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PRESCRIBING PATTERNS OF ANTIBIOTICS IN THE TREATMENT OF PULMONARY DISEASES IN TERTIARY CARE TEACHING HOSPITAL

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Abstract:

Background: Pulmonary diseases inflict an immense worldwide health burden. According to World health Organization (WHO) around 1 billion people suffer either from acute or chronic pulmonary diseases. The harsh reality is that, 4 million people die prematurely from chronic pulmonary disease, each year. The aim of the study was to assess various prescribing pattern of antibiotics received by patients from the healthcare professionals.

Methods: The study was prospective observational study conducted for the period of six months starting from August 2019 to February 2020 in medicine department of Tertiary care teaching Hospital, Davanagere, Karnataka.

Result: Total of 150 patients were enrolled in the study, the prevalence was found higher in male (79%) compared to female (21%). The common type of pulmonary disease observed was the Chronic obstructive pulmonary disease (44%) and the least observed was the pneumonia (4.6%). In our study, Majority of antibiotics prescribed were Ceftriaxone 140(55.55%) followed by Azithromycin 59(23.41%), Piperacillin/Tazobactum 12(4.76%). Among 150 patients, 71.3% (107) were observed without comorbidities and 28.6% (43) were observed with comorbidities. As per data of the current study, patient with COPD were prescribed with highest number of antibiotics. Hypertension 12(27.9%) was found to be common comorbidity followed by Cor pulmonale 9(20.93%) and type 2 diabetes mellitus 6(13.95%).

Conclusion: Patients with COPD (chronic obstructive pulmonary disease) were prescribed with highest rates of antibiotics. Monotherapy was preferred over combinational therapy. Also, study showed that antibiotics were prescribed in high numbers in mild to moderate condition. So, clinicians should emphasize on safely reducing the volume of antibiotics in mild to moderate condition and promote rational prescribing of antibiotics.

Key Words: Antibiotics, Pulmonary diseases, Prescribing pattern, Monotherapy, COPD,

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INTRODUCTION:

Pulmonary diseases can be elucidated as any kind of infections that are prone to affect the upper or lower respiratory tract. It can also be characterized as any disorder or dysfunctioning of the pulmonary system that influence the process of tranquil respiration .[1] The common upper respiratory tract infections (URTI) include- common cold, laryngitis, pharyngitis, otitis media, tonsillitis, acute rhinitis, acute rhino- sinusitis etc. A lower respiratory tract infection (LRTI) mostly includes pneumonia, bronchiolitis and bronchitis. Both upper and lower respiratory tract infections are very common in developing countries like Nepal, India, Bangladesh.[2] Pulmonary diseases account for more than 10% of all disability-adjusted life-years (DALYs), a benchmark that estimates the amount of active and productive life lost due to a condition. Pulmonary diseases are second only to cardiovascular diseases[3] .Also, pulmonary diseases make up five of the 30 most common causes of death: COPD is third; lower respiratory tract infection is fourth; tracheal, bronchial and lung cancer is sixth; TB is twelfth; and asthma is twenty-eighth.[4] Since antibiotics are widely used to treat any pulmonary diseases, safely reducing the inappropriate antibiotic prescribing has become a global priority to restrain the emergence of antimicrobial resistance (AMR).[2]Therefore, appropriate antibiotics prescribing practices must be followed to provide optimum health benefits and minimize the adverse effects.

An audit or evaluation of prescribing patterns is a significant indicator of the quality and standard of clinical practice which seeks to monitor, analyse, evaluate and if necessary, suggest any changes or modifications in prescribing practices to make clinical practice rational .[5]

Hence, current study is aimed to evaluate and analyse the prescribing patterns of antibiotics in the treatment of pulmonary diseases. This will help us to gain an insight on prevalence of pulmonary diseases, the most common pulmonary disease, current antibiotics prescribing trends and finally analysing the rationality of the prescription.

OBJECTIVES
PRIMARY OBJECTIVE
- To assess various prescribing pattern of antibiotics received by patients from the healthcare professionals.

SECONDARY OBJECTIVE
- To find out most commonly prescribed antibiotic in pulmonary infection.
- To point out various organism causing infections among the study population and to mark the commonest among them
- To provide patient counselling.

MATERIALS AND METHODS:
STUDY SITE:
Study was conducted at Tertiary care teaching Hospital Davanagere, Karnataka

STUDY DURATION:
Study was conducted for a period of 6 months.

STUDY DESIGN:
Prospective Observational Study.

PROPOSED SAMPLE SIZE:
More than 100 case sheets of patients admitted in medicine and paediatric department of the hospital

SOURCE OF DATA:
- Case sheets of patients in tertiary care hospital
- Data collection form designed as per the project.
- SCS College of pharmacy library.

STUDY CRITERIA:
- Study was carried out by considering the following inclusion and exclusion criteria

INCLUSION CRITERIA:
- All in-patients with the diagnosis of pulmonary disease
- All prescriptions containing antibiotics prescribed for the pulmonary disease.
- In-patient willing to cooperate in the study

EXCLUSION CRITERIA:
- Paediatric from neonatal intensive care unit
- Antibiotic used for infection other than RTI
- Patients who are admitted in OBG (Obstetrics and Gynecology) department
- Patient suffering with other than RTIs and immunosuppressed patients

ETHICAL APPROVAL:
The study was approved by the Institutional Ethics Committee of SCS College of Pharmacy, Harapanahalli.

MATERIALS USED:
- Case sheets of patients in tertiary care hospital
- Data collection form designed as per the project.

PHASES OF STUDY:
The proposed work is designed as mentioned below;

PHASE 1
- Review of literature
- Obtaining institutional ethical committee clearance
- Obtaining permission from Medicine and emergency department of the hospital
- Designing the data collection form

PHASE 2
- Collection of data from identified in-patients as per the inclusion criteria

PHASE 3
- To categorize the antibiotics, associated with pulmonary diseases according Pharmacological classification
- To evaluate the prescribing pattern of antibiotics in pulmonary diseases
- To check the rationality of treatment
- To identify the type of pulmonary diseases.
- Analysing the results

METHOD OF DATA COLLECTION:
- A prospective observational study was conducted in the inpatient in medical ward with antibiotics usage in CG Hospital, Davanagere
- The data required for the study was collected from the patient case sheets.
- In-patient in medicine Ward meeting the inclusion criteria were enrolled in the study
- The demographic details, dose and frequency both during admission and discharge were recorded in a properly designed data entry form

STATSTICAL METHOD:
Data was represented graphically and analysed using statistical method like computer software MS Excel

