



# INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X

Impact factor: 4.295

(Volume 4, Issue 4)

Available online at: [www.ijariit.com](http://www.ijariit.com)

## A prospective study on drug utilisation pattern of cephalosporins in respiratory tract infections

Mathew George

[bijuvij075@gmail.com](mailto:bijuvij075@gmail.com)

Pushpagiri College of Pharmacy, Thiruvalla, Kerala

Lincy Joseph

[sonysarovaram@gmail.com](mailto:sonysarovaram@gmail.com)

Pushpagiri College of Pharmacy, Thiruvalla, Kerala

Dr. Sujith K

[sujisreya@gmail.com](mailto:sujisreya@gmail.com)

Pushpagiri College of Pharmacy, Thiruvalla, Kerala

Monisha Mohan

[monishaeruva5663@gmail.com](mailto:monishaeruva5663@gmail.com)

Pushpagiri College of Pharmacy, Thiruvalla, Kerala

### ABSTRACT

*Drug Utilization Pattern is defined by WHO in 1977 as "the marketing, distribution, prescription and the use of drugs in a society, with special emphasis on the resulting medical, social and economic consequences". The aim is to evaluate the Drug Utilization Pattern of cephalosporins in respiratory tract infections. Methods: In a prospective observational study performed over a 6 months period (2017-2018), hospitalized adult patients who received cephalosporins for respiratory tract infections were selected. The collected data included demographic details, information regarding a cough, phlegm, periods of a cough and phlegm, breathlessness, wheezing, chest illness, past illness, tobacco, and smoking. Over the study period, 185 patients were evaluated. Lower Respiratory Tract infected patients (130) 70.3% were more than Upper Respiratory Tract (55) 29.7%. Majority patients came with a complaint of breathing (113) 61.1% difficulty following by acute exacerbation of COPD (39) 21.1%. First, second and third generation cephalosporins were prescribed. Out of which, the third generation were mostly prescribed than the other two; ceftriaxone 51.4% and cefixime 22.2%. Around (83) 44.9% patients were having co-morbid conditions, diabetes followed by hypertension.*

**Keywords**— Cephalosporins, Drug utilisation pattern, Respiratory tract infection, Ceftriaxone

### 1. INTRODUCTION

Drug Utilization Pattern is also referred to as Drug Utilization Evaluation (DUE), Drug Utilization Review (DUR) or Medication Utilization Evaluations (MUE), are defined by WHO as "the marketing, distribution, prescription and the use of drug in a society, with special emphasis on the resulting medical, social and economic consequences". Drug Utilization Pattern encompasses a drug review against predetermined criteria that results in changes to drug therapy when these criteria are not met. It involves a comprehensive review of the patient's prescription and medication data before, during or after dispensing to ensure appropriate medication decision-making and positive patient outcomes.

The principle aim of Drug Utilization studies is to facilitate the rational use of drugs in populations. For the individual patient, the rational use of a drug implies the prescription of a well-documented drug at an optimal dose, together with the correct information, at an affordable price. Without a knowledge of how drugs are being prescribed and used, it is difficult to initiate a discussion on rational drug use or to suggest measures to improve prescribing habits.

Cephalosporins are a group of semisynthetic antibiotics derived from 'cephalosporin-c' obtained from a fungus *Cephalosporium*. They are chemically related to penicillins; the nucleus consists of a  $\beta$ -lactam ring fused to a dihydrothiazine ring. By the addition of different side chains at position 7 of the  $\beta$ -lactam ring and at position 3 of dihydralazine ring, a large number of semi-synthetic have been produced. These have been conventionally divided into 4 generations. All cephalosporins are bactericidal and have the same mechanism of action as penicillin, i.e. inhibition of bacterial cell wall synthesis. However, they bind to different proteins than those which bind penicillins. This may explain differences in the spectrum, potency and lack of cross-resistance.

