

## Drug Utilization Pattern in Respiratory Tract Infections In A Tertiary Care Hospital

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### Abstract

Drug utilization study is defined as distribution, prescription, and use of drugs, with special attention on the medical, social, and economic outcome. It plays a crucial role in the health sector as it deals with the patterns of prescription, quality, determinants, and outcomes of the usage of drugs. The ultimate goal of this study is to provide insight into the efficiency of drug use and the results of such research to help set priorities for the rational allocation of health care budgets. The present study aimed to analyze the drug utilization pattern in patients with respiratory tract infections in a tertiary care hospital. The study was conducted in the In-patient and Out-patient departments of General medicine, Gandhi hospital, Secunderabad. Data of a total of 72 patients (n = 72) with respiratory tract infection cases were collected as per inclusion and exclusions criteria, documents, and their drug utilization patterns were analyzed in our study. The following tables depict the Inference of our study. A among 72 patients (n = 72), 31.3% of the patients were prescribed antibiotics and nutritional supplements (16.8%) followed by Antacids (13.2%), Bronchodilators (9.8%), Corticosteroids (5.7%), Mucolytics (5.2%), Anti Helmentics (5.2%), Diuretics (6.2%), Anti Virals (2.1%), Analgesics (3.4%) and least are Anti Histamine (1%). This study investigated the drug utilization patterns for Respiratory tract infection treatment among all age groups was carried out in a major Tertiary care hospital. Respiratory tract infections (RTIs) are among the most frequently observed and important problems in clinical medicine. We conclude that respiratory tract infection is one of the most frequently diagnosed diseases in the tertiary care hospital. Our study suggests that along with antibiotics other Non-anti-infective class drugs and Nutritional supplements also should be used to treat the condition. Overuse of antibiotics may lead to antibiotic resistance. The most common antibiotics prescribed were Amoxicillin+ Clavulanic acid, Followed by Piperacillin, Ceftriaxone, Azithromycin, Doxycycline Whereas Clarithromycin and metronidazole were prescribed in limited cases. The most common Non-anti-infective drug classes prescribed were Bronchodilators, Corticosteroids, Mucolytics, and Anti Histamines

**Keywords:** Drug utilization pattern, Respiratory diseases, Pediatrics, Infections.

**INTRODUCTION:**

**Drug utilization:** Drug utilization study is defined as distribution, prescription, and use of drugs, with special attention on the medical, social, and economic outcome. It plays a crucial role in the health sector as it deals with the patterns of prescription, quality, determinants, and outcomes of the usage of drugs. The ultimate goal of this study is to provide insight into the efficiency of drug use and the results of such research to help set priorities for the rational allocation of health care budgets [1,2].

**DRUG UTILIZATION PATTERN:**

The study of drug utilization patterns deals with monitoring, evaluating, and suggesting modifications in prescribing patterns to make medical treatment rational. Antibiotics are being prescribed for either prophylactic or therapeutic reasons [3,4].

Drug utilization studies provide a good opportunity to generate data on the aforementioned issues. An increase in the prescription of antibiotics in the clinical practice even for mild cases, selling of antibiotics over the counter without prescription by the pharmacies, poor patient compliance, or noncompliance with medicines further enhanced the development of antibiotic resistance. Irrational prescription of antibiotics might lead to drug resistance [5].

**Respiratory Tract Infection:** A Respiratory Tract Infection (RTI) is an infection anywhere in the respiratory tract (i.e. nose, throat, and lungs) and is the leading cause of morbidity and mortality in many developing countries. RTI is known as any infectious respiratory disease of the upper and lower tract. Upper respiratory tract infection (URTI) is a common infectious disease that includes the common cold, laryngitis, pharyngitis/tonsillitis, sinusitis, and Otitis Media. Lower respiratory tract infections (LRTIs) are the most common infectious disease which includes tracheitis, pneumonia, chronic bronchitis, acute bronchitis, and bronchiolitis [6, 7].

<b>Respiratory Tract Infections</b>	
<b>Upper respiratory tract infections</b>	<b>Lower respiratory tract infections</b>
Common cold	Pneumonia
Laryngitis	Chronic bronchitis
Pharyngitis/Tonsillitis	Acute bronchitis
Sinusitis	Bronchiolitis
Otitis Media	Tracheitis

**Elucidation of various LRTIs:**

**Pneumonia:** It is an inflammation of the lungs parenchyma (alveoli) rather than bronchi or bronchioles of infective origin and characterized by consolidation. It is classified clinically into lobular pneumonia and bronchopneumonia. Pneumonia is the leading infectious cause of mortality among children up to 5 years of age; the most significant bacterial strains associated with pneumonia in children include streptococcus pneumonia and Hemophilus influenzae type B followed by staphylococcus aureus and mycoplasma pneumonia[8].

**Bronchitis:** It is the inflammation of the trachea-bronchial tree which carries air to and from your lungs. It is classified as acute or chronic. Acute bronchitis occurs in individuals of all ages whereas chronic bronchitis primarily affects adults[9].

Acute bronchitis is mostly caused by a viral infection. The most common viruses that cause Acute bronchitis are enterovirus, rhinovirus, influenza A & B, parainfluenza, coronavirus, human Meta-pneumovirus and respiratory syncytial virus. Bacteria are detected in 1% to 10% of cases of acute bronchitis. Atypical bacteria, such as Mycoplasma pneumonia, chlamadophila pneumonia are rare causes of acute bronchitis[10-13]

**Bronchiolitis:** It is an inflammatory condition of minor elements of the trachea-bronchial tree. Bronchiolitis is the disease of infancy. It is the most common acute lower respiratory tract infection of viral origin among infants. It is characterized by fever, cough, crept, etc. The most common viruses which cause Bronchiolitis are respiratory syncytial virus, rhinovirus, adenovirus, coronavirus, human Meta-pneumovirus, influenza, or para-influenzavirus.

