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A RETROSPECTIVE STUDY ON CONVERSION THERAPY FROM INTRAVENOUS TO ORAL ANTIBIOTICS IN INPATIENTS ADMITTED FOR LOWER RESPIRATORY TRACT INFECTIONS AT TERTIARY TEACHING HOSPITAL IN MANDYA

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ABSTRACT

Background: Antibiotics are commonly used to treat lower respiratory tract infections (LRTIs). Early conversion of antibiotics from intravenous (IV) to oral route helps in preventing thrombophlebitis, reducing cost and cannula related infections. Appropriate use of antibiotics is a crucial for patient safety and public health. So, the aim of our study is on conversion therapy from IV to oral antibiotics. **Objective:** To evaluate the conversion therapy preferred in LRTIs patients and its relationship with the type of infections. **Methodology:** This was a record based retrospective study and 177 cases collected based on the inclusion criteria. The obtained information was subjected to suitable statistical methods. **Result:** Among 177 cases, males (67.79%) are more suffered and age group above 60 years (53.67%) are more hospitalized for pneumonia (32.76%) cases. Cephalosporin (54.29%) antibiotics were commonly prescribed class of drug in that ceftriaxone (43.82%) preferred. Among the conversion therapy switch therapy (60.45%) was commonly used. Chi-square test shows that there is a relationship between type of conversion therapy and type of LRTIs with calculated value 20.368. **Conclusion:** Our study concludes that male patients are more hospitalized and pneumonia is the common infection. Switch therapy was the commonly preferred type of conversion to treat patients. Cephalosporin antibiotics are preferred in patients for both IV and oral route to treat LRTIs. Clinical pharmacist needs to review the condition of patients for early conversion of IV to oral antibiotics to prevent irrational use of antibiotics.

KEYWORDS: Antibiotics, Switch Therapy, Pneumonia, Cephalosporins, Intravenous.

INTRODUCTION

Lower respiratory tract infections (LRTIs) are the most common bacterial infections encountered in hospitals, which can be acquired in the community and in hospital.[1] LRTI is a broad terminology which includes different diseases including acute bronchitis, pneumonia, and acute exacerbation of chronic obstructive pulmonary disease (COPD) or bronchiectasis. According to the Global Burden of Disease 2015 study, COPD and LRTIs represents the third and the fourth most common cause of mortality worldwide.[2]

The term antimicrobial conversion describes the practice of converting intravenous antimicrobial therapy to an alternative oral formulation, since the 1990s, the IV to PO antibiotic converting programs have been adopted in many countries.[3] The conversion may be a switch therapy, sequential therapy or step-down therapy.[4] Bioavailability of IV medications is always higher than that of their oral counterpart, so that the patient may get relief from symptoms earlier if they receive a complete IV course of therapy, a concept that is popular among the physicians.[5] According to some authorities, approximately 40% of patients starting on intravenous antibiotics are candidates for a switch to oral antibiotics after 2-3 days of therapy. In hospitalized patients, after a period of 72 hours of initial stabilization, 83% of patients would be unnecessarily receiving IV antibiotics, thus increasing the treatment costs by 200% in the case of some classes of antibiotics and prolonging hospital stay.[6]

Proper patient selection, patient health education, and an active therapeutic approach by multidisciplinary medical teams are the key factors leading to success in conversion from intravenous to oral antimicrobials.[7] The acquisition cost of parenteral antibiotics is almost always greater than that of their corresponding oral counterparts.[8] Oral therapy is less labour intensive for the nursing staff, and economic benefits are clear, since preparation and administration costs are smaller.[9] In the Indian scenario, the concept of early switch over from IV to oral therapy is not common even though it is popular in Western countries.[10] The appropriate use of

antimicrobial agents is crucial for patient's safety and public health.[11]

Clinical pharmacists, with the help of infectious disease (ID) team, have an integral role in day-to-day practice for the judicious use of antibiotics within a short period of time, thus promoting further patient safety.[12] So, the aim of our study is to evaluate the conversion of intravenous to oral antibiotics LRTIs patients.

OBJECTIVE

- To evaluate the type of conversion therapy preferred in LRTIs patients.
- To analyse the common types of LRTIs, class of antibiotics and relationship between types of infections with type of conversion.

MATERIALS AND METHODS

Study Design

This was a medical record based retrospective study.

Study Period

This retrospective study was conducted for a period of 6 months. 4 months of data collection and 2 months of data analysis with write up.

Study Population

Patients who were suffered from Lower Respiratory Tract Infections and was exposed to antibiotics upon admission in general medicine department at MIMS Mandya. Data was collected in medical record room for result analysis.

