed Dose Combination (FDC) drugs accounted for 5.6% and almost 98.69% of the drugs are from the Essential Medicine List (EML) (Table 2).

#### *Subjects' distribution according to number of antibiotics*

Study population was distributed based on number of antibiotics, every prescription contains an antibiotic with 97 (48.5%) of prescriptions containing at least two antibiotics, followed by

49 (24.5%) and 47 (23.5%) prescriptions containing three antibiotics and more than three antibiotics respectively and about only 7 (3.5%) prescriptions contain one antibiotic (Figure 1).

#### *Subjects' distribution based on monotherapy and dual therapy*

Distribution of subjects is done based on monotherapy and dual therapy, comprising a highest proportion 25.8% prescribed with azithromycin followed by ceftriaxone with 21.32%, 18.1% of the prescriptions contain a combination antibiotic Piperacillin + Tazobactam, 10.57% of prescriptions containing meropenem, 6.63% and 6.27% of prescriptions containing metronidazole and levofloxacin respectively. Doxycycline was present in 2.68% of the prescriptions whereas linezolid and vancomycin accounting for 1.97% each followed by ciprofloxacin in 1.25% and clindamycin in 1.07% of prescriptions. Co-trimoxazole and cefoperazone + sulbactam were combination antibiotics accounted for 0.89% and 0.71% respectively. 0.35% of prescriptions containing rifamycin antibiotic and the least utilized drugs were tigecycline and cefixime concerning over 0.17% in each (Figure 2).

#### ***Evaluation of antibiotics based on PDD and DDD***

Utilization of antibiotics was calculated based on PDD as well as DDD and DDD/1000/days. where DDD/1000/days is higher among azithromycin (9.858) followed by ceftriaxone (5.35) and piperacillin + tazobactam (2.586) and is lower in co-trimoxazole (0.042) and cefixime (0.041) (Table 3).

#### ***Comparison of PDD and DDD values***

PDD and DDD values were compared to identify the underutilization and over utilization. PDD is greater than DDD for ceftriaxone, doxycycline, tigecycline, levofloxacin, azithromycin, clindamycin, rifamycin and co-trimoxazole. PDD is less than DDD for cefoperazone + sulbactam, ciprofloxacin, meropenem, piperacillin + tazobactam, vancomycin and metronidazole whereas PDD is equal to DDD for cefixime and linezolid. (Table 4).

#### **Discussion**

Our investigation found that total of 1955 drugs were prescribed, with 9.775 average drugs per prescription. The percentage of antibiotics prescribed was 28.51%, with 38.85% of the medications prescribed under generic names. Additionally, 61.78% of prescriptions consisted of at least one injection. A study by Yadav et al. found a similar average number of medications per prescription. However, in the present study only 32% of drugs are by generic name,

indicating that our study had a higher adherence to generic prescribing. On the other hand, Yadav et al.'s study had a significantly higher percentage of prescriptions involving injections (93.5%) than our findings (61.78%) [6]. In our study the percentage of prescriptions with an antibiotic was 100%, FDC drugs accounted for 5.6% of the total, while 98.69% of the drugs prescribed from EML. Dsouza PD et al. observed a similar finding for prescription with an antibiotic at 100%. However, the proportion of FDC drugs was lower which is 1.95% and only 63.3% of prescribed drugs were from EML which was much lower than our results indicating our study was adhere to the recommended guidelines [14].

Recent analysis found that nearly half of the prescriptions 48.5% contain two antibiotics. In addition, 24.5% of prescriptions include three antibiotics, 23.5% consist of more than three antibiotics, and 3.5% prescriptions contain one antibiotic. The findings are similar with a study by Dsouza PD et al. which reported 4.5% prescriptions include monotherapy and 23% with triple therapy, 33% of prescriptions with dual therapy and the highest proportion 39.5% involving polypharmacy [14]. Our study revealed that more than half of the patients (55.5%) were hospitalized for 4-6 days, followed by 21.5% who stayed for 7-9 days. During hospitalization length of stay in the hospital was 6.12 days with a total number of 1225 days. In comparison, Nada Z et al. found that 59.34% of patients were hospitalized for 1-5 days indicating a slightly shorter stay than observed in our study [15]. Similarly, Rezlie Bellatasie et al observed that 50% patients had hospital admission ranging from 6-10 days with an average duration of 9.54 days [16]. Furthermore, Mareta RA et al. reported an average hospitalization stay of 9 days [17].

