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DRUG UTILIZATION STUDY ON PATIENTS WITH RESPIRATORY TRACT INFECTION AT A TERTIARY CARE TEACHING HOSPITAL, DAVANGERE

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ABSTRACT

Objective: The aim of the study was to evaluate drug utilization pattern in patients with respiratory tract infections at a tertiary teaching hospital. **Materials and Methods:** A prospective observational study was carried out for a period of 6 months among 140 patients in Chigateri District Hospital, Davangere based on inclusion and exclusion criteria and data was collected from patient case sheet, laboratory analysis report and past medical and medication history. **Results:** A total of 140 patients were enrolled into the study according to the inclusion criteria. Among all RTIs COPD (19.28%) was found to be more prevalent followed by tuberculosis (16.42%). Our study observed that males (71.42%) are more prone to infections than females (28.57%). A total of 906 drugs were found in the prescription of which 198 drugs were antibiotics followed by bronchodilators (8.27%), anti-histamines (4.41%), corticosteroids (7.94%). Among all antibiotics ceftriaxone was found to be 49.49%. Various FDC include piperacillin + tazobactam (31.3%), montelukast + levocetirizine (24.34%), Acebrophylline + acetylcysteine (21.73%). **Conclusion:** The present study was conducted to analyse rational prescribing of drugs in patients with RTI. Piperacillin + tazobactam was the commonly prescribed combination therapy. As most of the drugs were prescribed by their brand names it is necessary to promote prescribing by generic name. From this study it is concluded that drug utilization studies can provide feedback to physician and promote rational prescribing of drugs enabling better patient care in the management of RTI.

KEYWORDS: Respiratory tract infections, Drug utilization, Antibiotics, Generic drugs, LRTI, URTI, FDC.

INTRODUCTION

The Respiratory tract is a network of organs and tissues that plays a vital role in breathing process and a major target site for the entry of toxic agents. The primary function of respiratory tract is gas exchange, olfaction and protection against noxious agents. It has an elaborate system of host defences including humoral immunity, cellular immunity, and anatomic mechanism.[1] When functioning properly the host defences of the respiratory tract are markedly effective in protecting against pathogen invasion and removing potentially infectious agents. It has been estimated that an individual ingests about 8 microorganisms per minute or 10,000 per day.[2] Infections to the respiratory system is a severe human illness and it is one of the leading infectious diseases existing worldwide as they cause an increased morbidity among individuals of all age groups and people with immune system disorders are at risk of developing infections.

Infectious disease remains a significant threat to public health, risk to individuals regardless of age, gender, ethnic, background, socioeconomic status or lifestyle.[3] It is frequently the first infection to occur after birth and pneumonia is too often the final illness before death.[2] The various factors causing respiratory disorders includes genetics, allergies, smoking, air pollution and foreign pathogens. The causative agents of RTI are either bacterial or viral pathogens of which bacterial origin is associated with high morbidity and mortality. According to WHO 6.8% RTI deaths are reported every year. The frequency of respiratory infections depends on the exposure of individuals to infectious agent, their intensity and pathogen virulence drive differences.[4] According to American thoracic society there is a direct relationship between exposure to particulates, morbidity and mortality. Gaseous pollutants such as ozone, Sulphur dioxide and organic irritants are the other factors that may contribute to RTI. The primary cause of death appears to be cardiopulmonary incidents in persons with compromised cardiopulmonary function and individuals with asthma are at a greater risk. Based on the part of respiratory tract that is being infected it can be classified as:

- Upper respiratory tract infections (URTI):- it includes common cold, influenza, laryngitis, pharyngitis, otitis media, sinusitis and tonsillitis.
- Lower respiratory tract infections (LRTI):- it includes asthma, bronchitis, bronchiolitis, COPD, pneumonia and tuberculosis.