Sample Size

177 patients

Formula = $4pq/L^2$

p=50%, q=100-p, L= 7.5%

Calculation: $4\times50(100-50)/7.5^2$ = 177 cases

Sampling Method

Convenience sampling.

Criteria for sample collection

Inclusion Criteria

- Male and female patients.
- Age ≥18 years patients who were admitted at MIMS Tertiary Teaching Hospital with complaints of Lower Respiratory Tract Infections.

Exclusion Criteria

- Patients who are suffering from tuberculosis.
- Pregnant and lactating women.

Method of Data Collection

The data of patients who were admitted in general medicine department was collected using pre designed and semi structured profile form.

Following information were collected:

- Socio-demographic details like name, age, sex and marital status.
- Details regarding lower respiratory tract infection including types and treatment.
- Details on conversion of antibiotics from intravenous to oral.

Analysis of results

The data collected was entered in MS Excel worksheet and descriptive statistics like percentage, mean, chi-square test etc. were used in our study.

RESULTS AND DISCUSSION

This retrospective study was conducted in medical record department at MIMS tertiary care teaching hospital, Mandya. A total of 177 patient's case records in MIMS were enrolled in the study based on inclusion criteria. The demographic details such as age, sex, etc and treatment details from the patient's case records were recorded in a suitably designed patient profile form.

Distribution Based on Gender

Totally 177 patients were included in our study. Table 1 provides the Gender distribution of the patients. The numbers of males, 120 (67.79%) were more compared to the numbers of females, 57(32.20%).

Table 1: Distribution of Patients Based on Gender.

Gender	Number of Patients	Percentage
Male	120	67.79 %
Female	57	32.20 %

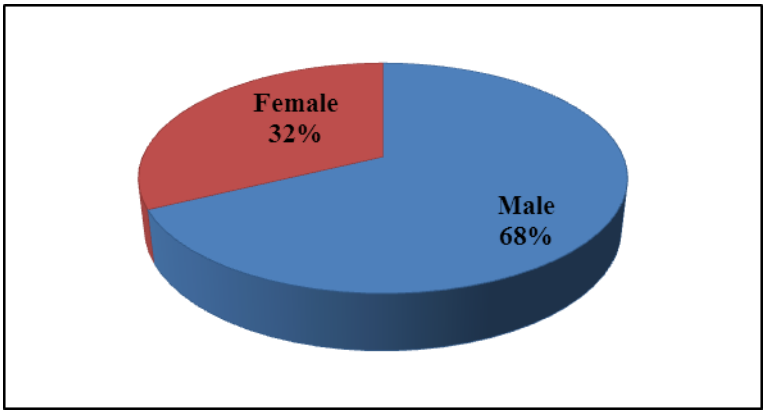

Fig 1: Distribution of Patients Based on Gender.

Categorization Based on Age

In our study maximum numbers of patients were found in the age group of above 60 years (53.67%) followed by 30-39 years (15.81%), 50-59 years (12.42%), 40-49 years (10.16%) and minimum number of patients were found in the age group of 18-29 years (7.90%). Standard deviation was found to be 20.7±55.

Table 2: Distribution of Patient Based on Age.

AGE CATEGORY	NUMBER OF PATIENTS	PERCENTAGE	SD ± Mean Age
18 – 29	14	7.90 %	20.7 ±55
30 – 39	28	15.81 %	
40 – 49	18	10.16 %	
50 – 59	22	12.42 %	
ABOVE 60	95	53.67 %	