In the current study, Antibiotics accounted for 28.54% of anti-infective agents. Most commonly prescribed antibiotic classes were macrolides (25.8%) cephalosporins (22.2%), Beta-Lactams (18.1%) and carbapenem (10.57%) followed by 7.5% with fluoroquinolones, imidazoles (6.6%) and 2.86% with tetracyclines. In contrast Mohammed et.al. found that cephalosporins being most frequently prescribed antibiotic (74.63%), followed by beta-lactams with 21.01%, Macrolides (13.04%), fluoroquinolones (10.14%), tetracyclines (4.34%) and 3.62% was carbapenem. Compared to our findings Mohammed et.al. study showed significantly greater reliance on cephalosporins and low usage of macrolides which is attributed to regional prescribing trends and differences in clinical guidelines [18].

Our findings from the DUE of antibiotics by using PDD and DDD metrics demonstrated that Ceftriaxone, Doxycycline, Tigecycline, Levofloxacin, Azithromycin, Clindamycin, Rifamycin and Trimethoprim + Sulphamethoxazole were over-utilized ( $PDD > DDD$ ), indicating a trend of prescribing higher than recommended doses. In contrast, Cefoperazone + Sulbactam, Ciprofloxacin, Meropenem, Piperacillin + Tazobactam, vancomycin and Metronidazole were under-utilized ( $PDD < DDD$ ) potentially reflecting dose minimization strategies or specific

patient conditions. Only Cefixime and Linezolid showed proper utilization (PDD=DDD), suggesting adherence to WHO-recommended dosing guidelines for these agents. These findings are partially compatible with earlier studies. For instance, the study by Gogineni V et al. reported overuse of Levofloxacin, Ofloxacin, Cefpodoxime proxetil and linezolid, while Amoxicillin and Azithromycin were found to be under-utilized (PDD>DDD) and Moxifloxacin, Ciprofloxacin and Cefixime were appropriately used (PDD=DDD) [10]. Similarly, Harish GN et al. observed over-utilization of Piperacillin, Cefepime, Cefuroxime, Ceftriaxone, Azithromycin, Doxycycline and Metronidazole (PDD>DDD), and under-utilization of Amoxicillin, cefotaxime, Cefadroxil, Cefoperazone, Cefixime, Cefpodoxime, Ciprofloxacin and Gentamicin (PDD<DDD). Interestingly, their study also identified proper use of Moxifloxacin, levofloxacin, Amoxicillin and Cefpodoxime [19].

DDD/1000 inhabitants/ day metric was used to estimate antibiotic consumption in the study population. The highest usage was observed for azithromycin, accounting for 9.858 DDD/1000 inhabitants/day indicating that it was a widespread use as broad-spectrum antibiotic. This was followed by ceftriaxone 5.35 DDD/1000 inhabitants/day, 2.586 DDD/1000 inhabitants/ day for piperacillin + tazobactam, 1.94 DDD/1000 inhabitants/day for meropenem. Cefixime had a lowest usage rate, with 0.0416 DDD/1000 inhabitants/ day. These results are identical with those reported by Harish GN et al. who found that azithromycin was the most often used drug (5.744 DDD/1000 inhabitants/day) followed by ceftriaxone 5.23 DDD/1000 inhabitants/day and 1.9 metronidazole DDD/1000 inhabitants/day with cefadroxil having the lowest consumption 0.0238 DDD/1000 inhabitants/day. The same high utilization of azithromycin and ceftriaxone among both study groups underlines its importance in empirical and broad-spectrum therapy [19].

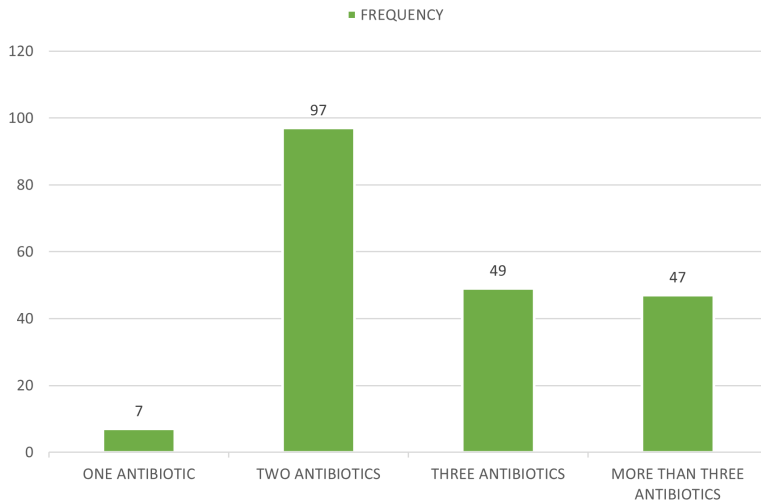
## **Conclusions**

The findings of the study include prescription trends and utilization of antibiotics in pneumonia patients by PDD and DDD metrics. The results clearly shown that only one third of the drugs are prescribed by generic name and about 98.69% were from EML suggesting that use of generic drugs and EML is crucial in prescription writing. Majority of the population received more than one antibiotic and most frequently prescribed antibiotic was azithromycin followed by ceftriaxone, piperacillin + tazobactam and meropenem indicating that our study followed the recommended guidelines for the treatment of pneumonia but can contribute to resistance if not monitored appropriately. Therefore, antibiotics should be selected based on culture testing to optimize the therapeutic outcomes, minimize adverse effects, and limit the development of AMR. This study highlights the need for implementation of ASP and also to monitor the clinical and biological markers thereby improvement in overall patient care.