### 2. OBJECTIVES

- To study the indications for which cephalosporins is prescribed.
- To determine the frequency and usage of cephalosporins.
- To determine the adverse effects and drug interactions of cephalosporins.

- To evaluate the risk factors and complications in the patients with respiratory tract infections.
- To study the rationality of drug use.

### 3. METHODS

This was a prospective observational study performed over a period of 6 months. The Drug Utilisation of cephalosporins in a tertiary care hospital, obtained from General Medicine department of pushpagiri medical college hospital, thiruvalla.

The data were collected in a pre-designed Performa from the patients, medical case sheets, drug charts of 185 patients. This was carried out from both in-patient and out-patient in General Medicine Department. Prescribing data is usually extracted from prescription forms. Data obtained include patient demography, drug name, dosage form, strength, dose frequency, route of administration, and duration of treatment. Both male and female patients aged greater than or equal to 18, infected with respiratory tract infection were identified. Prescription containing antibiotics other than cephalosporins, breastfeeding, and pregnant women were excluded from the study. The data obtained were tabulated and analyzed using statistical methods.

### 4. RESULTS AND DISCUSSIONS

In the 6 month study, a total of 185 patients infected with Respiratory Tract Infections were enrolled as per inclusion and exclusion criteria. All the patients were from both IP and OP department of general medicine.

#### 4.1 A) Number of patients

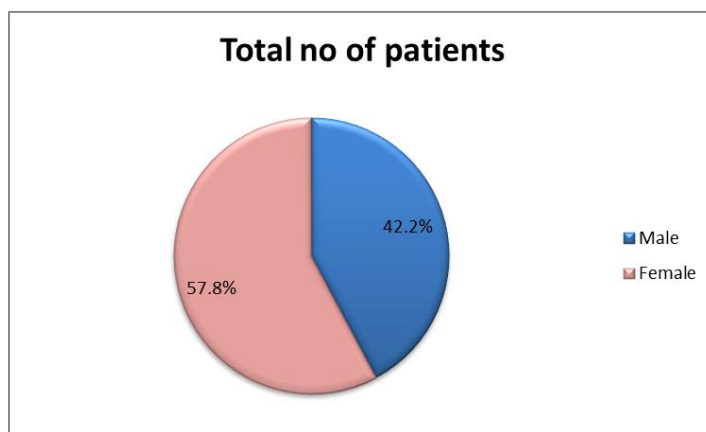


Fig. 1: Out of 185 patients male were 78 (42.2%) and female were 107 (57.8%)

#### B) Distribution of patient's age

Table 1: Distribution of patient's age

S. No	Age in years	Number of patients	Percentage (%)
1	18-20	8	4.3
2	21-30	24	13
3	31-40	17	9.2
4	41-50	33	17.8
5	51-60	39	21.1
6	61-70	32	17.3
7	71-80	19	10.3
8	>80	9	7
<b>Total</b>		<b>185</b>	<b>100</b>
<b>mean</b>		<b>52.19</b>	<b>12.5</b>