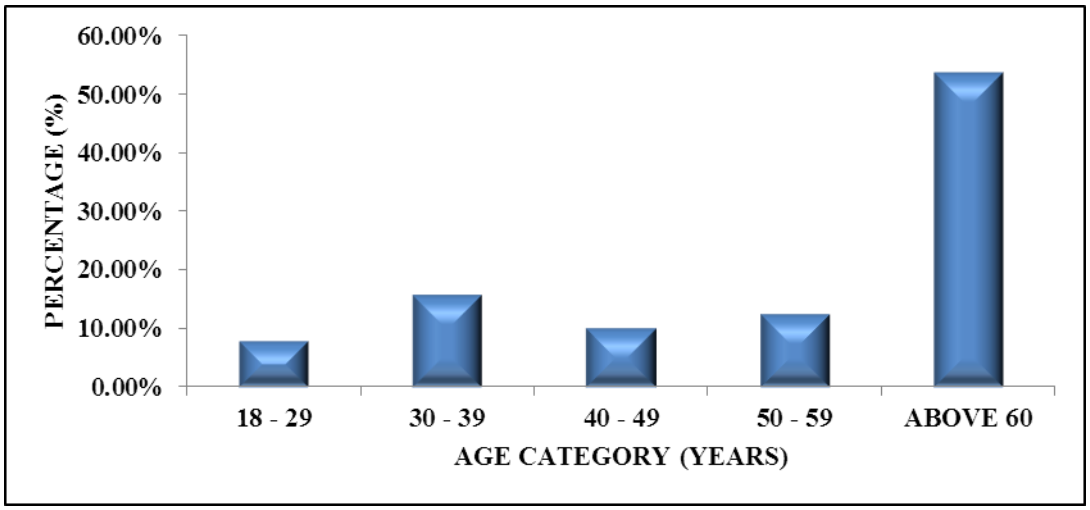

Fig 2: Categorization of Patients Based on Age.

Distribution of patient based on disease condition

Different types of lower respiratory tract infections were observed during the study. Most common cases reported were Pneumonia (32.76%) and COPD (31.63%) followed by Asthma (15.35%), Bronchitis (7.9%), LRTI (7.38%) and Bronchiolitis (5.08%).

Table 3: Distribution of Patients Based on Disease Condition.

Sl.No.	Type of LRTI	Number of Patients	Percentage
1.	Asthma	27	15.25 %
2.	Bronchitis	14	07.90 %
3.	COPD	56	31.63 %
4.	Bronchiolitis	09	05.08 %
5.	Pneumonia	58	32.76 %
6.	LRTI	13	07.38 %

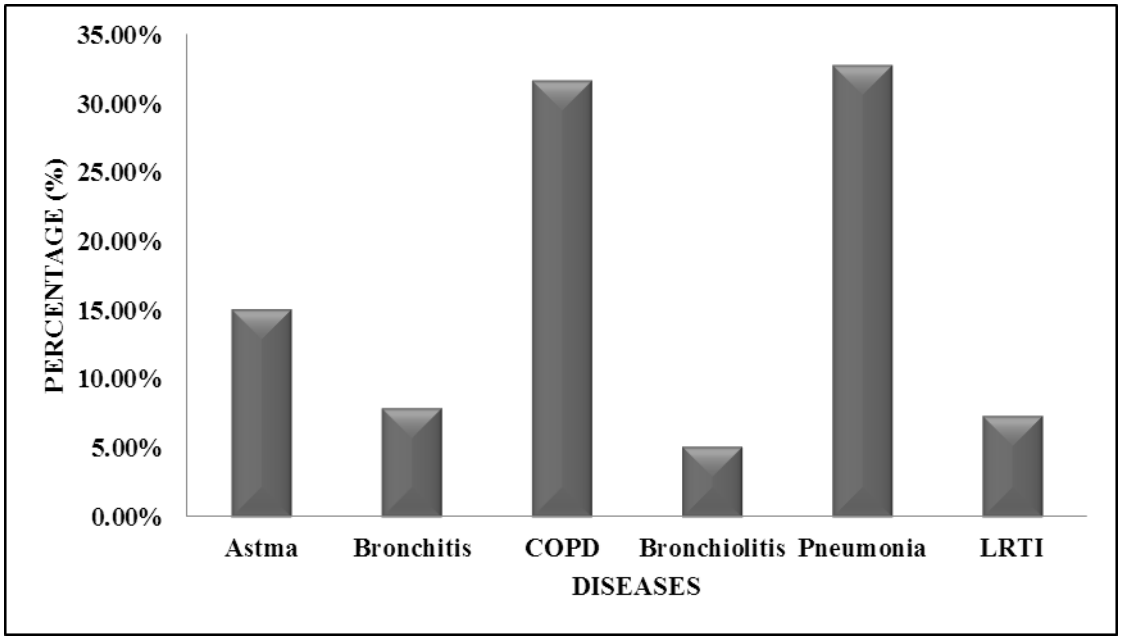

Fig 3: Distribution of Patients Based on Disease Condition.

Antibiotics Administered in In-Patients

A total of 267 antibiotics were prescribed in the 177 patient case records. Majority of the patients were prescribed from class Cephalosporin (54.29%) followed by Penicillin (16.52%), Macrolide (10.1%), Aminoglycoside (6.36%), Nitroimidazole (6.36%), Sulphonamide (2.24%), Fluoroquinolone (2.23%), Carbapenem (0.74%), Tetracycline (0.74%) and Oxazolidinone (0.37%).

Table 4: Antibiotics Prescribed in In-Patients.