**The pattern of drug prescription in RTIs:**

1. Antibiotics- Antibiotics are drugs that are used to treat infections caused by bacteria.
2. Bronchodilators- Bronchodilators are drugs that relax muscles that are tightened around airways.
3. Corticosteroids- Corticosteroids are the category of drugs that lowers inflammation within the body.
4. Antacids- Antacids are used to relieve the symptoms of Gastroesophageal Reflux Disease, heartburn, and indigestion.
5. Antipyretics- An antipyretic reduces fever.
6. Anti Histamines- Antihistamines are mainly used in the treatment of seasonal allergic rhinitis.
7. Antivirals - Antivirals are the class of medications that are used to treat viral infections.
8. Anthelmintics - Anthelmintics are drugs that are used to treat infections caused by parasitic worms.
9. Mucolytics- Mucolytics are therapeutics that make the mucus less sticky and gummy and make it trouble-free to cough up.

Antibiotics are the most prescribed drugs for the treatment of Respiratory tract infections. These drugs should be prescribed wisely i.e. use of the right dose at right time for the right duration of time, Antibiotics are the most frequently prescribed drugs in hospitals [13].

S.No.	Antibiotic Class	Antibiotic	Pediatric (mg/kg/day)	Adult(total dose/day)
1.	Macrolide	Clarithromycin	15	0.5–1 g
		Erythromycin	30–50	1–2 g
2.	Azalide	Azithromycin	10 mg/kg × 1 day, then 5 mg/kg/day × 4 days	500 mg day 1, then 250 mg/day × 4 day
3.	Tetracycline	Tetracycline hydrochloride	25–50	1–2 g
		Oxytetracycline	15–25	0.25–0.3 g
4.	Penicillin	Ampicillin	100–200	2–6 g
		Amoxicillin/amoxicillin-clavulanate	40–90	0.75–1 g
		Piperacillin-tazobactam	200–300	12 g
		Ampicillin-sulbactam	100–200	4–8 g
5.	Extended-Spectrum	Ceftriaxone	50–75	1–2 g
6.	Cephalosporins	Ceftazidime	150	2–6 g
		Cefepime	100–150	2–4 g
7.	Fluoroquinolones	Gatifloxacin	10–20	0.4 g 0.5–
		Levofloxacin	10–15	0.75 g 0.5–
		Ciprofloxacin	20–30	1.5 g
8.	Aminoglycosides	Gentamicin	7.5	3–6 mg/kg
		Tobramycin	7.5	3–6 mg/kg

Along with Antibiotics Non-Anti-Infective, class drugs are used to treat respiratory tract infections. If the infection is due to any allergy trigger Anti Histamines are given. Asthma, COPD, Pneumonia treated using Bronchodilators and Corticosteroids. Mucolytic is used in the treatment of Pneumonia, Chronic bronchitis, Asthmatic bronchitis, Acute tonsillitis, and Laryngitis as well as Sinusitis.

#### Formulation approaches:

##### Based on Physical state:

Solid	Liquid	Gas
Tablet	Syrup	Inhaler
Capsules	Solution	aerosols
Powders	Emulsion	

	Suspension	
	Drops	

**Based on route of administration:**

Oral	Parenteral	Intrarespiratory	Intranasal
Powders	Suspensions	Aerosols	Solutions
Tablets	Emulsions		Sprays
Capsules			Inhalations
Solutions			
Suspensions			
Emulsions			
Syrups			

The above mentioned Antibiotics and Non-Anti-Infective class drugs are given in the form of Powders, Tablets, Capsules, Solutions, Suspensions, Emulsions, Syrups through oral and parenteral routes to treat Respiratory tract infections.

**Nasal drops:** Liquid preparations containing medicaments that are inculcated into the nose with a dropper used to manage nose infections and occlusion of the nose.

**Aerosols:** Aerosol preparations are firm dispersions or suspensions of solid material and liquid droplets in a gaseous medium. The drug is delivered by aerosols is deposited in the airways by the following mechanism: Gravitational Sedimentation, Inertial Impaction, and Diffusion.

There are three commonly used clinical aerosols:

1. Jet or ultrasonic nebulizers
2. Metered-dose Inhaler (MDI)
3. Dry-powder inhaler (DPI)

Nebulizers are the medical equipments that are used to generate aerosolized drug solutions or suspensions for drug delivery to the respiratory tract. The onset of action is immediate therefore they are commonly used for the treatment of hospitalized patients.

Dry powder inhalers are bolus drug delivery devices that contain the solid drug in a dry powder mix (DPI) that is fluidized when the patient inhales.

Metered dose inhalers are used for the treatment of respiratory diseases such as Asthma and COPD.

They can be given in the form of a solution or suspension Particle size of fewer than 5 microns. It can be dispatched to quantify the amount of medicament precisely.

Regular monitoring, assessment, and refinement should be done along with prescription medicine to enhance the therapeutic outcome with changing organism patterns[14].

**Aim:**

- To analyze the drug utilization pattern in patients with respiratory tract infections in a tertiary care hospital.

**OBJECTIVES**

- To identify the types of antibiotics prescribed in Respiratory Tract Infections and their effectiveness.
- To identify other non-anti-infective medication frequently prescribed.
- To analyze the overall utilization pattern of various medicines and compare them with standard guidelines.

**METHODOLOGY**

- Study site:** The study was conducted in the In-patient and Out-patient departments of General medicine, Gandhi hospital, Secunderabad.
- Study duration:** For 6 months.
- Study design:** A prospective observational study.
- Study period:** December 2020 to May 2021.
- Study approval:** The study protocol was submitted to the Institutional ethical committee (IEC), CMR College of Pharmacy, Hyderabad for approval, and the approval for the study was been obtained.

**STUDY PROCEDURE**

- Preparation of structured documentation form for documentation purposes.
- Visit General Medicine and Pediatric wards on regular basis.
- Once the case is identified, analysis and collection of cases and detailed information related to disease were obtained according to Respiratory Infections, inclusion, and exclusion criteria on regular basis.
- Up-date collected cases regularly on a daily basis until the patient is discharged
- Interpretation of data to generate the result.
- Tabulation of various data based on respective parameters
- Evaluation of result to find the final inference.