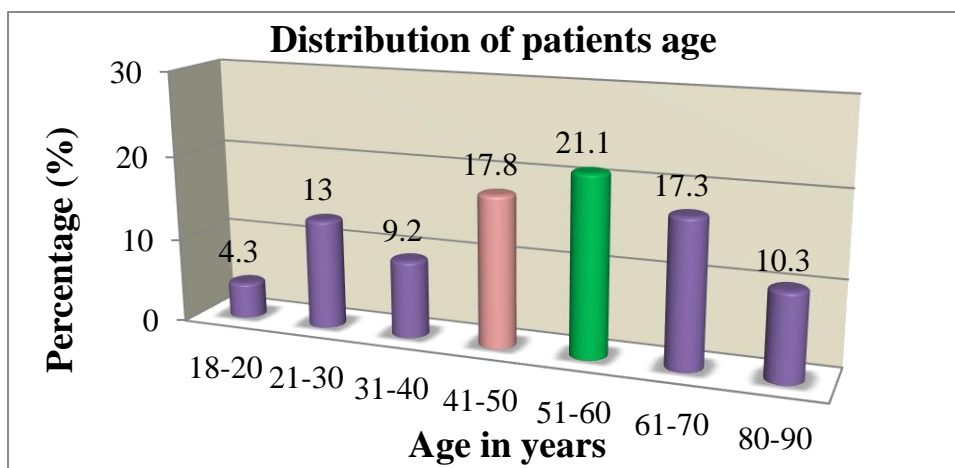


Fig. 2: The majority of 39 patients belonged to age group 51-60 (21.1%), 33 patients belong to age group 41-50 (17.8%) and 32 patients belong to age group 61-70 (17.3%)

Table 2: Cephalosporins prescribed for different indications

Indications	Number	Percentage (%)
Breathing Difficulty	51	27.56
Tonsillitis	31	16.75
Acute Exacerbation of COPD	24	12.97
Sinusitis	14	7.56
Pneumonia	15	8.10
Bronchitis	36	19.45
Pleural Effusion	2	1.08
Pulmonary Edema	5	2.70
Running nose	7	3.78

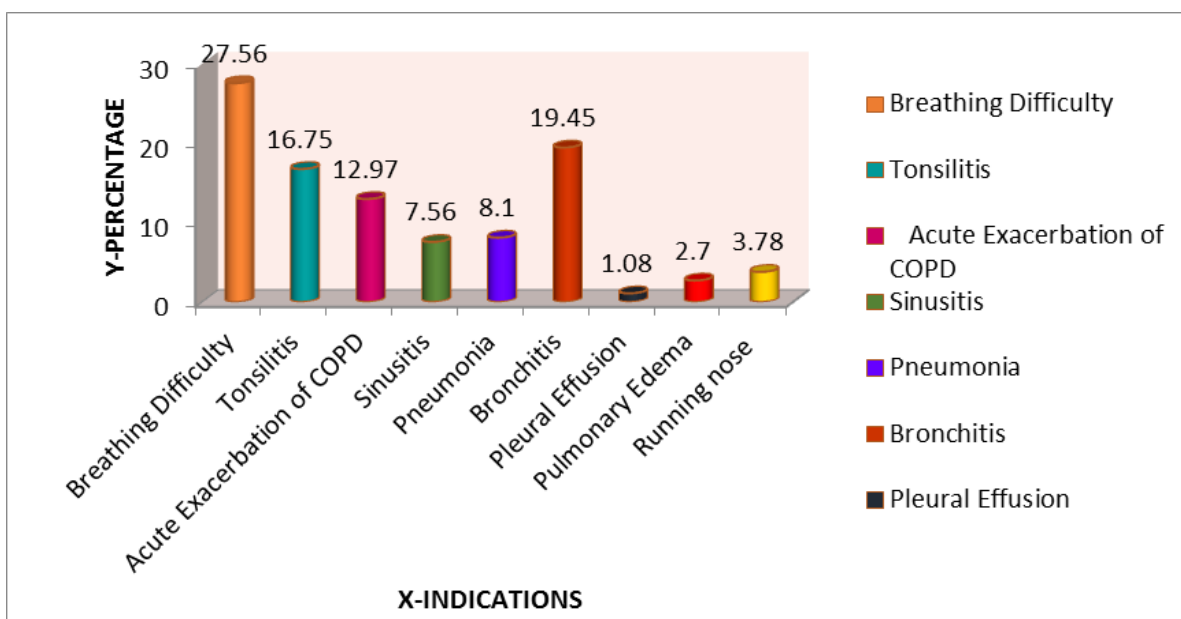


Fig. 3: Indications for which cephalosporins is prescribed

From the study breathing difficulty was found to be the common diagnosis of respiratory tract infection followed by bronchitis.