Class of Antibiotic	Name of Antibiotic	Number of Antibiotics	Percentage
Cephalosporin	Inj. Ceftriaxone	117	43.82 %
	Inj. Cefotaxime	21	7.86 %
	Inj. Cefoperazone	5	1.87 %
	Tab. Cefixime	1	0.37 %
	Tab. Cefpodoxime	1	0.37 %
Macrolide	Tab. Azithromycin	26	9.73 %
	Inj. Azithromycin	1	0.37 %
Aminoglycoside	Inj. Amikacin	16	5.99 %
	Inj. Gentamicin	1	0.37 %
Penicillin	Inj. Amoxiclav	23	8.61 %
	Inj. Pipzo	16	5.99 %
	Tab. Amoxiclav	2	0.74 %
	Inj. Ampicillin	3	1.12 %
Fluoroquinolone	Tab. Norfloxacin	1	0.37 %
	Inj. Ciprofloxacin	4	1.49 %
	Tab. Levofloxacin	1	0.37 %
Nitroimidazole	Inj. Metronidazole	17	6.36 %
Tetracycline	Tab. Doxycycline	2	0.74 %
Sulphonamide	Tab. Co-trimoxazole	6	2.24 %
Oxazolidinone	Inj. Linezolid	1	0.37 %
Carbapenem	Inj. Micropenam	1	0.37 %
	Tab. Micropenam	1	0.37 %

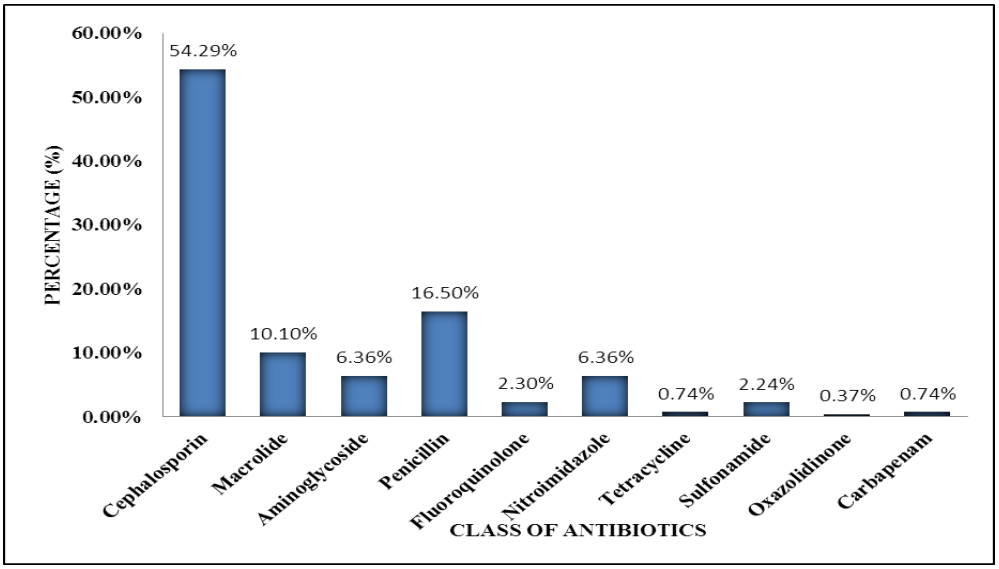

Fig 4: Antibiotics Prescribed in In-Patients.

Antibiotics Prescribed During Discharge

Cephalosporin (58.19%) class of antibiotic was the most prescribed drug for discharge followed by Penicillin (22.74%), Fluoroquinolone (6.86%), Macrolide (6.34%), Sulphonamide (3.17%), Nitroimidazole (1.58%), Tetracycline (0.52 %) and Oxazolidinones (0.52 %).

Table 5: Antibiotics Prescribed During Discharge.

Class of Antibiotics	Name of Antibiotics	Number of Patients	Percentage
Cephalosporin	Tab. Cefixime	108	57.14 %
	Tab. Cefpodoxime	2	1.05 %
Nitroimidazole	Tab. Metronidazole	3	1.58 %
Fluoroquinolone	Tab. Levofloxacin	9	4.76 %
	Tab. Norfloxacin	3	1.58 %
	Tab. Ofloxacin	1	0.52 %
Penicillin	Tab. Amoxiclav	42	22.22 %
	Tab. Amoxicillin	1	0.52 %
Tetracycline	Tab. Doxycycline	1	0.52 %
Macrolide	Tab. Azithromycin	12	6.34 %
Sulphonamide	Tab. Co-trimoxazole	6	3.17 %
Oxazolidinone	Tab. Linezolid	1	0.52 %