**SELECTION OF PATIENTS****Inclusion criteria**

- Patients of all ages and both genders were admitted to General Medicine and Paediatric

departments with definite Respiratory Tract Infections as the diagnosis.

### Exclusion criteria

- Patients admitted to the Emergency Department.
- Patients left the hospital in between therapy and incomplete case sheets.
- Pregnant or lactating individuals
- Patients with HIV Infection.

### Results:

Data of a total of 72 patients ( $n = 72$ ) with respiratory tract infection cases were collected as per inclusion and exclusions criteria, documents, and their drug utilization patterns were analyzed in our study. The following tables depict the Inference of our study.

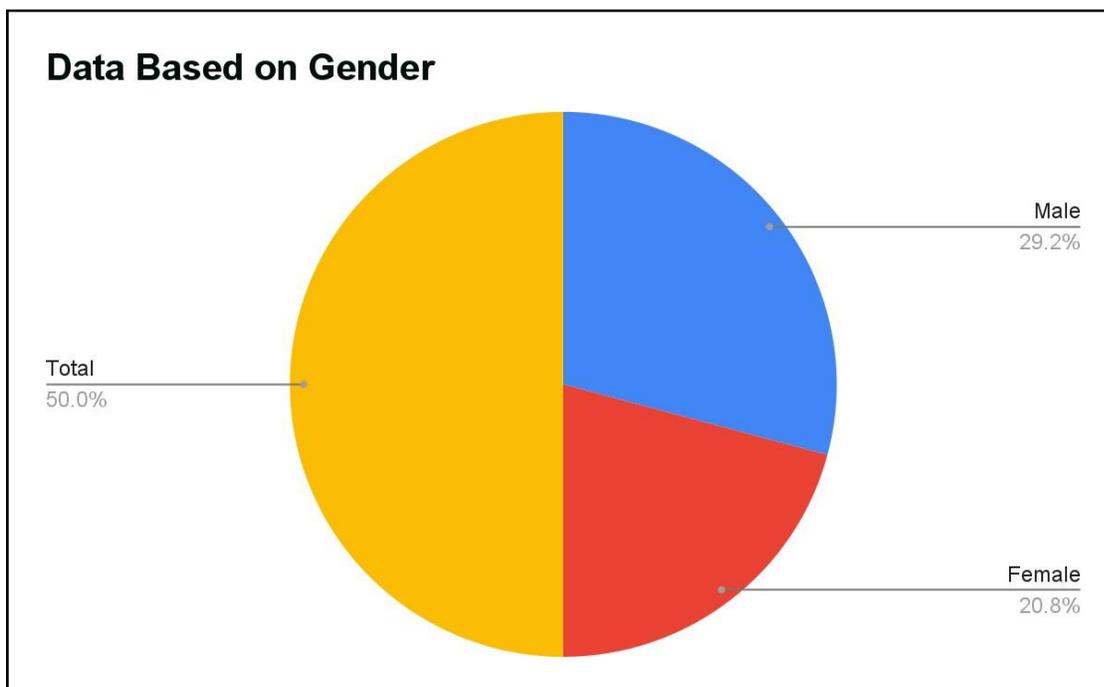


Figure 1. Gender Wise Distribution

### Inference:

In the above table, 72 cases of respiratory tract infection are distributed according to gender. Among the 72 cases, 42 (58.3%) were male patients and 23 (35.38%) were female patients. so; it indicated the predominance of male 60% in our study.

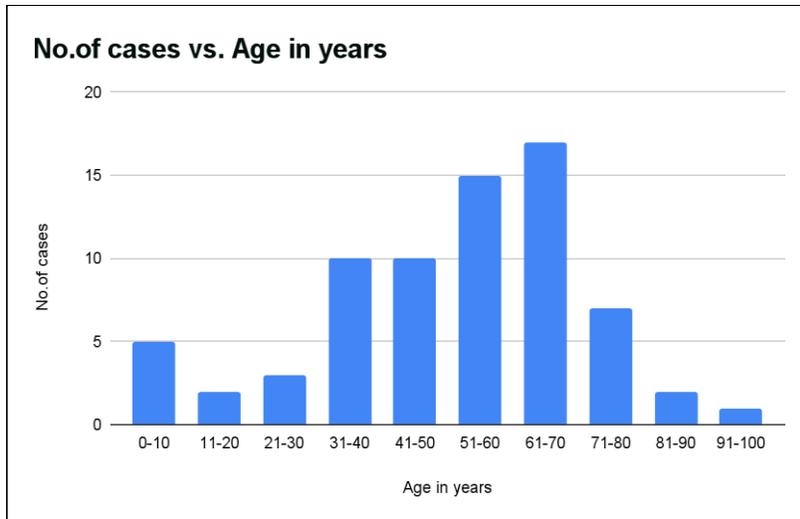


Figure 2. AgeWise Distribution

**Inference:**

The above table indicated the maximum number of cases fall within the age group of 61-70 years (23.6%); followed by 51-60 (20.8%) cases with more than 90 years of age were very few.