RESULTS:
In this study 150 patient were enrolled after getting a informed consent. The prescribing patterns and demographic details were collected in the data collection form. The filled form were analysed and the results were interpreted by using Microsoft excel
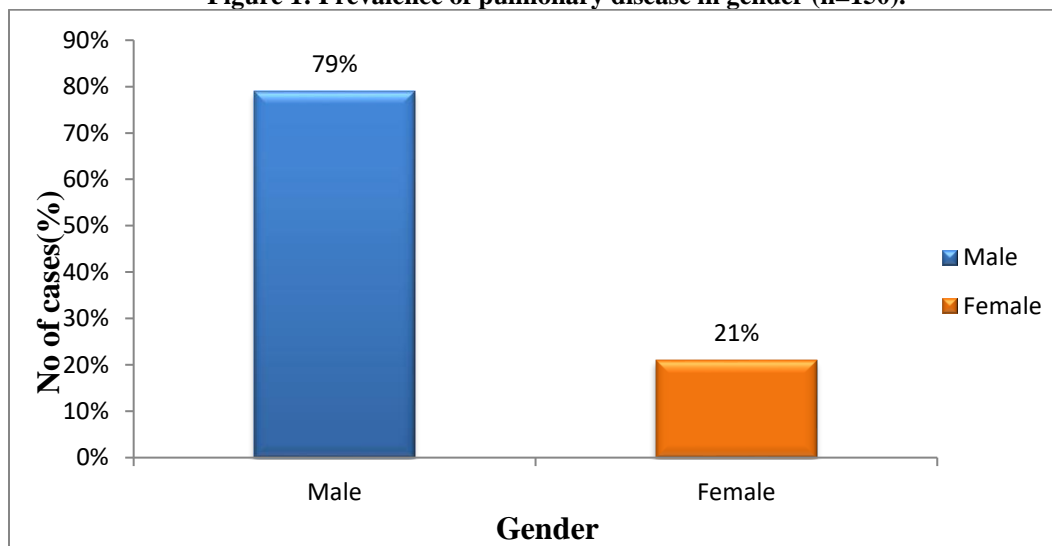
1) Gender wise Distribution of patients:
Among a total number of 150 patients, the prevalence was found higher in males (79%) compared to females (21%)

Table 1: Prevalence of pulmonary disease in gender (n=150).

Gender	No of Patients	Percentage (%)
Male	118	79(%)
Female	32	21(%)

Figure 1: Prevalence of pulmonary disease in gender (n=150).

2) Age wise Distribution of patients

Among total number of 150 cases, the distribution of the disease tends to be higher in age group between 61-70 (33.33%) and lower distribution was observed in age group 20-30 (2%)

Table 2: Age wise distribution of patients (n=150).

Sl.No	Age group	Total no of Patients	Percentage (%)
1	20-30 years	3	2%
2	31-40 years	14	9.33%
3	41-50 years	39	26%
4	51-60 years	31	20.66%
5	61-70 years	50	33.33%
6	71-80 years	13	8.66%

**Figure 2: Age wise distribution of patients (n=150).**
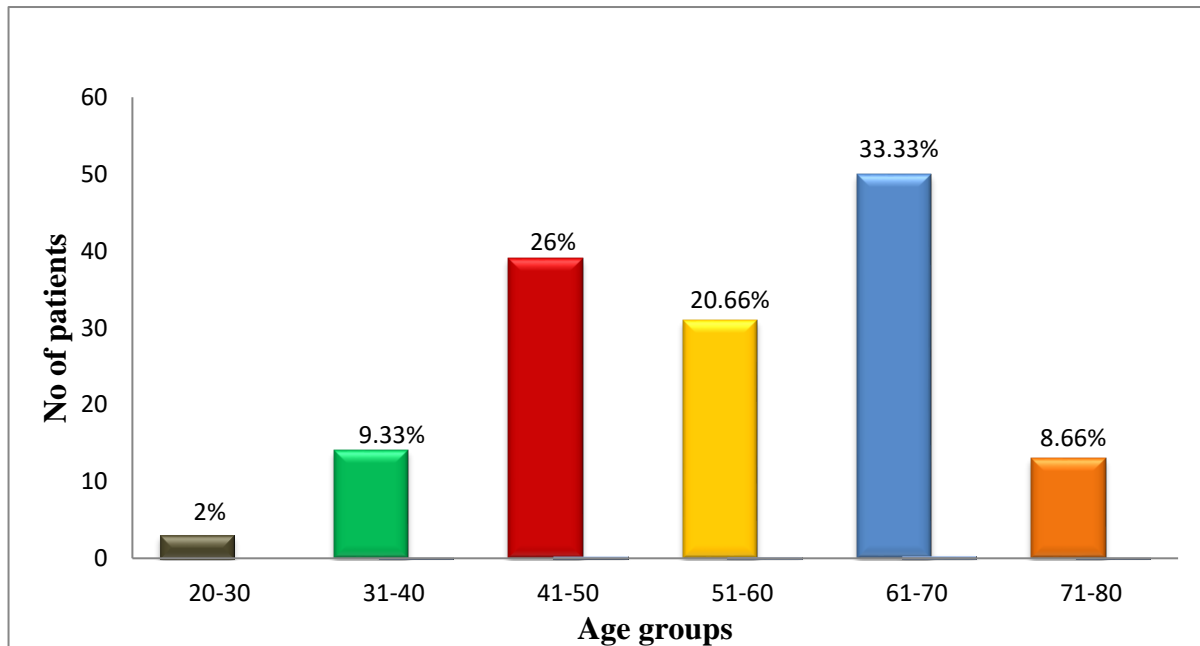
3) Types of pulmonary diseases

Out of total enrolled population n=150,the most common type of pulmonary disease observed was the Chronic obstructive pulmonary disease (44%) and the least observed was the pneumonia (4.6%)

Table 3: Types of pulmonary diseases (n=150).

Sl. No	Disease	Gender		Total number of cases	Percentage (%)
		Male	**Female**		
1	Pleural effusion	10	3	13	8.6%
2	Pneumonia	5	2	7	4.6%
3	COPD	56	10	66	44%
4	Asthma	9	6	15	10%
5	LRTI	22	11	33	22%
6	Tuberculosis	16	3	19	12.6 %
7	Bronchitis	10	0	10	6.6%