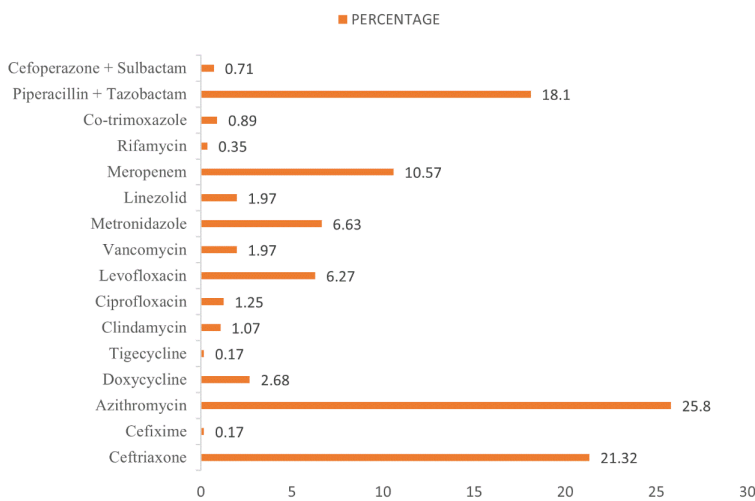
## References

1. Dasaraju PV, Liu C. Infections of the respiratory system. In: Baron S (ed). Medical microbiology. 4<sup>th</sup> edition. Galveston, TX, USA: University of Texas Medical Branch at Galveston; 1996.
2. Pattemore PK, Jennings LC. Epidemiology of respiratory infections. *Pedi Res Med* 2009;435-52.
3. Grainger E. Pneumonia: a neglected global threat. *Lancet Respir Med* 2025;13:289.
4. Nyamagoud SB, Swamy AHV, Varghese LE. Evaluation of antibiotic utilization and prescription patterns in inpatient hospital setting: a retrospective observational study. *BLDE Univ J Health Sci* 2024;9:116-23.
5. Patil RH, Verma A, Swamy AHMV, Nyamagoud SB. Drug utilization evaluation of antibiotics in Indian tertiary care hospital. *Int J Phar Sci Res* 2023;14:2371-84.
6. Yadav M, Bharti M, Nigam Ak, et al. Observational analysis of antimicrobial agent utilization pattern in the community-acquired pneumonia at a tertiary care facility. *J Med Sci Health* 2024;10:175-82.
7. Leekha S, Terrell CL, Edson RS. General principles of antimicrobial therapy. *Mayo Clin Proc* 2011;86:156-67.
8. Kandi ST, Jopi C, Acharya R, B S. To study the prescription pattern of antibiotics in respiratory tract infection in patients in tertiary hospital. *WJPLS* 2021;7:122-31.
9. Desai B, Parmar D, Vaghela J, Vegada B. Drug utilization study in respiratory disorders in in-patients of medical ward in a tertiary teaching care hospital. *Int J Pharm Clin Res* 2023;15:1828-36.
10. Vinutna G, Babji M, Namburi R, Kumari R. Drug utilization study in patients with acute respiratory tract infections at a tertiary care hospital in bhimavaram, india. *Int J Adv Res Dev* 2018;3:35-44.
11. Misra AK, Sharma S, Rai S, et al. Defined daily dose (DDD): an essential metric in the antimicrobial stewardship programmes (AMPSs) in the healthcare sector. *JASPI* 2023;1:27-33.
12. Arain S, Khalawi F, Parakkal SA, et al. Drug utilization evaluation and impact of pharmacist interventions on optimization of piperacillin/tazobactam use: a retrospective analysis and prospective audit. *Antibiotics* 2023;12:1192.
13. Ali H, Zafar F, Alam S, et al. Drug utilization and prescribing pattern of antibiotics in a tertiary care setups; trends and practices. *Pak J Pharm Sci* 2018;31:691-7.
14. Dsouza PD, Chitralu SPP, Patil CM, et al. Prescription patterns and drug utilization in respiratory tract infections: implications for antimicrobial stewardship at a tertiary care teaching hospital. *Monaldi Arch Chest Dis* 2025;95:3196.