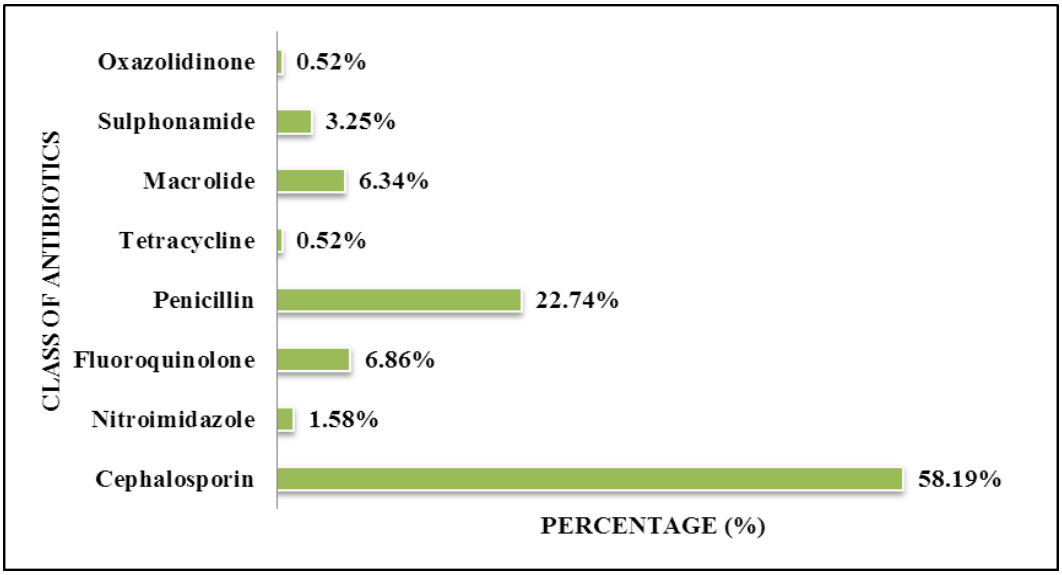

Fig 5: Antibiotics Prescribed During Discharge.

Co-Morbid Conditions

Most of the patients admitted for LRTI were also suffering from co-morbid conditions. Majority of them was having type 2 diabetes mellitus (13.55%) and hypertension (12.42%) and least was hemiparesis (0.56%).

Table 6: Co-Morbid Conditions.

Sl.No.	Co-Morbid Conditions	Number of Patients	Percentage
1.	LRTI + Type 2 diabetes mellitus	24	13.55 %
2.	LRTI + Hypertension	22	12.42 %
3.	LRTI + Dyslipidemia	3	1.69 %
4.	LRTI + Anemia	6	3.38 %
5.	LRTI + Retro viral disease	4	2.25 %
6.	LRTI + Hypothyroidism	3	1.69 %
7.	LRTI + Left ventricular dysfunction	2	1.12 %
8.	LRTI + Ischemic heart disease	4	2.25 %
9.	LRTI + Kidney injury	3	1.69 %
10.	LRTI + Hemiparesis	1	0.56 %