Figure 3: Types of pulmonary diseases (n=150).
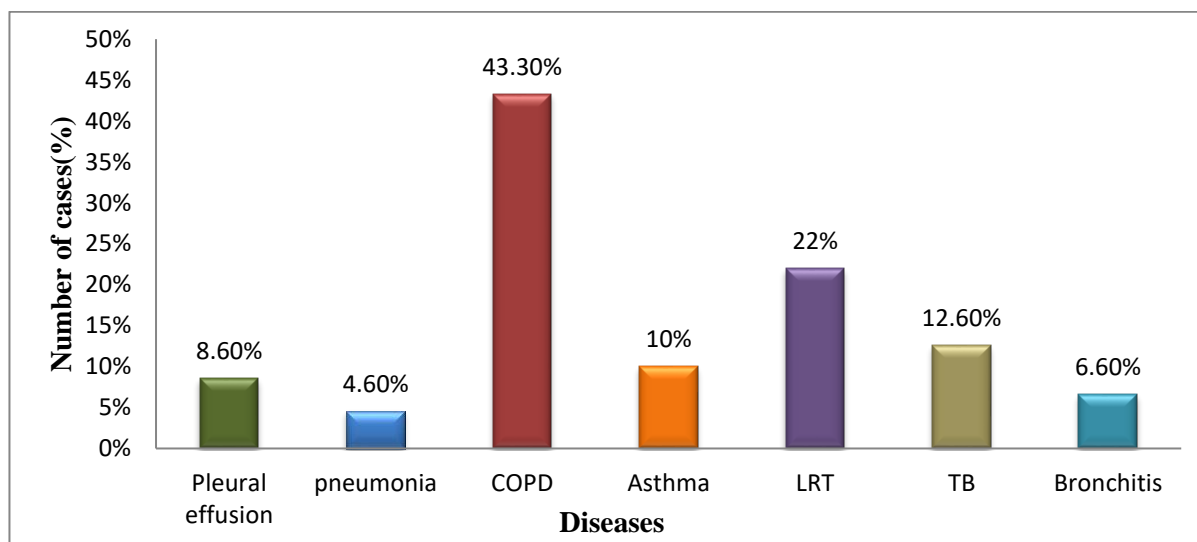
4) Comorbidities
Out of the total population n=150, 71.3 %(107) were observed without comorbidities and 28.6%(43) were observed with comorbidities.

Table 4: Comorbidities (n=150).

| Sl. No	Category	No of cases	Percentage (%)
1	With co-morbidities	43	28.6%
2	Without co-morbidities	107	71.3%

Figure 4: Comorbidities (n=150)
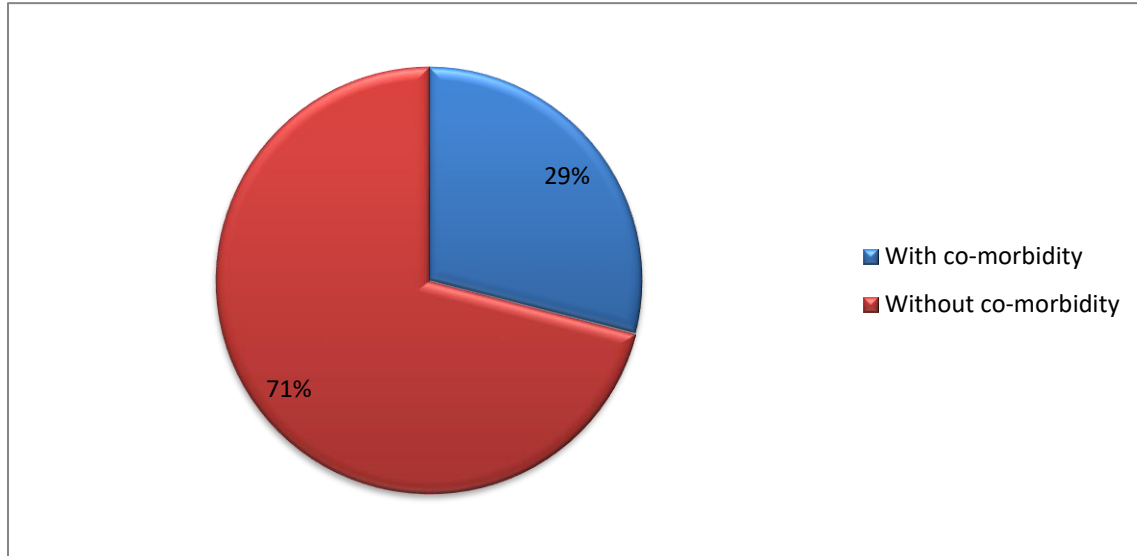
5) Distribution of co-morbidities

From the observed population, n=43, Hypertension was found to be the common comorbidity 12(27.9%) and the Retroviral disease, Alcoholic liver disease and Gastritis were marked to be less frequent comorbidities 1(2.32%)

Table 5: Types of co morbidities (n=43)

| Sl.No	Co-morbidities	No of patients	Percentage (%)
1	Hypertension	12	27.9%
2	Cor pulmonale	9	20.93%
3	T2DM	6	13.95%
4	Anaemia	3	6.97%
5	Seizure	2	4.65%
6	Alcoholic liver disease	1	2.32%
7	Ischemic heart disease	4	9.30%
8	Chronic liver disease	2	4.65%
9	Cellulitis	2	4.65%
10	Retroviral disease	1	2.32%
11	Chronic kidney disease	3	6.97%
12	Cerebrovascular accident	2	4.65%
13	Gastritis	1	2.32%

Figure 5: Types of co morbidities (n=43).
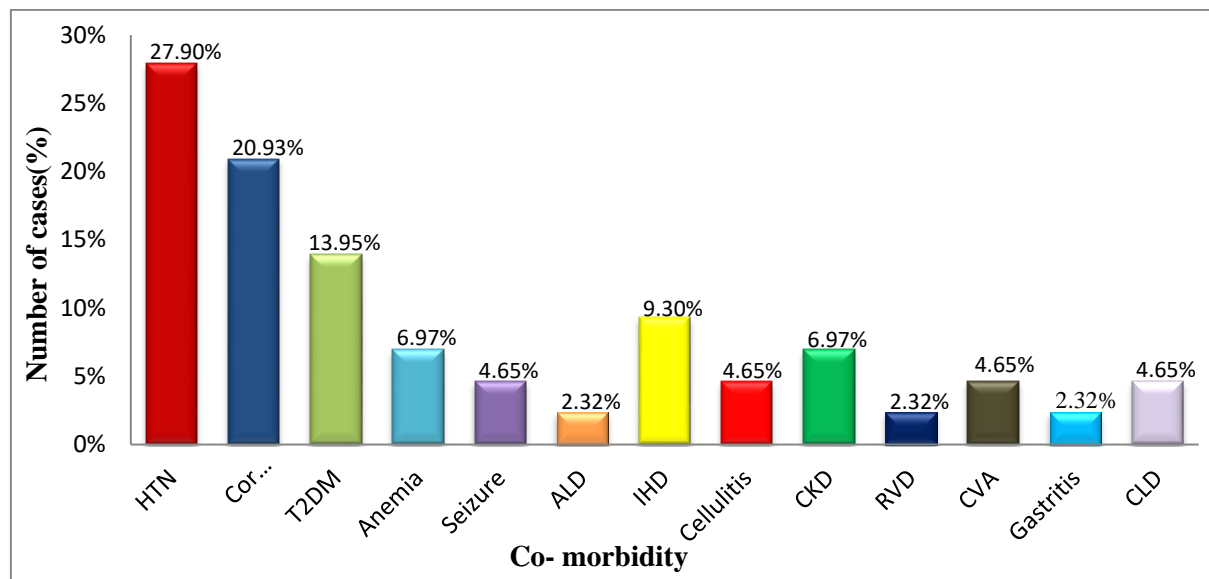
6) Antibiotic pattern prescribed by physician

While analysing the antibiotic pattern prescribed by the physician for the observed population n=252, Ceftriaxone 140(55.55%) was the antibiotic most commonly prescribed followed by Azithromycin 59(23.41%), Piperacillin/Tazobactum 12(4.76%), while Amoxicillin 1(0.39%) and Amoxicillin clavulanic acid 1(0.39%) being the least prescribed.