15. Zavira N, Jaelani AK, Herawati F, Yulia R. Evaluation on the use of antibiotics for pneumonia patients. *Jurnal Kesehatan Prima* 2021;15:88-98.
16. Noh JW, Koo JH, Heo MH, Lee JY. Massive closures of pediatric clinics and an exodus of pediatricians in Korea during the COVID-19 pandemic: what career paths did closed-down pediatricians choose? *J Korean Med Sci* 2025;40:e71.
17. Andarasi MR, Norachuriya Z, Nabila SM, et al. Assessment of antibiotic use in ICU patients with pneumonia using ATC/DDD as a quantitative analysis method. *Jurnal Farmasi Dan Ilmu Kefarmasian Indonesia* 2017;9:138-45.
18. Hussain MA, Khan S, Jabeen S, Kanth AR. Drug utilization review in patients with pulmonary diseases in a tertiary care hospital. *Int J Phar Analytical Res* 2019;8:162-68.
19. Naik HG, Khanwelkar CC, Kolur A, et al. Drug utilization study on antibiotics use in lower respiratory tract infection. *National J Med Res* 2013;3:324-27.



**Figure 1. Distribution of subjects based on number of antibiotics.**



**Figure 2. Distribution of antibiotics based on monotherapy and dual therapy.**

**Table 1. Characteristics of the study subjects.**

Category		Total number of subjects (%)
Gender	Male	91 (45.5)
	Female	109 (54.5)
Age	18-32	18 (09)
	33-47	27 (13.5)
	48-62	66 (33)
	63-77	71 (35.5)
	78-92	18 (9)
Residency	Rural	111 (55.5)
	Urban	89 (44.5)
Comorbid	Present	175 (87.5)
	Absent	25 (12.5)
Social History	Smoking + Alcohol	15 (7.5)
	Alcohol	26 (13)
	Smoking	11 (5.5)
	No Habits	148 (74)
Tobacco	Yes	52 (26)
	No	148 (74)
Length of Stay	1-3	26 (13)
	4-6	111 (55.5)
	7-9	43 (21.5)
	10-12	14 (7)
	13-15	3 (1.5)
	16-19	3 (1.5)

**Table 2. WHO core drug prescribing indicators.**

WHO Parameters	Number/Percentage
Prescription containing average number of drugs	9.775
Percentage of drugs prescribed by generic name	38.85%
Percentage of prescriptions with antimicrobials	100%
Percentage encounter with an antibiotic prescribed	28.51%
Percentage encounter with an injection prescribed	61.78%
Total number of FDC drugs	110 (5.6)
Percentage of drugs from EML	98.69%

**Table 3. Drug utilization evaluation of antibiotics by PDD and DDD.**

Drug name	ATC code	DDD	PDD	DDD/1000/days
Cephalosporins				
Ceftriaxone	J01DD04	2000mg	2159mg	5.35
Cefixime	J01DD08	400mg	400mg	0.0416
Cefoperazone + Sulbactam	J01DD62	4000mg	3000mg	0.125
Tetracyclines				
Doxycycline	J01AA02	100mg	200mg	1.25
Tigecycline	J01AA12	100mg	3000mg	1.25
Quinolones				
Ciprofloxacin	J01MA02	1000mg	657mg	0.191
Levofloxacin	J01MA12	500mg	514mg	1.5
Carbapenem				
Meropenem	J01DH02	3000mg	2378mg	1.94
Beta-Lactam				
Piperacillin + Tazobactam	J01CR05	14000mg	8600mg	2.586
Macrolides				
Azithromycin	J01FA10	300mg	500mg	9.858
Lincosamides				
Clindamycin	J01FF01	1200mg	1560mg	0.27
Glycopeptides				
Vancomycin	J01XA01	2000mg	1318mg	0.302
Imidazole				
Metronidazole	J01XA01	1500mg	1268mg	1.304
Rifamycin				
Rifamycin	J04AB02	600mg	825mg	0.11
Sulphonamides and Trimethoprim				
Trimethoprim + Sulphomethoxazole	J01EE01	1900mg	1920mg	0.042
Miscellaneous				
Linezolid	J01XX08	1200mg	1200mg	0.458

**Table 4. Comparison of PDD and DDD values.**

PDD>DDD	PDD=DDD	PDD<DDD
Ceftriaxone	Cefixime	Cefoperazone + Sulbactam
Doxycycline	Linezolid	Ciprofloxacin
Tigecycline		Meropenem
Levofloxacin		Piperacillin + Tazobactam
Azithromycin		Vancomycin
Clindamycin		Metronidazole
Rifamycin		
Trimethoprim + Sulphamethoxazole		