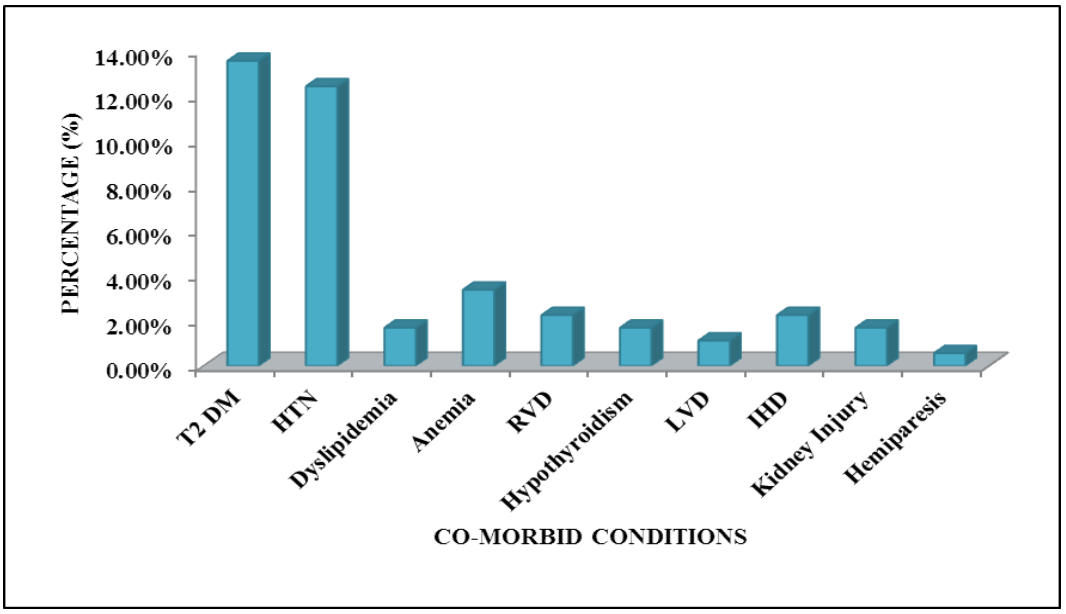

Fig 6: Co-morbid Conditions.

Adjuvant therapy

As the collected data is of LRTIs, the majority of patients were being prescribed medications for Bronchospasm along with supportive therapy which accounts for 300 drugs (30.12%) and least prescribed drugs were for CNS disorders (0.90%).

Table 7: Adjuvant Therapy.

Sl.No	Disease Condition	Number of Patients	Percentage
1.	Allergies	200	20.08 %
2.	Vitamin supplements	41	04.11 %
3.	CNS disorders	9	00.90 %
4.	Pain relievers	117	11.74 %
5.	Cardio vascular disease	114	11.44 %
6.	Diabetes mellitus	43	04.31 %
7.	Gastritis	172	17.26 %
8.	Bronchospasm	300	30.12 %

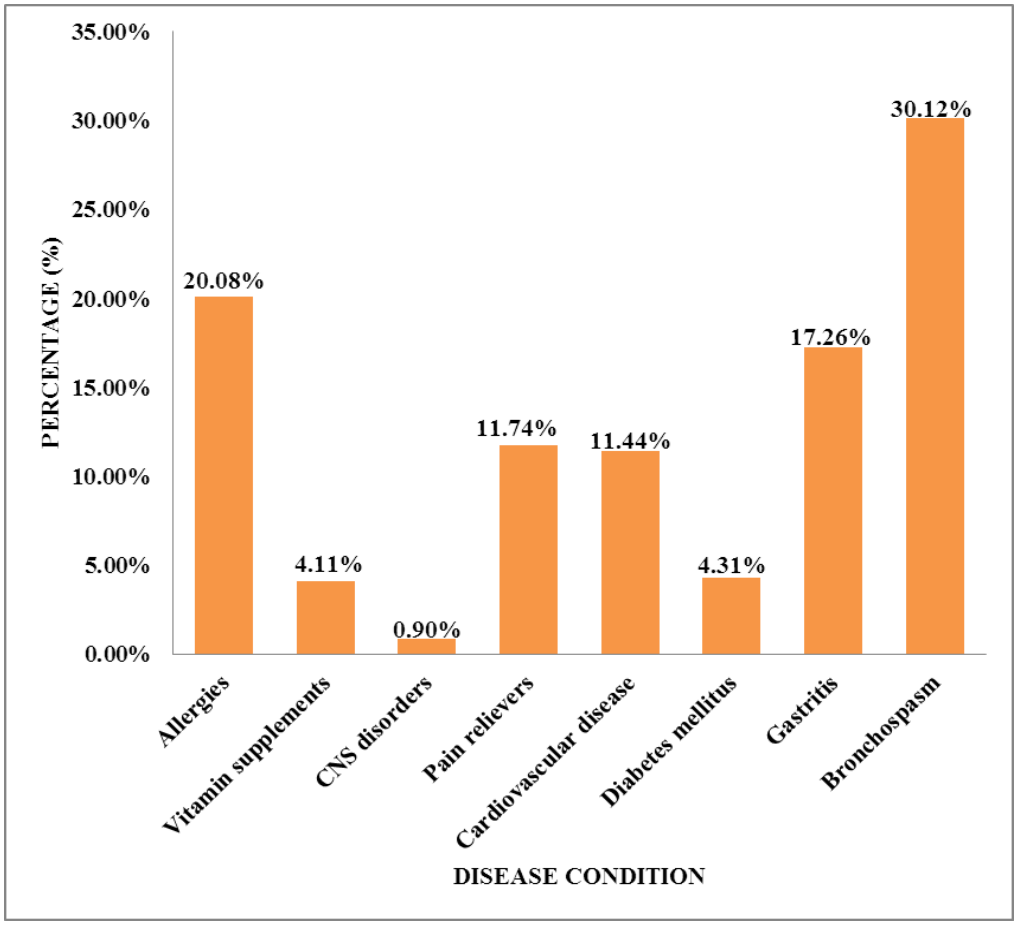

Fig 7: Adjuvant Therapy.