**Table 6: Antibiotic pattern prescribed by physician (n=252)**

Sl No	Name of antibiotics	Dose	Dosage	Frequency	Duration	No of times Prescribed		Percentage
1	Piperacillin/ Tazobactum	4.5g	Injection	Q8hr	7-14days	8	12	4.76%
		4.5g	Injection	Q12hr	7-14days	4		
2	Ceftriaxone	1g	Injection	Q12hr	5-7 days	139	140	55.55%
		2g	Injection	Q12hr	5-7 days	1		
3	Azithromycin	500mg	Injection	Q24hr	5 days	38	59	23.41%
		500mg	Injection	Q24hr	5 days	21		
4	Isoniazid	300mg	Tablet	Q24hr	6 month	8	8	3.17%
5	Rifampicin	600mg	Tablet	Q24hr	6 month	8	8	3.17%
6	Ethambutol	800mg	Tablet	Q24hr	6 month	8	8	3.17%
7	Pyrazinamide	1g	Tablet	Q24hr	6 month	8	8	3.17%
8	Metronidazole	500mg	Tablet	Q12hr	14days	3	3	1.19%
9	Clarithromycin	500mg	Tablet	Q12hr	7-14days	1	1	0.39%
10	Ciprofloxacin	500mg	Injection	Q12hr	5-7 days	1	1	0.39%
11	Doxycycline	100mg	Tablet	Q12hr	5-7days	2	2	0.79%
12	Amoxicillin	500mg	Capsule	Q12hr	5 days	1	1	0.39%
13	Amoxicillin Clavulanic acid	600mg	Injection	Q12hr	5-7days	1	1	0.39%

Figure 6: Antibiotic pattern prescribed by physician (n=252).
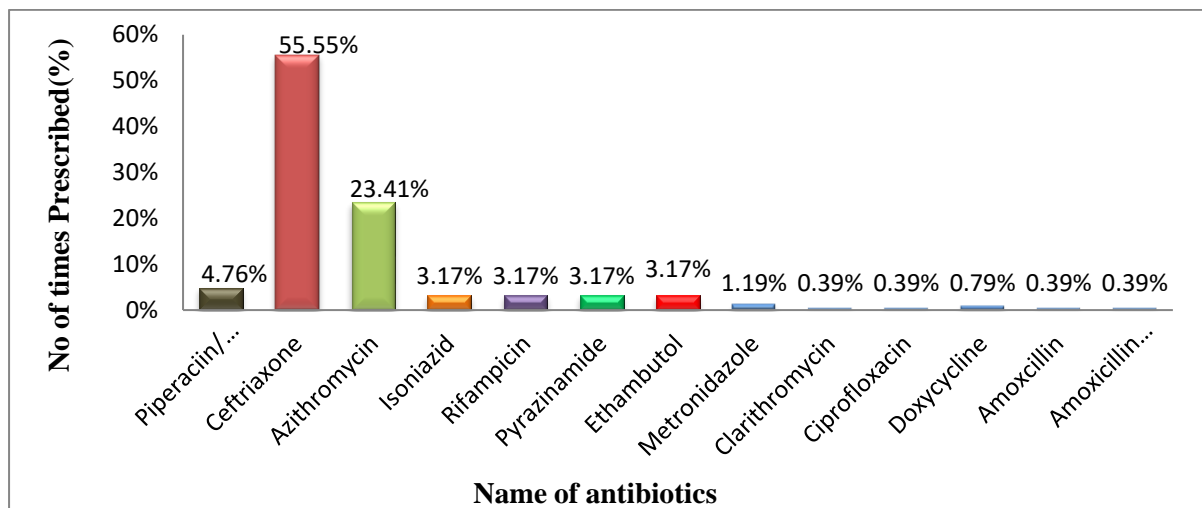
7) Prescribing pattern of antibiotic in LRTI

From the observed population n=50, the most commonly prescribed antibiotic was Ceftriaxone (54%). Metronidazole (2%) and Amoxicillin Clavulanic acid (2%) were the least prescribed.

Table 7: Prescribing pattern of antibiotic in LRTI (n=50)

| Sl No	Name of antibiotics	Number of antibiotics	Percentage (%)
1	Piperacillin/ Tazobactum	4	8%
2	Ceftriaxone	27	54%
3	Azithromycin	17	34%
4	Amoxicillin Clavulanic acid	1	2%
5	Metronidazole	1	2%

Figure 7: Prescribing pattern of antibiotic in LRTI (n=50).
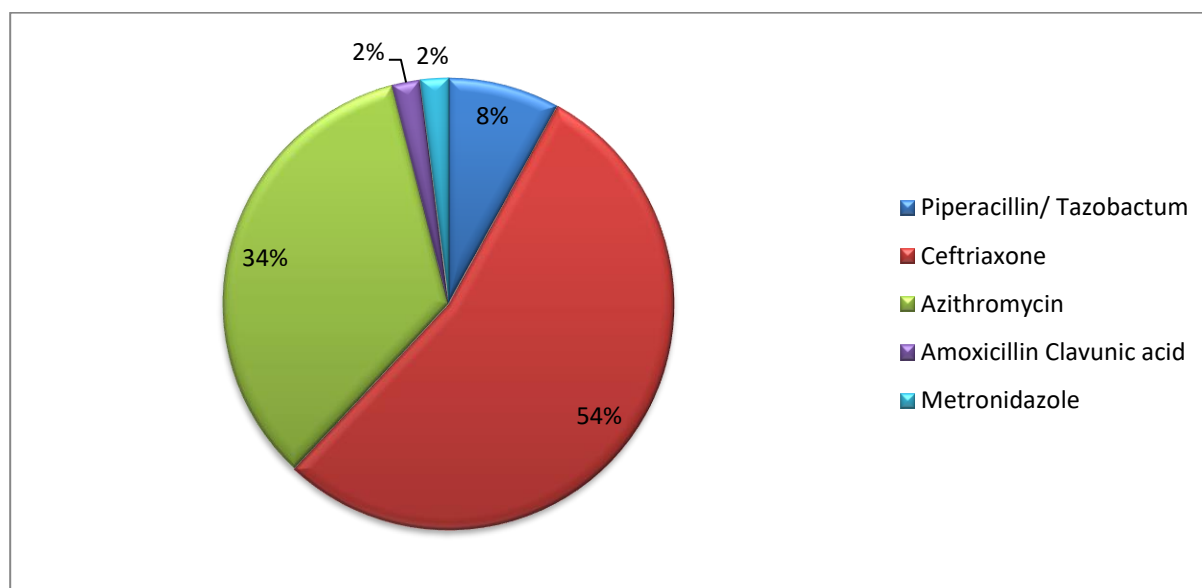
8) Prescribing pattern of antibiotic in Pleural effusion
From the observed population n=14, Ceftriaxone 10(71.4%) was the most commonly prescribed antibiotic and Piperacillin/Tazobactum 1 (7.14%) was the least prescribed.