Other underlying conditions include pleural effusion which is a term used to describe the accumulation of abnormal quantity of fluid in the space between lungs and chest wall. Another condition affecting the pleura is the pneumothorax where the air may get into the space between chest wall and lungs and mesothelioma is rare form of cancer that forms on the pleura. As RTI are the leading cause of morbidity it is necessary to carry out preventive measures to avoid exposure to infections. Various measures to be taken includes: smoking cessation, sufficient rest, long term oxygen therapy (LTOT), rehabilitation, non-invasive positive pressure ventilation (NPPV), physiotherapy, avoid exposure to agents that trigger the respiratory tract, use of vaporization may help to loosen respiratory secretion, and patient should be encouraged to drink fluids to decrease the viscosity of respiratory secretion.[5]

Medications that are prescribed in respiratory tract infections are not only to eradicate the infection but also to enhance the functioning of the respiratory system. Some medications used include:

- Antibiotics are specifically used against bacteria which may kill or inhibit the growth of bacteria but not effective against virus. Antimicrobial therapy shown to provide 95% of resolution for the developed symptoms. Antibiotics are been prescribed either for prophylactic or therapeutic reasons. They are more commonly used as a first line agent in the management of lower respiratory tract infection. Though they offer several benefits with infectious disease but inappropriate use may cause serious risk, health complications without any therapeutic effects.[6]

- Bronchodilators are medications used to relax airway muscles making it easier to breathe. Bronchodilators can be sub-divided into β-sympathomimetic, methylxanthines, and anticholinergics as well as been classified as short acting or long acting. Bronchodilators improve the effectiveness of cough in clearing secretions by increasing surface velocity of air flow during cough.[7]

- Corticosteroids are widely used anti-inflammatory and immune suppressive agents, most effective in the treatment of RTI which helps to suppress chronic air way inflammation. Even though lifesaving drugs that may produce adverse reactions which may be mild or life threatening. They are often used in combinations with bronchodilators. Oral corticosteroids should only be used if the symptoms cannot be controlled with maximum doses of steroids and bronchodilators.[1]

- Hypersecretion of mucus is a common characteristic in acute and chronic respiratory conditions. Expectorants are primarily used against this mucus and making it clear from the respiratory tract.

Other agents used in the management of RTI include antitussives, decongestants such as antihistamine and phenylephrine, NSAIDs, antiviral drugs, inhalation therapy, mucolytics.

According to WHO drug utilization is defined as the marketing, distribution, prescription and use of drugs in society with particular focus on medical, social and economic constituents. It involves review of patient's prescription and medication data before, during and after dispensing in order to assure appropriate therapeutic decision making and positive patient outcomes.[8] Drug utilization plays an important role in medical audit as it reports a quality, extend and outcome of drug exposure, inappropriate use of antibiotics has contributed a major problem to the public health due to the rise in the antibiotic resistance in the community. Drug utilization review assures the quality care and sustainability drug therapy to the patient in health management. Rational use of drugs aims to reduce drug related adverse events, development of resistance to microorganisms and decrease cost of the treatment and to ensure that patient receive medications that are appropriate to clinical needs, adherence, and drug availability in adequate dose for sufficient duration of time.[9]

METHODOLOGY

A prospective observational study was carried out for a period of 6 months among 140 patients in Chigateri District Hospital, Davangere. The ethical clearance for the study was obtained from Institutional Ethical Committee of SCS College of Pharmacy. The study was carried out by relying on inclusion criteria such as Cases with comorbid conditions, Patients admitted for more than 2 days, Patients with all age groups and newly detected and known cases of respiratory tract infections and data was collected from patient case sheet, laboratory analysis report and past medical and medication history. Data was collected in a well designed data collection form and Data was analyzed using Microsoft excel (descriptive analysis).

RESULTS

Our study analyzed 140 patients with RTIs after getting informed consent. The demographic details and prescribing pattern of drugs were collected in a suitable data collection form. The filled forms were analyzed to evaluate drug utilization of patients with RTI.