Types of conversion

Out of the 177 patient case records, the majority of the patient's treatment regimen uses switch therapy (60.45%) followed by step-down therapy (24.29%) and sequential therapy (15.25%).

Table 8: Types of Conversion Therapy.

Sl.No.	Type of Conversion	Number	Percentage
1.	Sequential	27	15.25 %
2.	Switch	107	60.45 %
3.	Step down	43	24.29 %

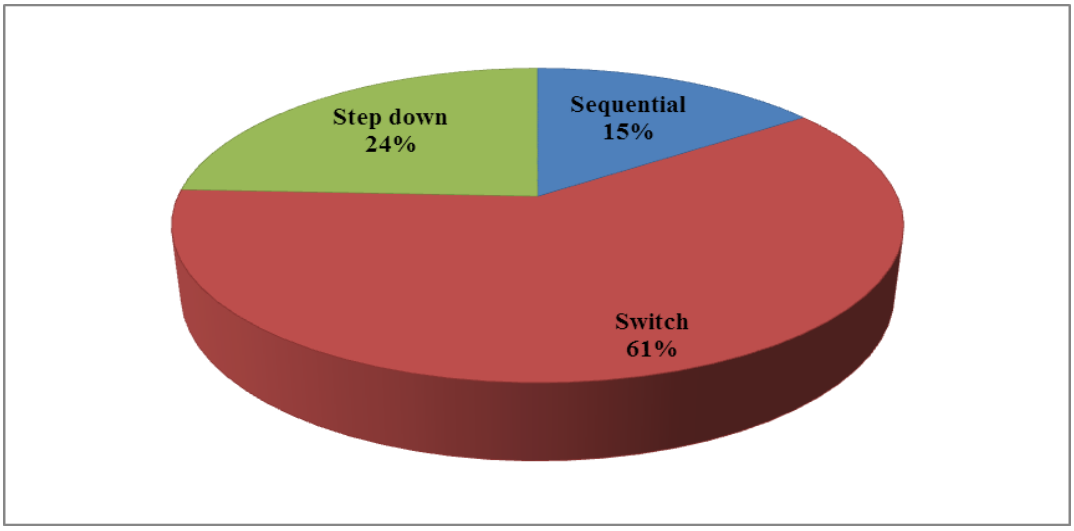

Fig 8: Types of Conversion Therapy.

Categorization based on conversion therapy

In sequential therapy the conversion from inj. Amoxiclav to tab. Amoxiclav is the major conversion (81.48%). In switch therapy the major conversion is inj. Ceftriaxone to tab. Cefixime (80.37%) and in step-down therapy the major conversion is from inj. Ceftriaxone to tab. Azithromycin (46.51%).

Table 9: Categorization based on Conversion Therapy.

Type	Intravenous	Oral	Number of Patients	Total
Sequential	Inj. Amoxiclav	Tab. Amoxiclav	22 (81.48%)	27 (100%)
	Inj. Azithromycin	Tab. Azithromycin	2 (7.40%)	
	Inj. Metronidazole	Tab. Metronidazole	3 (11.11%)	
Switch	Inj. Ceftriaxone	Tab. Cefixime	86 (80.37%)	107 (100%)
	Inj. Cefotaxime	Tab. Cefixime	15 (14.01%)	
	Inj. Cefoperazone	Tab. Cefixime	3 (2.80%)	
	Inj. Cefoperazone	Tab. Cefpodoxime	1 (0.93%)	
	Inj. Ciprofloxacin	Tab. Norfloxacin	2 (1.86%)	
Step down	Inj. Ceftriaxone	Tab. Co-trimoxazole	3 (6.9%)	43 (100%)
	Inj. Ceftriaxone	Tab. Levofloxacin	1 (2.32%)	
	Inj. Ceftriaxone	Tab. Amoxiclav	5 (11.62%)	
	Inj. Ceftriaxone	Tab. Azithromycin	20 (46.51%)	
	Inj. Ceftriaxone	Tab. Linezolid	1 (2.32%)	
	Inj. Pipzo	Tab. Levofloxacin	3 (6.9%)	
	Inj. Pipzo	Tab. Cefixime	5 (11.62%)	
	Inj. Cefotaxime	Tab. Amoxiclav	1 (2.32%)	
	Inj. Amoxiclav	Tab. Cefixime	1 (2.32%)	
	Inj. Ampicillin	Tab. Cefixime	1 (2.32%)	
	Inj. Metronidazole	Tab. Levofloxacin	1 (2.32%)	
	Inj. Amikacin	Tab. Cefixime	1 (2.32%)	

Relationship between type of LRTI and type of conversion therapy

A relationship exists between type of LRTI and conversion therapy since the calculated chi-square value (20.368) was found to be greater than the expected table value (18.307). The degree of freedom was found to be 10 and the P value was 0.05. Hence our study rejects the null hypothesis and accepts the alternative hypothesis.