Table 8: Prescribing pattern of antibiotic in Pleural effusion (n=14)

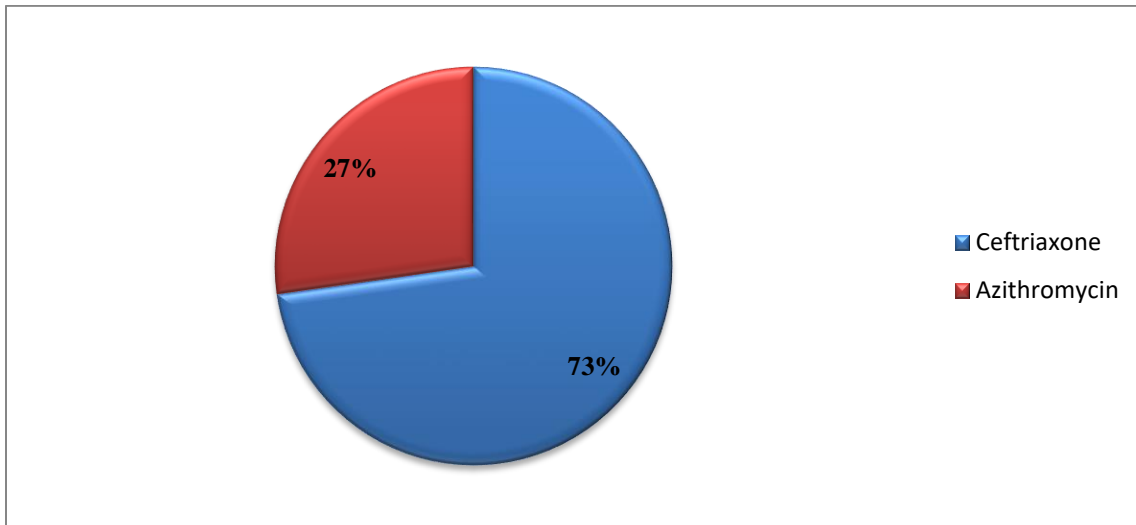| Sl No	Name of antibiotics	Number of antibiotics	Percentage (%)
1	Piperacillin/ Tazobactum	1	7.14%
2	Ceftriaxone	10	71.4%
3	Azithromycin	3	21.4%

Figure 8: Prescribing pattern of antibiotic in Pleural effusion (n=14)
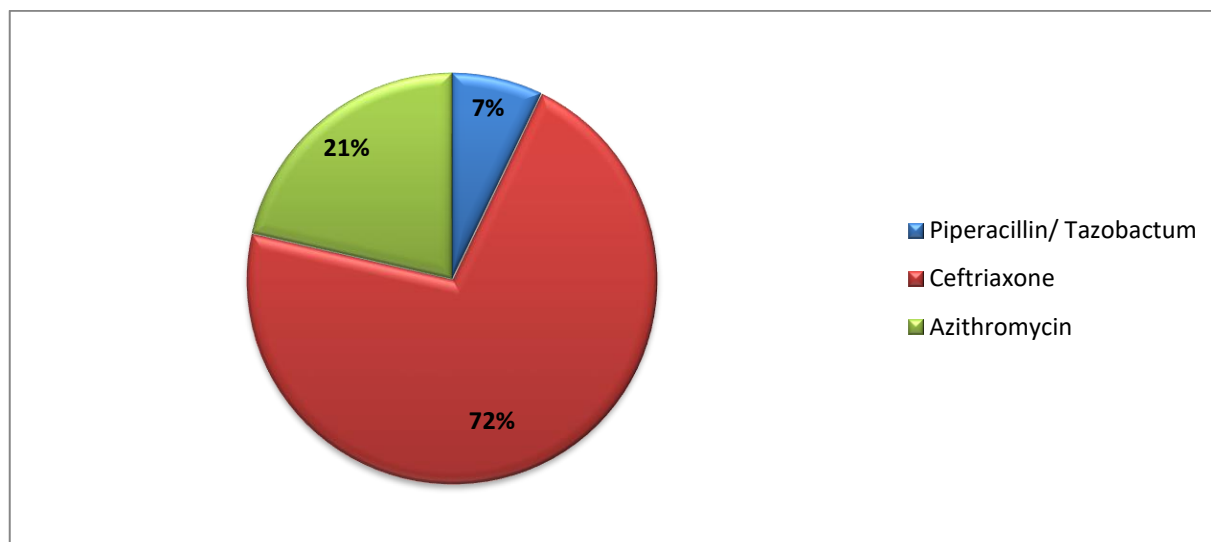
9) Prescribing pattern of antibiotic in Bronchitis
From the observed population n=11, the mostly prescribed antibiotic for Bronchitis was Ceftriaxone 8(72.72%) and Azithromycin 3(27.23%) was the least.

Table 9: Prescribing pattern of antibiotic in Bronchitis (n=11)

Sl No	Name of antibiotics	Number of antibiotics	Percentage (%)
1	Ceftriaxone	8	72.72%
2	Azithromycin	3	27.23%

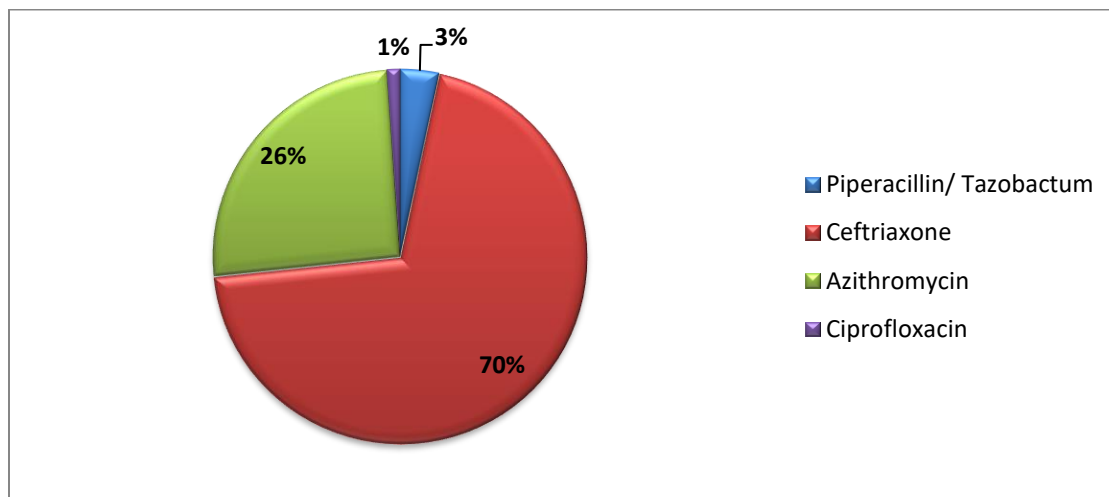**Figure 9: Prescribing pattern of antibiotic in Bronchitis (n=11).**

10) Prescribing pattern of antibiotic in COPD

From the observed population n=90, the most commonly prescribed antibiotic for COPD was Ceftriaxone 63(70%) and Piperacillin/Tazobactum 3(3.33%) was the least.