4.3 The frequency of use of cephalosporins

Table 3: Cephalosporins prescribed for particular indications among the patients

Diagnosis	Number of patients									
	CEFADROXIL+CLAVULANIC ACID	+ CEFIXIME CLAVULANIC ACID	CEFIXIME	CEFTRIAZONE	+ CEFTRIAZONE SULBACTAM	CEFUROXIME	+ CEFUROXIME CLAVULANIC ACID	CEFOTAXIME	CEFPODOXIME	+ CEFPODOXIME CLAVULANIC ACID
Breathing difficulty	9	-	-	29	13	-	-	-	-	-
Tonsillitis	3	10	5	-	-	3	5	-	2	3
Acute exacerbation of COPD	-	-	-	18	-	-	3	3	-	-
Sinusitis	2	3	4	3	-	-	-	-	1	1
Pneumonia	-	-	-	6	8	-	-	1	-	-
Pleural effusion	-	-	-	2	-	-	-	-	-	-
Pulmonary edema	-	-	-	5	-	-	-	-	-	-
Running nose	-	3	2	-	-	-	-	-	-	2
Bronchitis	4	12	2	8	3	5	-	-	1	1

4.4 Drug Utilisation Pattern of cephalosporins among the study populations

Table 4: Cephalosporins prescribed among the study populations

Cephalosporins	Number of female	Percentage (%)	Number of male	Percentage (%)
Cefadroxil+ Clavulanic acid	10	9.34	8	10.25
Cefixime+ Clavulanic acid	13	12.14	15	19.26
Cefixime	6	5.64	7	8.97
Ceftriaxone	46	42.99	25	32.05
Ceftriaxone +sulbactam	11	10.28	13	16.66
Cefuroxime	3	2.80	5	6.41
Cefuroxime+ clavulanic acid	7	6.54	1	1.28
Cefotaxime	3	2.80	1	1.28
Cefpodoxime	3	2.80	1	1.28
Cefpodoxime+clavulanic acid	5	4.67	2	2.56
<b>Total</b>	<b>107</b>	<b>100</b>	<b>78</b>	<b>100</b>

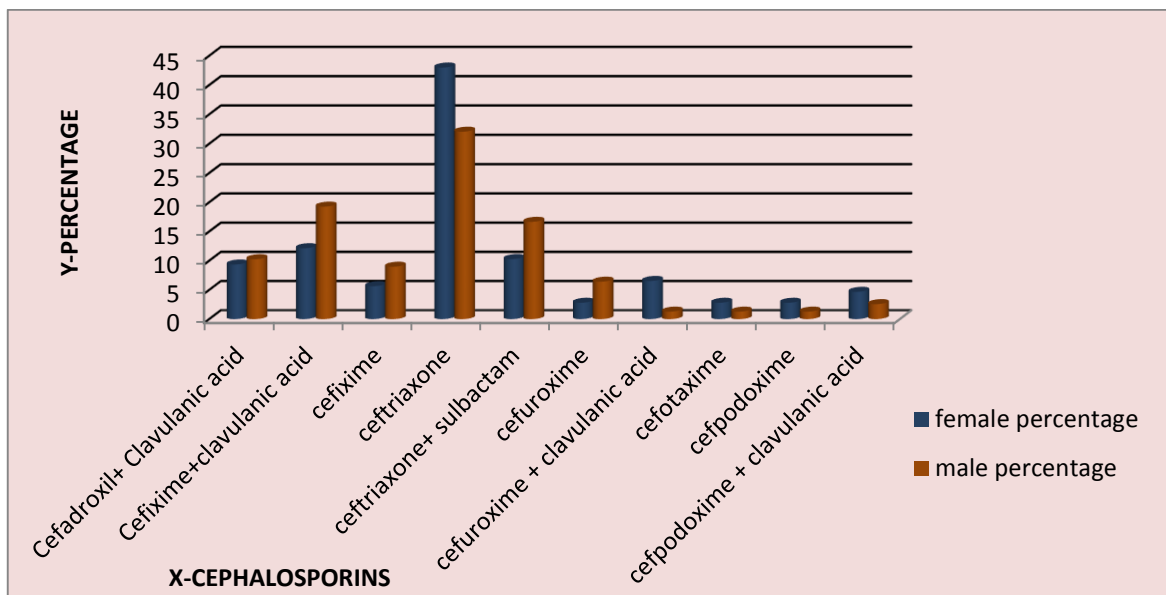
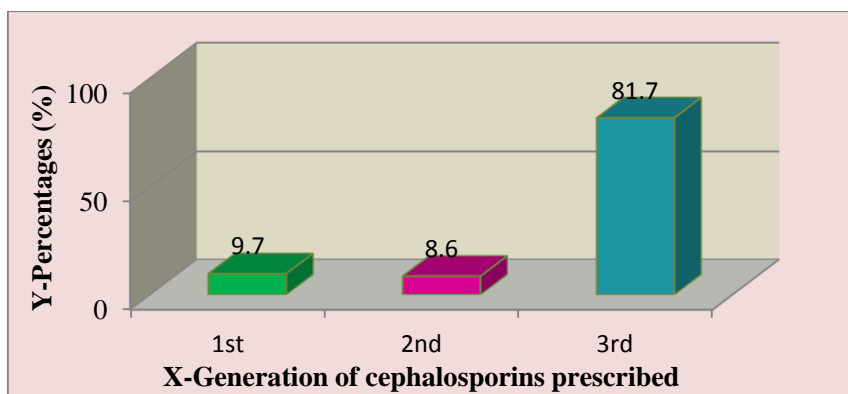