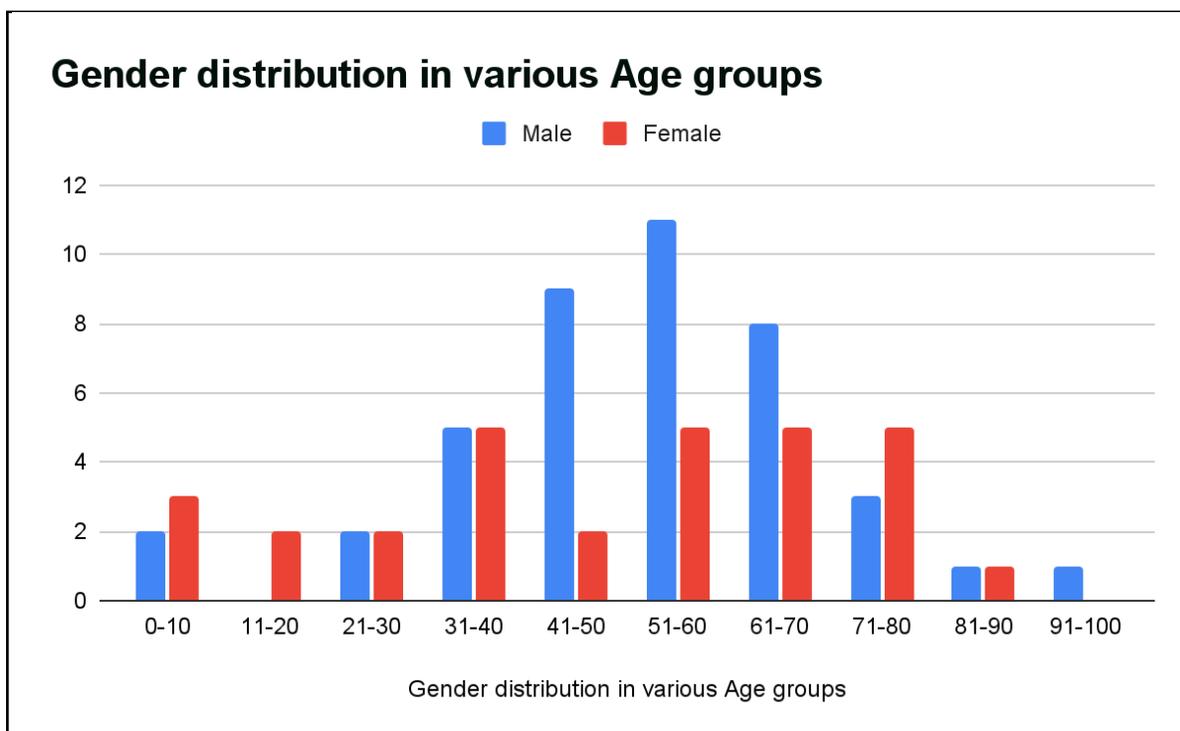


Figure 3. Gender Distribution in Various Age Groups

**Inference:**

The above table indicated the gender distribution in various age groups, (n = 72) out of 72 the predominance of male patients (n = 42) is observed than female patients (n = 30) in our study.

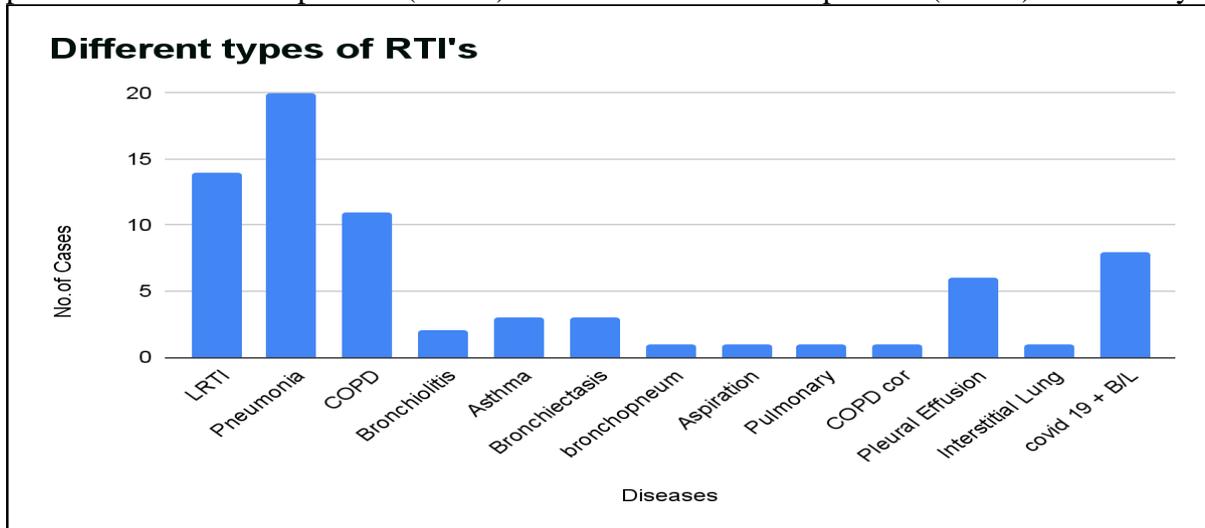


Figure 4. Distribution of cases as per Diagnosis

**Inference:**

The table highlights that out of 72 patients (n = 72), 20 patients were diagnosed with Pneumonia (28%), the maximal diagnosed clinical condition, followed by lower respiratory tract infection (n = 14) 19.4%.