➢ **Socio-demographic details of the participants**

A total of 140 patients with RTI were enrolled into the study. Out of which the majority of the patients belonged to 61-70 age group 38 (27.14%) followed closely by 51-60 age group 27(19.28%). Only 2(1.42%) of the patients were in the age group of 11-20 years affected among the total study population and males was found to be more 71.42 % (100) when compared to females 28.57 % (40).

Table 1: Socio-demographic details of the participants.

Socio-demographic details(N=140)		Number(n)	Percentage (%)
Age (Years)	0-10	13	9.28
	11-20	2	1.42
	21-30	13	9.28
	31-40	20	14.28
	41-50	14	10
	51-60	27	19.28
	61-70	38	27.14
	>70	13	9.28
Gender	Male	100	71.42
	Female	40	28.57

➢ **Disease prevalence in RTI**

In our study the most commonly diagnosed disease was found to be LRTI. Of which COPD was more 27(19.28%) followed by TB 23(16.42%), Unspecified LRTI 22(15.71%), Asthma 17(12.14%), PE 14(10%), and SARI 10 (7.14%). Bronchitis, pneumonia and sinusitis were 6(4.28%), bronchiolitis and otitis media were 3(2.14%) and bronchiectasis 2(1.42%).

Table 2: Disease prevalence in RTI.

Diseases		Number(n)	Percentage (%)
URTI	Sinusitis	6	4.28
	Otitis media	3	2.14
LRTI	Asthma	17	12.14
	Pleural effusion	14	10
	TB	23	16.42
	COPD	27	19.28
	SARI	10	7.14
	Unspecified LRTI	22	15.71
	Bronchitis	6	4.28
	Pneumonia	6	4.28
	Bronchiectasis	2	1.42
	Cystic ILD	1	0.71
	Bronchiolitis	3	2.14
Total (N)		140	100%

➢ **Drugs prescribed in the management of RTI**

Our study observed that a total of 906 drugs were prescribed which includes 198(21.85%) antibiotics, bronchodilators 75(8.27%), antihistamines 40(4.41%), leukotriene antagonist 28(3.09%), ATT 35(3.87%), corticosteroids 72(7.94%) and mucolytics 61(6.73%).

Table 4.1 depicts the various classes of drugs that are particularly prescribed in the treatment of RTI

Table 4.2 shows other classes of drugs that were prescribed for various other conditions seen along with RTI during our study period namely Anti-pyretics, analgesics, antihypertensives, antidiabetics etc.

Table 3.1: Pattern of drug prescription in RTI.

Drug class	Drug name	Number(n)
Antibiotics	Ceftriaxone	98
	Azithromycin	46
	Penicillin	39
	Amoxicillin	02
	Doxycycline	08
	Levofloxacin	03
	Clarithromycin	01
	Ciprofloxacin	01
	Total (N)	198(21.85%)
Bronchodilators	Etophylline	18
	Theophylline	24
	Acebrophylline	33
	Total (N)	75(8.27%)
Antihistamines	Cetirizine	38
	Chlorpheniramine maleate	02
	Total (N)	40(4.41%)
Leukotriene antagonist	Montelukast	28(3.09%)
Anti-tubercular drugs	Isoniazid	09
	Rifampicin	10
	Ethambutol	09
	Pyrazinamide	04
	Streptomycin	03
	Total (N)	35(3.87%)
Corticosteroids	Hydrocortisone	37
	Dexamethasone	23
	Prednisolone	12
	Total (N)	72(7.94%)
Nasal decongestants	Phenylephrine	04(0.44%)
Mucolytics	N-acetylcysteine	61(6.73%)

Table 3.2: Various classes of drugs prescribed for each type of RTI during the study period.