Table 10: Prescribing pattern of antibiotic in COPD (n=90)

Sl No	Name of antibiotics	Number of antibiotics	Percentage (%)
1	Piperacillin/ Tazobactum	3	3.33%
2	Ceftriaxone	63	70%
3	Azithromycin	23	25.55%
4	Ciprofloxacin	1	1.11%

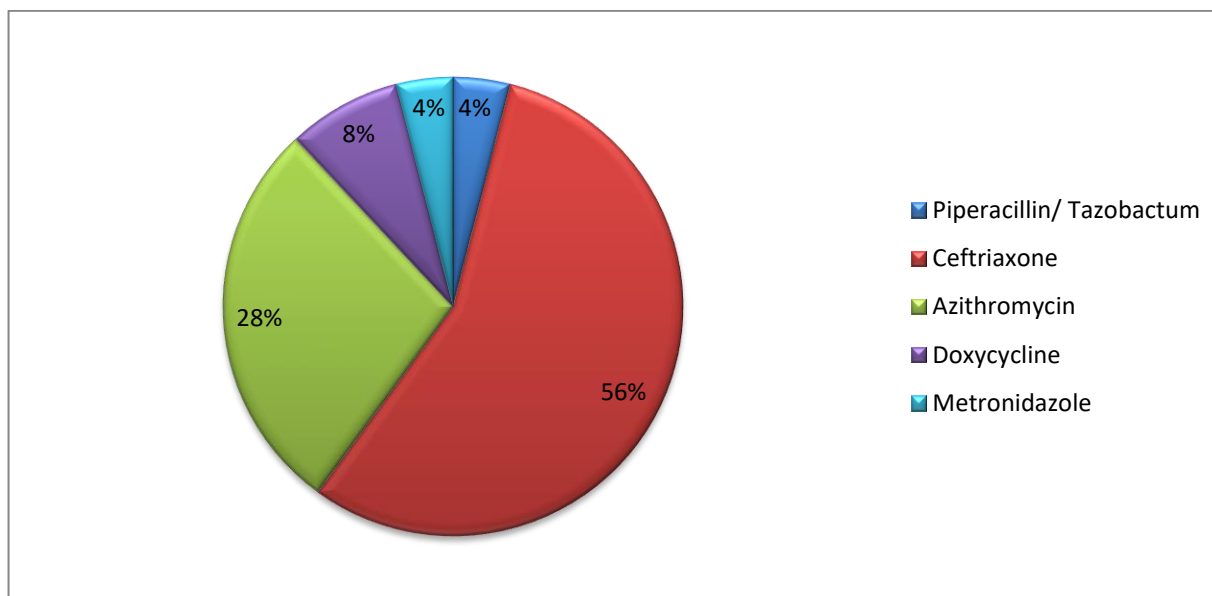**Figure 10: Prescribing pattern of antibiotic in COPD (n=90)**

11) Prescribing pattern of antibiotic in Asthma

From the observed population n=25, the most prescribed antibiotic for Asthma was Ceftriaxone 14(56%). Piperacillin/Tazobactum 1(4%) and metronidazole 1(4%) were the least.

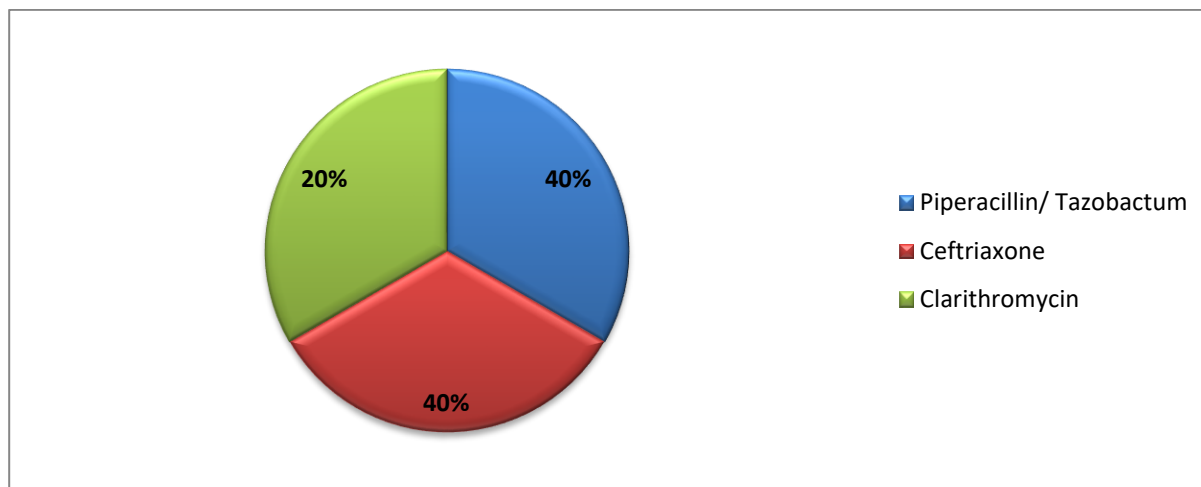**Table11: Prescribing pattern of antibiotic in Asthma (n=25)**

Sl No	Name of antibiotics	Number of antibiotics	Percentage (%)
1	Piperacillin/ Tazobactum	1	4%
2	Ceftriaxone	14	56%
3	Azithromycin	7	28%
4	Doxycycline	2	8%
5	Metronidazole	1	4%

Figure11: Prescribing pattern of antibiotic in Asthma (n=25).

12) Prescribing pattern of antibiotic in Pneumonia

From the observed population n=5, the most commonly prescribed antibiotic for Pneumonia were Ceftriaxone 2(40%) and Piperacillin/Tazobactum 2 (40%).

**Table 12: Prescribing pattern of antibiotic in Pneumonia (n=5)**

Sl No	Name of antibiotics	Number of antibiotics	Percentage (%)
1	Piperacillin/ Tazobactum	2	40%
2	Ceftriaxone	2	40%
3	Clarithromycin	1	20%

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Figure 12: Prescribing pattern of antibiotic in Pneumonia (n=5)

13) Prescribing pattern of antibiotic in Tuberculosis
From the observed population n=56, the most commonly prescribed antibiotic for Tuberculosis was Ceftriaxone 16(28.57%). Piperacillin/Tazobactum 1(1.78%) was the least prescribed.