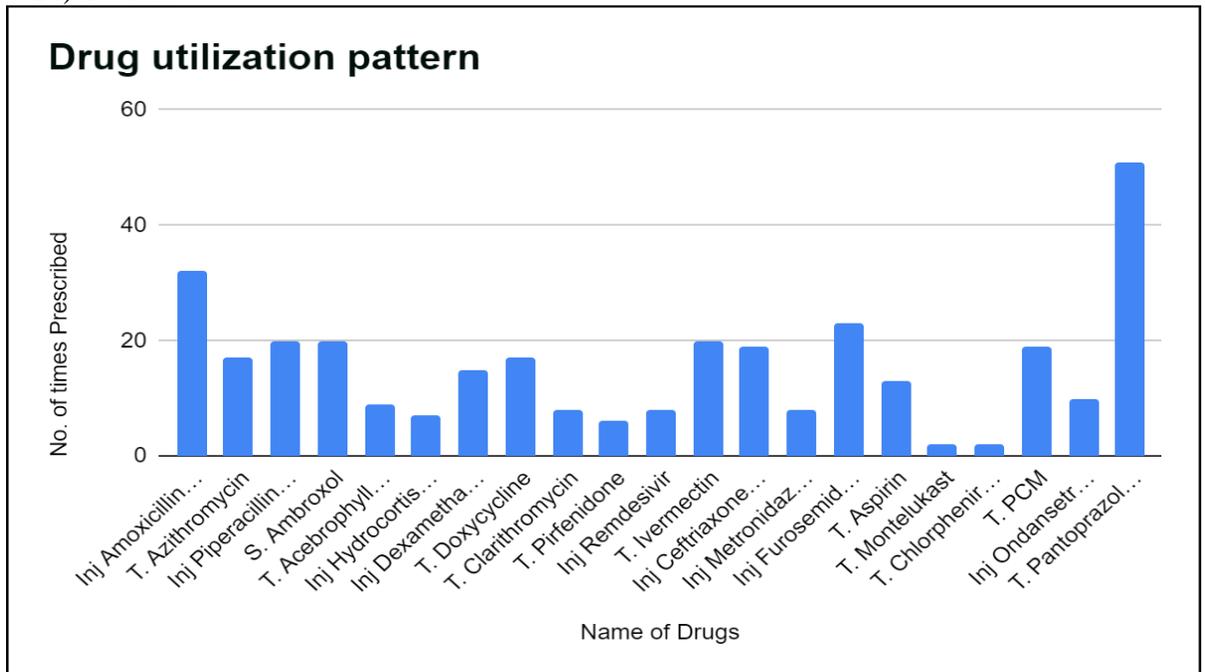


Figure 5. Drug Utilization Pattern

**Inference:**

Among the following 72 patients, Inj Augmentin was frequently given to 32 patients (10.5%), most commonly prescribed medications are InjPiptaz (7%), Tab Ivermectin (7%), Tab Azithromycin (6%), Inj Monocef (6.3%) and Syp Ambroxol (7%), least preferred drugs was Tab Montek (0.7%).

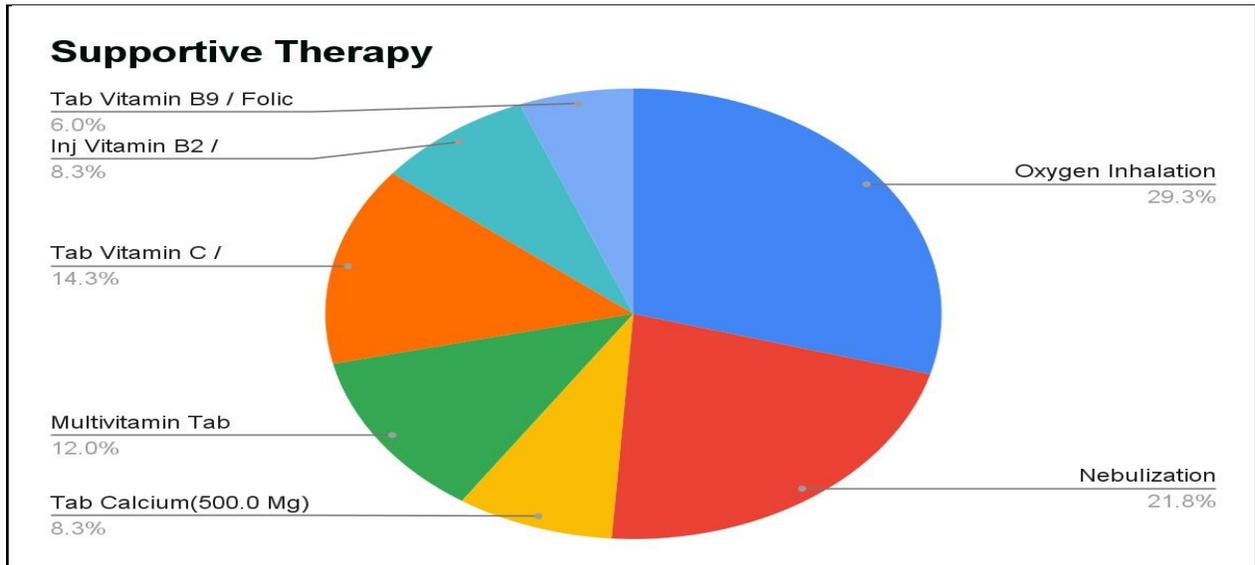


Figure 6: Distribution of supportive therapy

**Inference:**

The supportive/supplementary therapy that was prescribed in total was 133. The most supportingtherapies give were oxygen inhalation which was prescribed in 39 cases (29.3%), Nebulization therapy in 29 patients (21.8%) followed by multivitamin (12%), Ascorbic acid (14.3%), and folicacid (6%) calcium (8.3%) and Thiamine (8.3%).

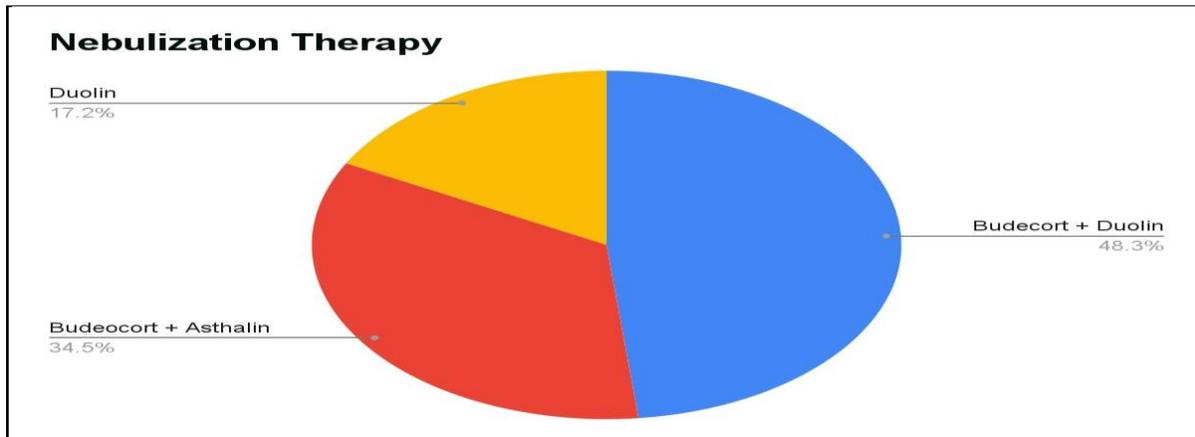


Figure 7. Nebulization Therapy

**Inference:**

The above table indicates the combination of Budecort and Duolin is mostly prescribed.