Drug \ Diseases	Asthma	Pneumonia	PE	TB	COPD	SARI	LRTI	Bronchitis	Bronchiolitis	Bronchiectasis	Cystic ILD	Sinusitis	Otitis media
Antibiotics	17	8	20	30	42	15	37	9	1	2	1	12	4
Bronchodilators	17	6	5	6	23	2	6	1	-	1	-	-	-
Antihistamines	6	1	5	5	15	5	9	3	-	-	-	2	1
Leukotriene antagonist	7	1	2	4	13	5	4	6	-	-	-	1	-
Anti-pyretic and analgesics	1	4	11	15	8	6	18	8	2	4	1	8	6
Corticosteroids	13	5	9	9	22	6	8	3	-	-	-	2	-
Anti-viral	2	4	-	-	3	3	-	-	-	-	-	-	-
Diuretics	6	-	12	3	10	6	6	-	1	1	-	-	-
Anti-hypertensives	10	-	2	1	11	1	12	1	1	2	-	-	-
Antiemetic	-	-	2	5	2	2	5	-	-	-	-	1	1
ATT	-	-	-	35	-	-	-	-	-	-	-	-	-
Anti-diabetic	2	2	1	3	4	5	4	-	1	1	-	-	-
Anticoagulant	1	2		1	3	4	1	-	-	1	-	-	-
Anticonvulsant	-	-	2	1	-	1	1	-	-	-	-	-	-
Mucolytic agents	10	6	3	4	15	8	7	4	2	2	-	-	-
Acid reducing agent	10	4	13	24	25	11	16	5	1	2	-	4	3
Nasal decongestants	-	-	-	-	-	-	-	-	-	-	-	4	-
Total(N)	102	43	87	146	197	80	134	41	9	16	2	34	15

- **Commonly prescribed antibiotics**

Among all the antibiotics ceftriaxone (49.49%) was found to be more predominant than others followed by azithromycin (23.23%), penicillin (19.69%).

Table 4: Most commonly prescribed antibiotics.

Antibiotics	Number (n)	Percentage (%)
Ceftriaxone	98	49.49
Azithromycin	46	23.23
Penicillin	39	19.69
Amoxicillin	02	1.01
Doxycycline	08	4.04
Levofloxacin	03	1.51
Clarithromycin	01	0.50

Ciprofloxacin	01	0.50
Total(N)	198	100%

- **Fixed dose combinations**

Only six FDC were prescribed in 140 prescriptions among them piperacillin + tazobactam (31.3%) were mostly prescribed followed by Montelukast +Levocetirizine (24.34%), Acebrophylline + Acetylcysteine (21.73%), Etophylline + Theophylline (13.91%), Amoxicillin + Clavulanic acid (6.95%) and Tramadol + PCT (1.73%).

Table 5: Number of FDC drugs prescribed.

FDC	Number(n)	Percentage (%)
Montelukast +Levocetirizine	28	24.34
Tramadol + PCT	2	1.73
Piperacillin + Tazobactam	36	31.3
Acebrophylline + Acetylcysteine	25	21.73
Amoxicillin + Clavulanic acid	8	6.95
Etophylline + Theophylline	16	13.91
Total (N)	115	100%

- **Associated illness with RTI**

During our study period we found that HTN was the most commonly seen comorbidities along with RTI followed by Anaemia and DM.

Table 6: Associated illness with RTI.

Comorbidities	Number (n)	Percentage (%)
HTN	18	25
Anaemia	15	21
DM	12	17
Others	8	11
TB	6	8
IHD	4	6
Hydropneumothorax	3	4
COPD	3	4
Thrombocytopenia	3	4
Total(N)	72	100%

Table 7: Prescribing indicators.