Table 10: Relationship between Type of LRTI and Conversion Therapy.

Type of LRTI	Sequential Therapy	Switch Therapy	Stepdown Therapy	Chi-Square Value
Asthma	3	18	5	20.3684
Bronchitis	0	4	4	
COPD	3	43	12	
Bronchiolitis	4	3	2	
Pneumonia	14	32	14	
LRTI	3	8	5	

P value = 0.05

Routes of administration

Patients treated with drugs were administered mostly via intravenous route (51.54%), followed by oral route (31.54%), nasal route (14.9%) and the least preferred route of administration was via intramuscular route (1.54%).

Table 11: Routes of Administration.

Sl.No.	Route of Administration	Number of Patients	Percentage
1.	Intravenous	668	51.54 %
2.	Intramuscular	20	1.54 %
3.	Per Oral	414	31.94 %
4.	Intranasal	194	14.96 %

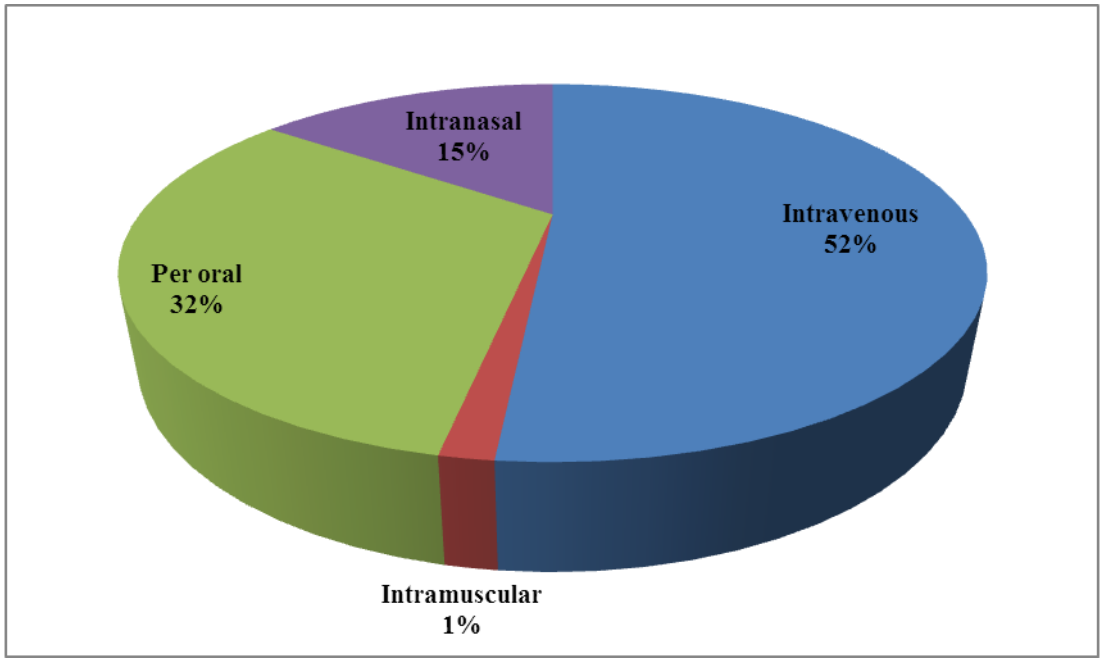

Fig 9: Routes of Administration.

CONCLUSION

Our study concludes that, most of the patients who were admitted for LRTI were males compared to females. Majority of the patients were suffering from pneumonia and COPD. After the analysis of our data, we found that the switch therapy was the most preferred type of conversion therapy. And it was found that the intravenous route of administration was the most preferred route of administration, in which injection ceftriaxone were mostly prescribed upon admission to the hospital and tablet cefixime was the preferred drug of choice for the conversion. Chi-square test was applied to check the relationship between type of conversion therapy and type of LRTIs. The calculated value was greater than the tabular value and hence, we concluded that a relationship exists between the variables. Clinical pharmacist along with physician plays an important role in early switching from intravenous to oral antibiotics to prevent irrational use of antibiotics and to reduce the burden for the patients.

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CONFLICT OF INTEREST

The authors declared no conflict of interest.

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