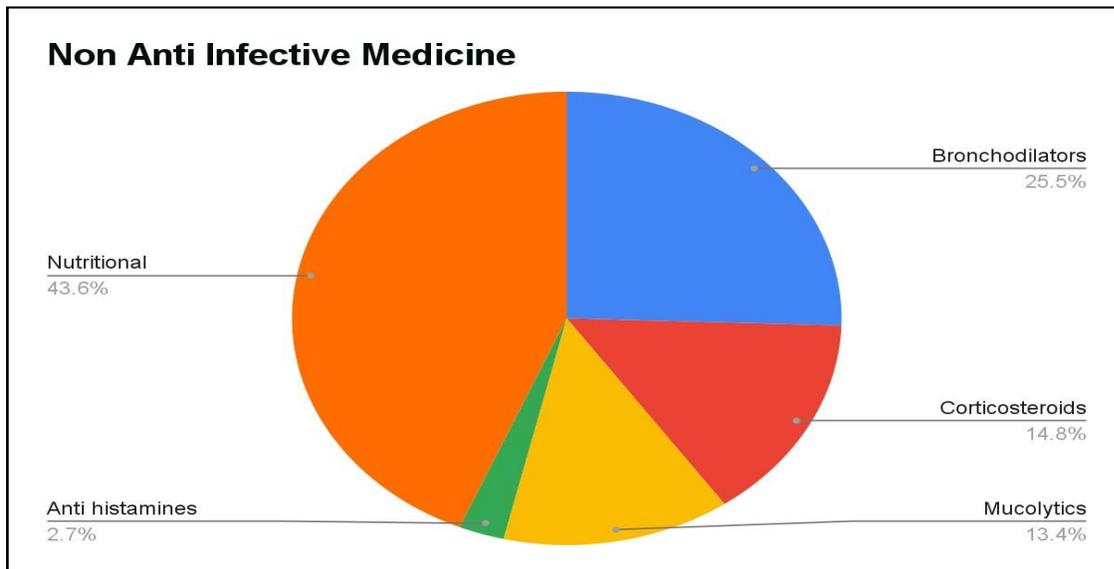


Figure 8. Utilization Pattern of Non-Anti infective medications.

**Inference:** The above table indicates the most commonly prescribed Non-Anti-Infective medications are nutritional supplements in 65 patients (43.6%), Bronchodilators in 38 patients (25.5%) followed by Corticosteroids (14.8%), Mucolytics (13.4%), least prescribed is Anti Histamines (4%).

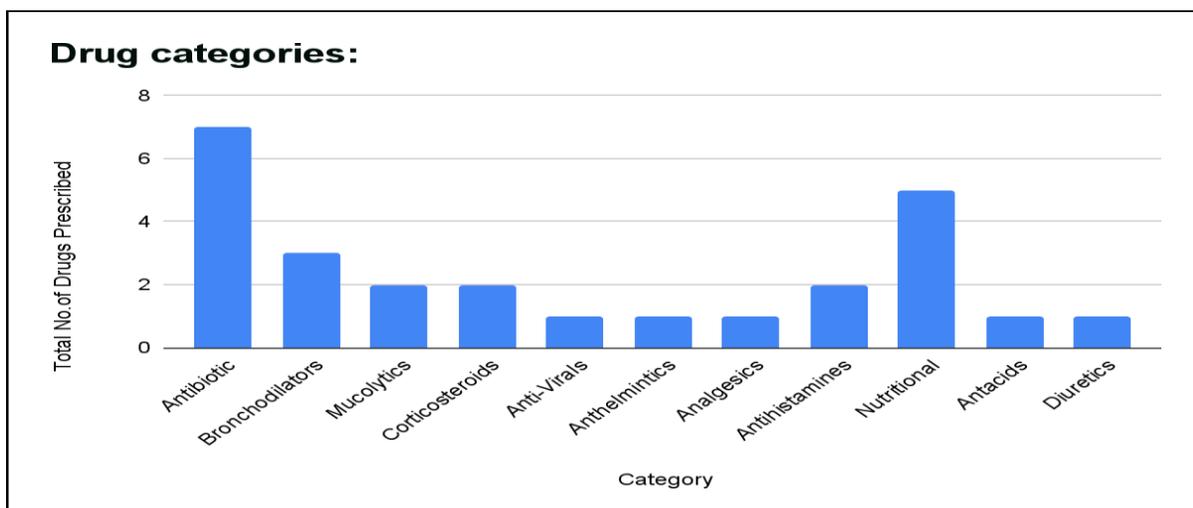


Figure 9. Distribution based on the Drug category

**Inference:** The above table indicates the total number of antibiotics (26.9%) and nutritional supplements (19.2%) are prescribed more than Bronchodilators (11.5%), Mucolytics (7.7%), andCorticosteroids (7.7%).