Fig. 4: The figure shows the Drug Utilisation Pattern of cephalosporins among the study populations. Ceftriaxone was most prescribed cephalosporins in the given populations

4.5 Generation of cephalosporins prescribed in the study



4.6 Classification of drug-drug interaction based on a severity scale

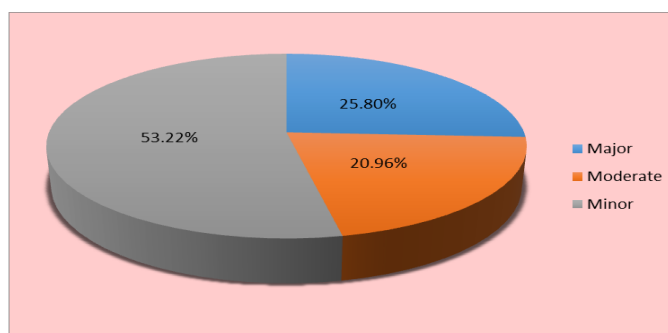


Fig. 5: DDIs based on a severity scale

4.7. Drug groups involved in Drug-Drug interaction with cephalosporins

Table 5: Drug groups involved in the DDIs

Drug groups	Number of DDIs	Percentage (%)
Anticoagulant	25	40.32
Diuretic	17	27.4
Antacid	12	19.3
PPIs	8	12.9
<b>Total</b>	<b>62</b>	<b>100</b>

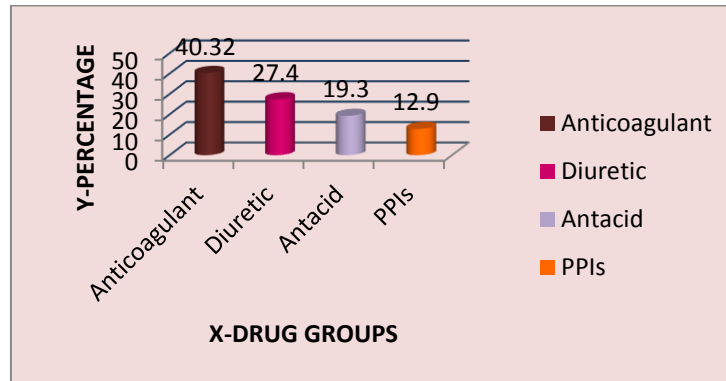


Fig. 6: Drug groups involved in drug-drug interactions with cephalosporins

4.8 Co-morbid conditions in the respiratory tract infected patients

Table 6: Co-existing disease condition in the infected patients

S. No	Co-morbid conditions of the patients	Number of patients	Percentage (%)
1	None	102	55.13
2	DM	27	14.59
3	HTN	13	7.05
4	CKD	5	2.70
5	SEIZURE	4	2.16
6	ARTHRITIS	6	3.24
7	ASTHMA	6	3.24
8	HTN,DM	17	9.18
9	HTN,CKD	5	2.702