**Table 13: Prescribing pattern of antibiotic in Tuberculosis (n=56)**

Sl No	Name of antibiotics	Number of antibiotics	Percentage (%)
1	Piperacillin/ Tazobactum	1	1.78%
2	Ceftriaxone	16	28.57%
3	Azithromycin	5	8.92%
4	Metronidazole	1	1.78%
5	Amoxicillin	1	1.78%
6	Isoniazid	8	14.28%
7	Rifampicin	8	14.28%
8	Ethambutol	8	14.28%
9	Pyrazinamide	8	14.28%

Figure 13: Prescribing pattern of antibiotic in Tuberculosis (n=56).
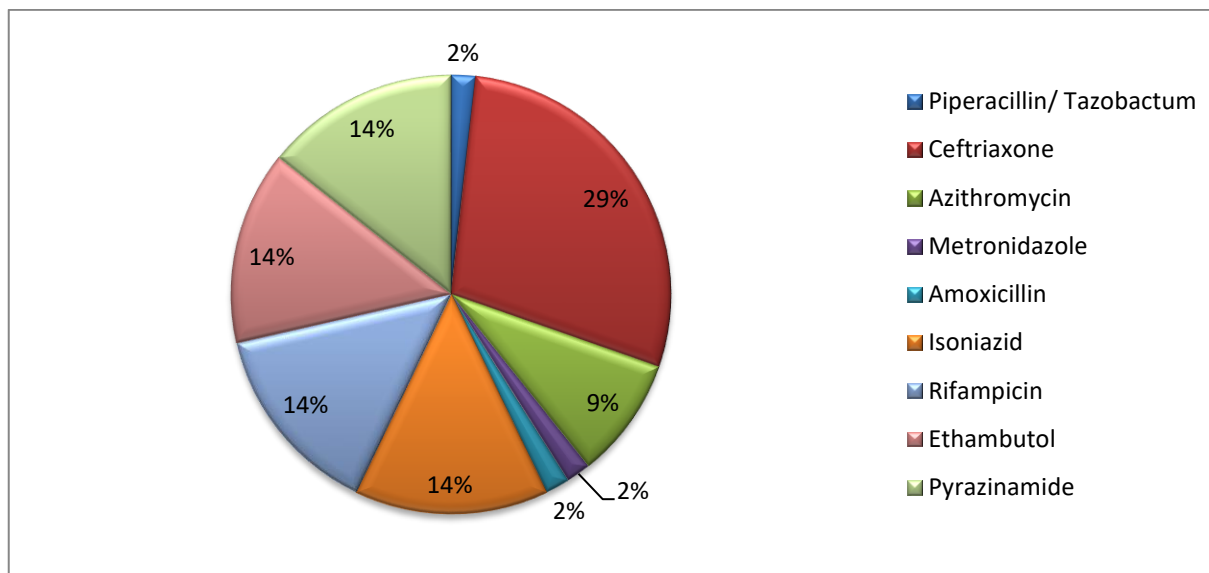
14) Antibiotic class (n=215)

From the observed population n=215, the most commonly prescribed antibiotic was Cephalosporin 140(55.5%) and the least used was Fluoroquinolones 1(0.39%)

Table 14: Antibiotic class (n=215)

| Sl.No	Class	No of times prescribed	Percentage (%)
1	Penicillin	14	5.6%
2	Cephalosporin	140	55.5%
3	Macrolides	60	23.8%
4	Tetracycline	2	0.79%
5	Fluoroquinolones	1	0.39%
6	Nitroimidazole	3	1.19%
7	Anti TB agents	32	12.69%

Figure 14: Antibiotic class (n=252)
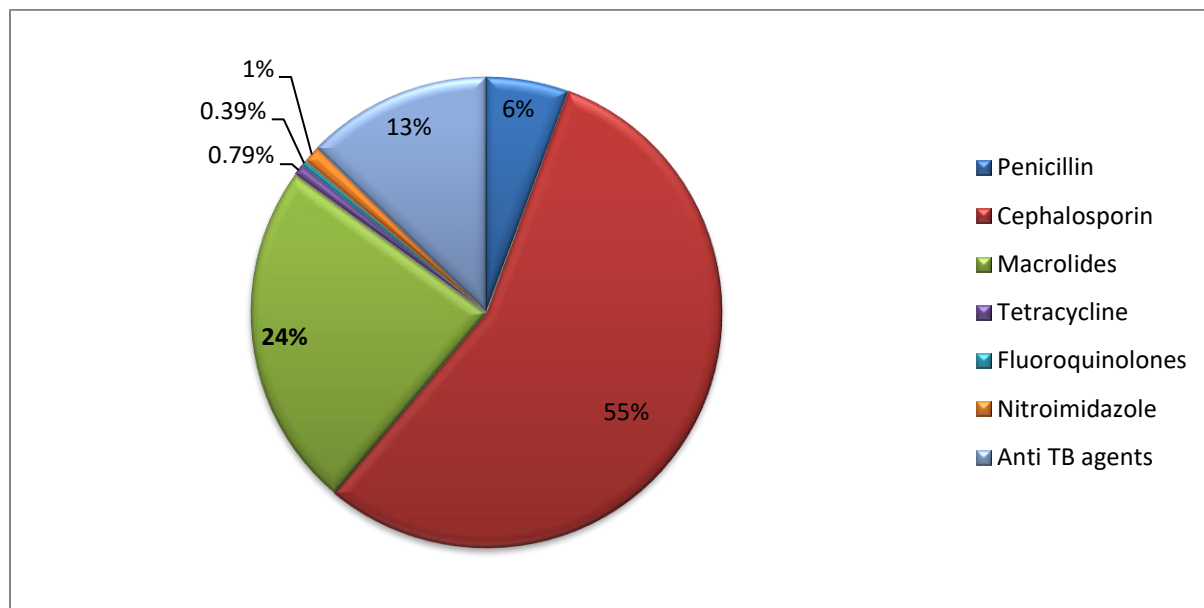
15) Type of antibiotic therapy

The number of antibiotics prescribed for the study population was calculated and categorized. The categorization was based on monotherapy, dual therapy and triple therapy, four drug therapy and five drug therapy. One antibiotic was prescribed to 78(52%) patients, two antibiotics to 53(35.3%) patients, three antibiotics to 8(5.33%) patients, four antibiotics to 6(4%) patient and five antibiotics were prescribed to 5(3.33%) patients.