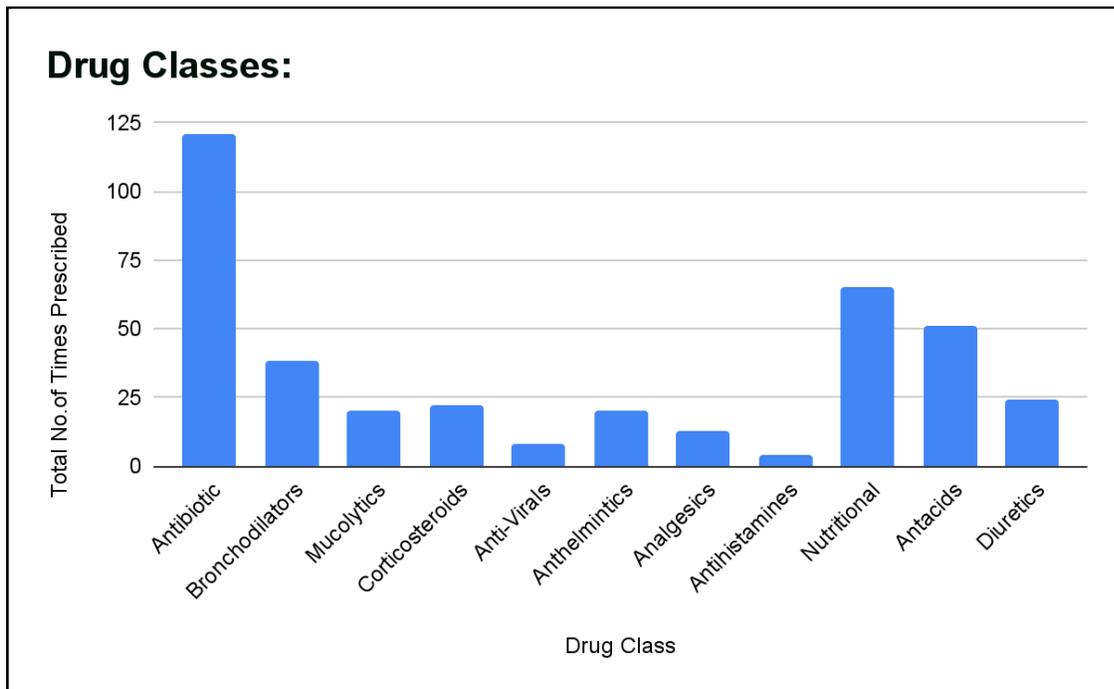


Figure 10. Utilization Pattern of Class of Drugs Prescribed

**Inference:**

The above table indicates among 72 patients ( n = 72 ), 31.3% of the patients were prescribed antibiotics and nutritional supplements (16.8%) followed by Antacids (13.2%), Bronchodilators (9.8%), Corticosteroids (5.7%), Mucolytics (5.2%), Anti Helmentics (5.2%), Diuretics (6.2%), Anti Virals (2.1%), Analgesics (3.4%) and least are Anti Histamine (1%).

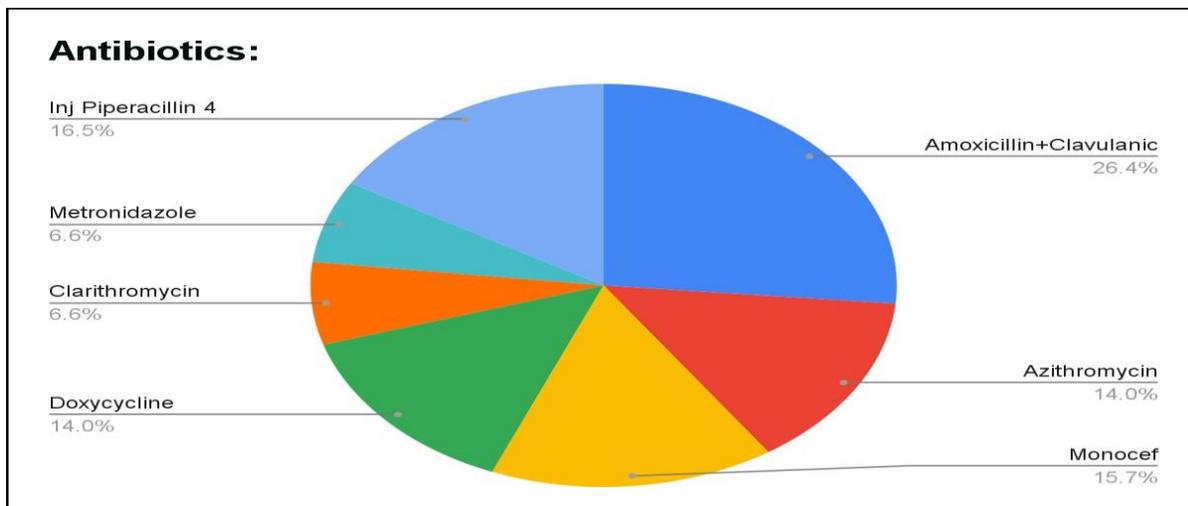


Figure 11. Distribution of Total Antibiotics Prescribed

**Inference:**

The above table shows that Amoxicillin + Clavulanic acid (26.4%) is the drug of choice in RTI followed by Piperacillin (16.5%), Ceftriaxone (15.7%), Azithromycin (14%), Doxycycline (14%) each, whereas Clarithromycin (6.6%) and metronidazole (6.6%) were prescribed in limited cases.