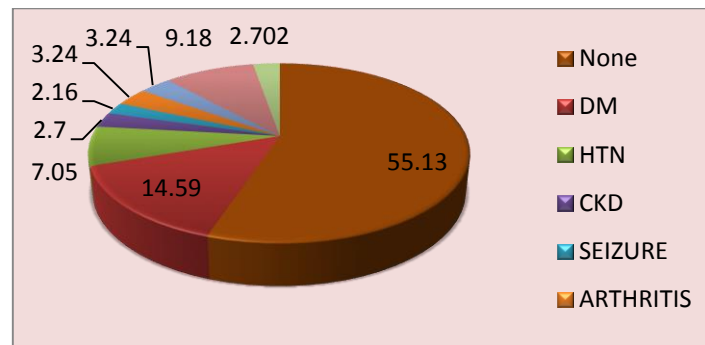


Fig. 7: Co-morbid conditions of the patients, that is the patient having the co-existing diseases when presented with RTIs

4.9 Smokers and drinkers

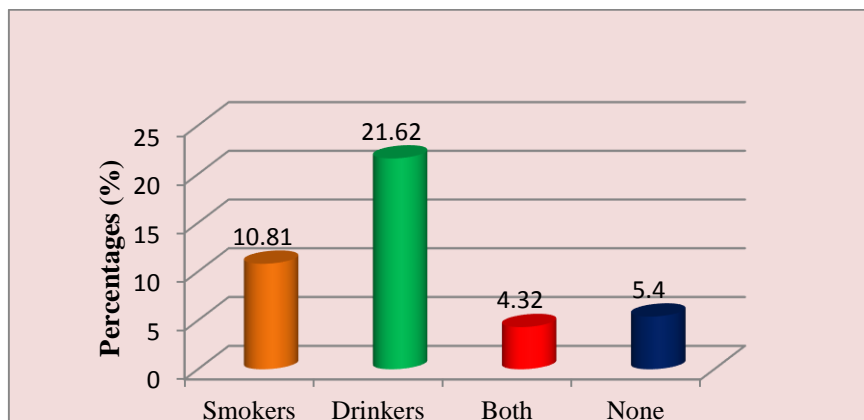


Fig. 8: smokers and drinkers who were presented with RTIs.

*George Mathew et. al; International Journal of Advance Research, Ideas and Innovations in Technology*  
Among 185 patients enrolled in the study, the following result was obtained:

**Gender:**

- Female patients (107) (57.8%) were more than male patients (78) (42.2%).
- Mean value was found to be 92.5.
- Mean percentage was found to be 50%.

**Age:**

- 39 (21.1%) Patients belongs to the age group 51-60 were more prone to infections.

**Patients:**

- In-patient (110) was more in number compared to out-patient (75).

**Type of infections:**

- 133 (71.89%) patients came with LRTIs.
- 52 (28.10%) patients came with URTIs.
- Breathing difficulty (51) (27.56%) affecting the LRT was found more following to bronchitis (36) (19.45%).

**Prescribing pattern of cephalosporins:**

- First, second and third generation cephalosporins were prescribed.
- Third generation cephalosporin-ceftriaxone was mostly prescribed for in-patients and cefixime was prescribed for out-patients.
- From the third generation cephalosporins, cefpodoxime and was also being prescribed.
- Also, cefadroxil from the first generation and cefuroxime from the second generation were prescribed to the infected patient.