Prescribing indicators	Value obtained
Average number of drugs per prescription	6.47
Percentage of drugs by generic name	42.71%
Percentage of encounters with an injection prescribed	46.30%
Percentage of antibiotics prescribed per prescription	21.85%

DISCUSSION

As RTI accounts for a large percentage of consultations it became commonest of infections. We carried out study with 140 patients who are diagnosed with RTI with or without comorbidities. Our study observed that prevalence of respiratory disease were more in male 100 (71.40%) than females 40(28.57%). Majority of the patients belonged to the age group of 61-70yrs (27.14%) which is similar to the study conducted by Preetha selva *et al*.[10] Among the various respiratory diseases analyzed most of the patients were diagnosed with LRTI of which COPD was more prominent compared to other RTI which is in accordance to the study by Avula N *et al*.[11] The study also revealed that the HTN was the most commonly seen comorbidity among the study population. HTN was the similar comorbidity obtained from the study conducted by Sujata J *et al*.[12]

A total of 906 drugs were prescribed in the management of RTI with or without comorbidities in which antibiotics were more predominantly prescribed. Percentage of antibiotics prescribed per prescription was 21.85% which is in accordance with the WHO indicators (<30%). A total 8 types antibiotics of different classes were used in the treatment of RTI among them ceftriaxone (49.49%) was found to be preponderance out of all the antibiotics and Divya K *et al*[13] also highlighted the use of ceftriaxone followed by azithromycin in their study. Distribution of antibiotics was higher in COPD 42(21.21%) followed by LRTI 37(18.68%). Apart from antibiotics most frequently prescribed class was bronchodilators which includes etophylline (24%), theophylline (32%) and acebrophylline (44%). Cetirizine and chlorpheniramine malate were prescribed as antihistamines and phenylephrine was prescribed among the nasal decongestants which is similar to the previous study. Other class of drug observed during the study period are presented in table 3.2. Out of all prescriptions analyzed PCT was the only analgesic/antipyretic which is found to be 10.15%. This is found to be appropriate as most of the RTI are presented with fever. Other than drugs IVF and Vitamin supplements are also prescribed in the prescription. Supportive therapies such as nebulization and oxygenation were also observed during our study where distribution of nebulization was high in LRTI which is similar to the study conducted by Sujata J *et al*[12] but oxygenation was high in asthma which may contrast to the previous study.

Out of 140 prescriptions 6 FDC were present in which Piperacillin + Tazobactam (31.3%) were higher than other FDC which is in agreement with Mirza A *et al*.[3] Using FDC drugs

helps to reduce side effects, increased patient compliance, synergy and increased efficacy. Among the various drug formulations used oral dosage forms including tablets, syrups, capsules were found to be 49.70%, injectables 46.30% and 3.99% inhalational drugs were prescribed which is in accordance with study conducted by Mirza A *et al*.[3]

Among 140 prescriptions average number of drugs per prescription was 6.47%. Out of 906 drugs 42.71% drugs were prescribed by their generic names. Prescribing drugs by brand names may undermine some of the goals of essential medicine concept. Prescribing by generic name helps the hospital pharmacy to have better inventory control. Generic drugs are often economical than the branded one. A study of prescribing pattern of drugs is an effective way to increase the appropriateness of the therapy thereby minimizing polypharmacy and improving rational use of drugs.

CONCLUSION

A prospective observational study on drug utilization in patients with RTI was carried out. Out of 140 patients it was observed that males were more prone to respiratory tract infections than females. Age group of 61-70 years was higher than other age groups. COPD was more prevalent among all RTI followed by TB in which hypertension was the most commonly seen associated illness with RTI. Majority of patients received antibiotics of which the frequently prescribed antibiotic was ceftriaxone. The most dominant combination category observed in the entire prescription was piperacillin and tazobactam (31.3%). Majority of drugs were prescribed in their brand name so it is necessary to promote prescribing by their generic names. From this study it is concluded that drug utilization studies can provide feedback to physician and promote rational prescribing of drugs enabling better patient care in the management of RTI.

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Author’s contribution

All the authors have contributed equally.

Conflict of interest

All the authors declare no conflict of interest.

Ethics declaration

The protocol was verified by the S.C.S COLLEGE OF PHARMACY Institutional Ethics Committee. Informed consent was obtained from individuals admitted in the hospital.

Consent for publication

All authors have given their consent for publication.

Competing interests

The authors declare that they have no competing interests.

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