Table 15: Type of antibiotic therapy (n=150)

Sl.No	Type of therapy	Number	Percentage (%)
1	One antibiotic	78	52%
2	Two antibiotics	53	35.3%
3	Three antibiotics	8	5.33%
4	Four antibiotics	6	4%
5	Five antibiotics	5	3.33%

Figure 15: Type of antibiotic therapy (n=150).
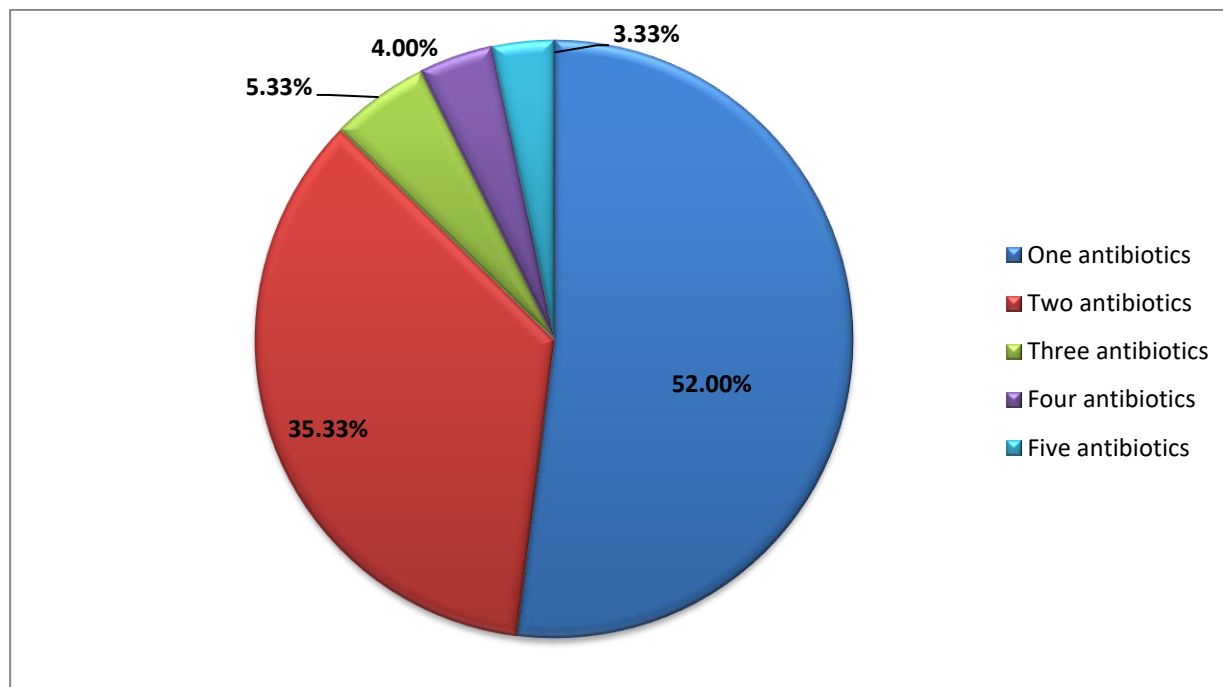
DISCUSSION:

Pulmonary diseases, a common preventable and treatable disease has been a major public health problem in this century and is one of the leading causes of morbidity and mortality in the industrialized and developing countries.

In our present study prevalence of pulmonary disease is more in gender male (79%) than female [21%] with an age group 61-70(33.33%) and COPD was more common among males as compared to females; this finding is in accordance with results of the previous studies conducted by Sewant MP *et al*, [6] This shows that elderly patients are more at risk of developing pulmonary disease when compared to other age groups. The study also revealed that hypertension {27.9%} was most predominant comorbidity followed by Cor pulmonale (20.93%) in LRTI patients and it is similar to the study conducted by Akbari *et al,* with HTN (26.2%) as the majority among the co morbidities .[7]

While analysing the prescriptions for class of antibiotics, the result showed that cephalosporin (ceftriaxone) were the most commonly prescribed antibiotics with a percentage of 55.5% followed by macrolides (23.8%), penicillin (5.6%), anti-tuberculosis agents (12.69%), nitroimidazole (1.19%), tetracycline (0.79%), fluoroquinolones (0.39%). Whereas the study conducted by Errabelly

et al, the most frequently used antibacterial agents were cephalosporin (55%), followed by penicillin (11.7%), fluoroquinolones (11.4%), macrolides (10.1%) combination of penicillin's +beta lactamase inhibitor (7.9%). [1]

As per the data of current study, the commonly prescribed antibiotics in LRTI was ceftriaxone (54%) followed by azithromycin (34%) and piperacillin/tazobactum combination (8%). In pleural effusion ceftriaxone (71.4%) and azithromycin (21.4%) were frequently prescribed. Whereas in COPD ceftriaxone (70%), azithromycin (25.5%), piperacillin/tazobactum (3.33%) and ciprofloxacin (1.11%) were mostly prescribed. In asthma majority was ceftriaxone and azithromycin with a percentage of (56%) and (28%) followed by doxycycline (8%). In pneumonia the majority were piperacillin tazobactum and ceftriaxone with 40% and clarithromycin 20%. Among the patients with tuberculosis the commonly prescribed antibiotics were ceftriaxone (28.57%), azithromycin (8.92%), amoxicillin and piperacillin/tazobactum (1.78 %)and anti-tuberculosis drugs with 14.28%{ isoniazid + rifampicin+ ethambutol+ pyrazinamide}.These results did not match with the study conducted by S Suwitha *et al*, [7]

Further, in our study, antibiotics were prescribed as monotherapy, dual therapy, triple therapy, four drug therapies and five drug therapies. However, significant rise was observed in monotherapy with 52%, dual therapy with 35.3%, triple therapy with 5.33% and four drug therapy with 4% and five drug therapy with 3.33%. So the most preferred drug of choice for the treatment of pulmonary diseases was monotherapy. The study also revealed that the commonly co-prescribed drug were anti-hypertensives due to the predominance of Hypertension as the most common comorbidity in the study. These findings are congruent with the previous study conducted by Akbari *et a*l, [8] Lakshmi R *et al,* [9]

CONCLUSION:

Prescription pattern studies have become a major tool for evaluating the health care system. The study concludes that COPD was the commonly diagnosed pulmonary disease. The symptomatic treatment was given for all patients diagnosed with pulmonary disease. The monotherapy of antibiotics were more prescribed than dual and triple therapy. Cephalosporin was the mostly prescribed class of antibiotics. Anti-hypertensives were also co-prescribed with the antibiotics due to the high prevalence of hypertension as comorbidity. It was found that the antibiotics were prescribed in high numbers in mild to moderate condition which is major concern as it may cause the patient to develop antibiotic resistance and some adverse effects. Also, this study serves to limelight the current prescribing trends of antibiotics in patients with pulmonary diseases admitted in the hospital. Hence, prescribing pattern studies can provide feedback to the medical professionals and promote rational prescribing of antibiotics.

STRENGTHS AND LIMITATIONS
STRENGTH

- The study is mainly focused on the actual prescribing patterns of antibiotics in pulmonary diseases.
- By counselling the patients, this study helped to improve the patient's knowledge, attitude and awareness towards the disease.
- This study provided an insight on the prevalence of pulmonary disease patients in a tertiary care teaching hospital
- Improved patient's quality of life.

LIMITATIONS

- As the study was done for a short period, it may not state the real clinical situation.
- The study is just based on a single hospital and hence it cannot be generalized.
- Lack of patient compliance.
- Communication barriers during the data collection and patient counselling.

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