**Route of administration:**

- Intravenous route was preferred than the oral route.

**Co-Morbidity conditions:**

- 83(44.9%) patients with co-morbid conditions have been presented in the hospital with RTIs.
- Out of this, Diabetic patients were more infected with RTIs followed by the Hypertensive patient.

**Drug-drug interactions:**

- 62 drug interactions were found during the prescription analysis. Out of which, 16 major, 13 moderate and 33 minor drug interactions were found. 50 drug interactions were pharmacodynamics and 12 drug interactions were pharmacokinetic. Drug groups involved in the DDIs were described in table 12. The tools for finding the DDIs was Micromedex.com, Drugs.com.

**Adverse drug reactions:**

- Third generation cephalosporins were found to be the most prescribed class of drugs among the study populations. The adverse effects of third-generation cephalosporins are pain and phlebitis at the site of injection, immediate and delayed hypersensitivity reactions, various hematological disorders, nephrotoxicity, hepatotoxicity, GI disturbances. But the incidence of these ADR is very low according to FDA. No adverse drug reactions were found in this study. The patient unable to recognize the minor symptoms occurring along with their disease condition may be the reason for unable to find the ADR.

Smoking and drinking are having a major impact on the respiratory tract infections. 20 (25.64%) patients were smokers, 40 (51.28%) patients were drinkers, 8 (10.25%) patients were using both and 10 (12.82%) patients were belonging to the category none.

Around 185 patients enrolled in the study, female were found more than the male. From this study, we cannot conclude that the females are more infected with this type of infection than the male. Maybe some socio-economic factors be the reason for this type of findings.

Age can be considered as one of the reasons for this type of infections. Systemic immune responses particularly the cellular and humoral components of adaptive immunity, however gradually decline with advancing age and are thought to be a major risk factor for lower respiratory tract infections. The age-associated decline in immune function has provided the rationale for vaccination against the most common bacterial and viral pathogens (pneumococcus and influenza A) as a preventive measure against lower respiratory tract infection. Cigarette smoke has a major impact on health issues worldwide. Many of the healthcare consequences of cigarette smoking could be related to its ability to compromise the immune system, and a constant low level of infection that may be responsible for the pathogenesis of inflammatory disease induced by smoking.

Alcoholic lung disease is a significant public health concern and understanding its mechanism should enable to develop effective therapeutic intervention and treatment. Immunosuppression due to acute or chronic alcohol abuse appears to be a significant risk factor in the initiation and progression of diseases. Impaired alveolar epithelial barrier functions, mucociliary clearance, increased renin-angiotensin activity are the major effects of acute and chronic alcohol abuse. Oxidative metabolism of ethanol and its associated oxidative stress have been suggested as an underlying mechanism of alcoholic lung disease.

Diabetes mellitus was found to be the most common co-morbid condition among the patients with respiratory tract infections. Immune system dysfunction in people with diabetes may be mediated through impaired migration, phagocytosis, intracellular killing, and chemotaxis. Indeed, several studies have suggested that people with diabetes are at an increased risk of infection-related mortality. Exposure to persons with respiratory complaints, both inside and outside the household, is a risk factor with an acute respiratory tract infection. While it may be difficult to intervene on this risk factor, transmission of respiratory infections might be reduced by improved hygienic conditions.

## 5. CONCLUSION

Infections of the respiratory tract are among the most common causes of antibiotic prescribing. The diagnosis within the community is generally limited to clinical criteria, and the microbiological information is frequently lacking. Hospitalized patients are more likely to undergo diagnostic sampling, but difficulties remain in reliably defining a microbial etiology, thereby providing a confident basis for antibiotic selection. In this study, very few antibiotics were found to be prescribed in brand names while analyzing the prescription. Cephalosporins were usually prescribed in a generic name. This has been done may be the prescribers have no role in purchasing and dispensing of particular brand medicine. Most of the patient consulting in the OP department are not undergoing the culture sensitivity test and less number of patients were undergoing this test in the IP department. The decrease in the percentage of culture might be based on the clinical presentation at the time of admission or patient might have consumed the antibiotic prior to admission. A large percentage of sterile culture might be attributed to this and also to the viral cause of illness and, or proper specimen might not have collected. This is found to be the major impact in the rational use of drugs. Hence, the rationality of drug is found to be irrational.