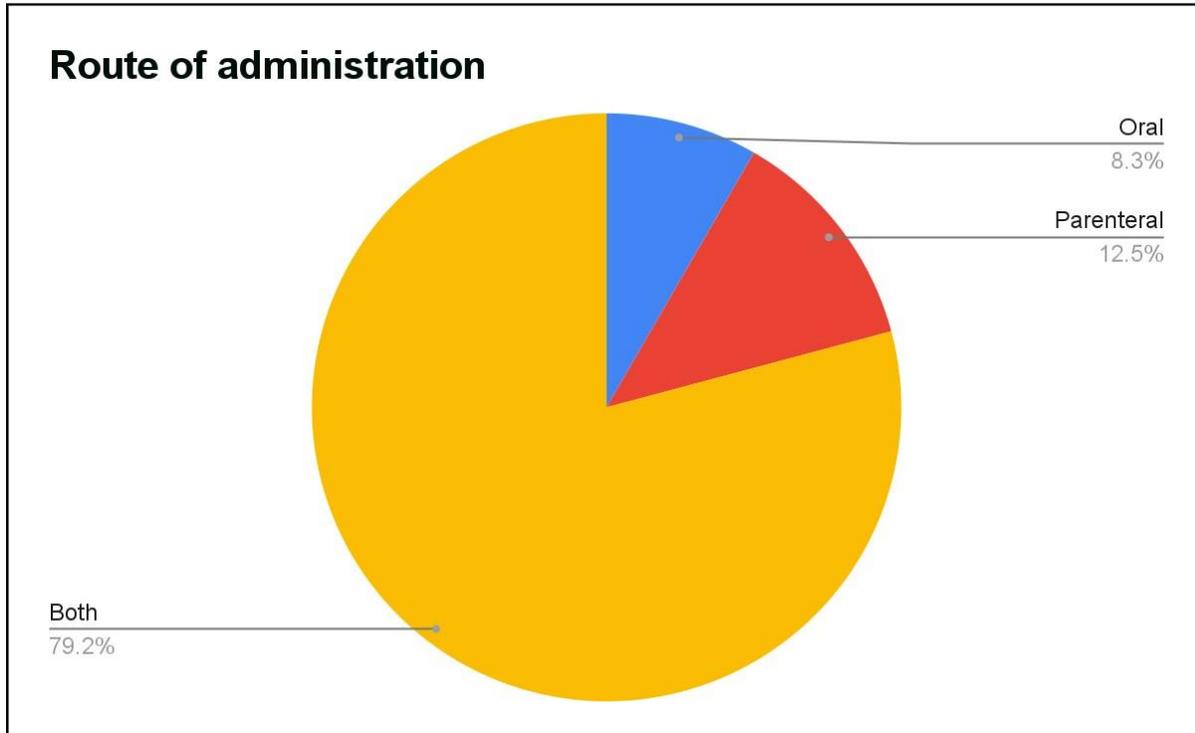


Figure 12. Distribution Based on Route of Administration

**Inference:**

The above table indicates that the majority of the patients were treated by oral and parenteral routes of administration (79.2%), whereas 12.5% of patients by the parenteral route and 8.3% by the oral route.

**DISCUSSION:**

- This study investigated the drug utilization patterns for Respiratory tract infection treatment among all age groups was carried out in a major Tertiary care hospital.
- Respiratory tract infections (RTIs) are among the most frequently observed and important problems in clinical medicine.
- Our study was a prescription-based observational study. A total of 72 cases were analyzed as per inclusion and exclusion criteria. Among the 72 cases of male and female patients, male patients are more affected with Respiratory tract infections. The maximum diagnosed clinical conditions are Pneumonia and Lower respiratory tract infection. The most commonly prescribed medications are antibiotics along with some Non-Anti-Infective drug

classes namely Bronchodilators, Corticosteroids Mucolytics, and Anti Histamines similar findings were also reported by **Bhattacharyya D (2017) [16]**. The supporting therapies given were oxygen inhalation and Nebulization therapy.

➤ The result of this study shows that Amoxicillin + Clavulanic acid is the drug of choice in RTI followed by piperacillins, Ceftriaxone, Azithromycin, Doxycyclines whereas Clarithromycin and metronidazole were prescribed in limited cases.

➤ Our study finding illustrates that the use of antibiotics in Respiratory tract infection treatment was adequate as the recovery rate was high with its use in most of the cases which were also supported by **Das SK (2020) [17]**.

➤ The majority of patients in the current analysis are found to have Respiratory tract infections due to low immunity power, to treat this condition nutritional supplements which act as immunity boosters are given along with Antibiotics and Non-Anti-Infective class drugs. The nutritional supplements given to boost the immune system are multivitamin, Ascorbic acid, folic acid, calcium, Thiamine. Among these nutritional supplements, Ascorbic acid is most frequently prescribed because Ascorbic acid (vitamin C) is one of the biggest immune system boosters of all similar findings were also reported by **Alkahtani SA (2017)[18]**.

➤ Nebulization and Oxygen therapy are performed to treat Respiratory tract infections. Our study findings illustrate that Oxygen therapy is performed to treat most of the patients because the majority of patients are found to have pneumonia. If Pneumonia is so severe

then oxygen therapy plays a crucial role in saving the patient, Our study is correlating with the study of **Salehi S (2020) [19]**. Oxygen therapy is generally safe, but it can cause side effects, but still, Oxygen therapy is better than nebulization because a nebulizer will not treat pneumonia, it will just help you temporarily breathe better.

➤ Non-Anti-Infective class drugs are prescribed such as Bronchodilators, Corticosteroids Mucolytics, the least prescribed is Anti Histamines. The study suggests that the accurate diagnosis of the cause of the disease is essential for the use of Non-Anti-Infective class drugs. If the infection is due to any allergy trigger Anti Histamines are given. Asthma, COPD, Pneumonia treated using Bronchodilators and Corticosteroids. Mucolytic is used in the treatment of Pneumonia, Chronic bronchitis, Asthmatic bronchitis, Acute tonsillitis, and Laryngitis as well as Sinusitis.

➤ The findings of this study submit the important plan of action to enhance the rational use of medication and to identify the types of antibiotics and other non-anti-infective medications prescribed for respiratory tract infections in a tertiary care hospital and this helped to set up the prescribing pattern and achieve a better patient outcome along with the safety and efficacy of the utilized medication [15].

## CONCLUSION

✚ Respiratory tract infection is one of the most frequently diagnosed diseases in the tertiary care hospital. Our study suggests that along with antibiotics other Non-anti-infective class drugs and Nutritional supplements also should be used to treat the condition. Overuse of antibiotics may lead to antibiotic resistance.

✚ The most common antibiotics prescribed were Amoxicillin+ Clavulanic acid, Followed by Piperacillin, Ceftriaxone, Azithromycin, Doxycycline Whereas Clarithromycin and metronidazole were prescribed in limited cases. The most

common Non-anti-infective drug classes prescribed were Bronchodilators, Corticosteroids, Mucolytics, and Anti Histamines.

✚ The most common nutritional supplements which act as immunity boosters prescribed were multivitamin, Ascorbic acid, folic acid, calcium, Thiamine. The supporting therapies given were oxygen inhalation and Nebulization therapy. An essential drug list for a hospital and problem-based basic training in pharmacotherapy should be recommended and assessment of prescriptions is essential to promote rational prescribing of antibiotics.

✚ The findings of the current study would lead to the rational use of antibiotics for factual treatment of Respiratory Tract Infections. There is a crucial need for microbiological analysis before treatment of infections to facilitate rational use of Antibiotics along with Non-anti-infective class drugs and nutritional supplements.

✚ This study concluded the well-advised use of drugs in Respiratory tract infections treatment which help in providing better patient management and limiting the outcome morbidity and mortality arising from respiratory tract infections.

### LIMITATIONS OF THE STUDY

- The study duration was for 6 months so due to less time, we could not reach the maximum study.
- As there were fewer patients admitted in the pediatric department we could not collect many cases of pediatrics.

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