## 6. REFERENCES

- [1] Introduction to Drug Utilisation Research 2003.pg.6
- [2] Navarro et al.Drug Utilisation Review Strategies.AMCP.2008; PG.215-229
- [3] Anne Meneghetti.Upper Respiratory Tract Infections.medscape.2016;pg.1-6
- [4] K.D.Tripathi.Essentials Of Medical Pharmacology,7<sup>th</sup> edition; pg no.716-733
- [5] Mohd.Muhammad et. al.Drug Utilisation Pattern of cephalosporins in tertiary care hospital. Biomedical Research 2017; 28 (13): 6095-6102
- [6] Arul B., Rangabashyam S. R., Kothari R., Bobby Mathew Thomas, Elavarasi M., Glory M. Abraham.Drug Utilisation Review of cephalosporins in tertiary care hospital-A Retrospective Study. World journal of pharmacy and pharmaceutical sciences.2017; 6(9):1737-1743.
- [7] Dr.Bandari Kiran, Dr.Md.Abuzar Ghujran, Dr.T.S.Sunil Kumar, Dr.D.Shravan Kumar.The Drug Utilisation of cephalosporins in a tertiary care hospital. World journal of pharmacy and pharmaceutical sciences.vol.5 issue 1201-1216
- [8] C.Suhas Reddy, Hamid Reza Davoudi, Binai K.Shankar, Ahamada Safna Mariyam m.Drug Utilisation evaluation of cephalosporins in the general medicine and general surgery department in a tertiary care teaching hospital.Am.J.Pharm Health Res 2015,154-164.
- [9] Kiran Nagaraju, Neda Mohammadi Fard, G. Surekha and Patel Vishal S Amir Bolouri. Drug Utilisation Evaluation of cephalosporins, macrolides, quinolones antibiotics in KIMS hospital. IJRPC 2014, 4(4), 841-849.
- [10] Jyothi k, Jagdish Babu.D; Drug Utilisation Evaluation of cephalosporins in General Medicine units of rural tertiary care hospital.IntjcurrPharmRes.2012;4(2):88-91
- [11] Rama Ganguly, Myron R. Szewczuk.Age and Immunity to Respiratory Tract Infections.1989; 12:25-35.
- [12] Ashish J Mehta, David M Guidor.Alcohol abuse, the alveolar macrophage, and pneumonia.The American journal of medical sciences.2012; 343:244-247.
- [13] Lata Kaphalia, William J. Calhoun. Alcoholic lung injury: Metabolic, biochemical and immunological aspects.2013:171-179.
- [14] Harish Govind Naik, Chitra C Khanwelkar, Ashwini Kolur. drug utilization study on antibiotics use in lower respiratory tract infection.2013;3(4):324-327
- [15] Fernando Saldias and Orinaldo Diaz.Cigarette smoking and lower respiratory tract infection.2011;67-86
- [16] B.Chitra, Sanoj Panicker.Drug Utilization Evaluation of antibiotic at a tertiary care hospital.ijppr.2016;7(3).350-359
- [17] Drupad H.S., Nagabhushan H, Prakash G.M.Prospective observational study of antimicrobial drug utilization in medical institute care unit in a tertiary care teaching hospital.ijpr.2016;6(1):13-17
- [18] Javier Garau, Walter Wilson, Martin Wood. Fourth-generation cephalosporins: a review of in vitro activity, pharmacokinetics, pharmacodynamics and clinical utility. Clinical microbiology and infection.1997; 3(1):87-101.