ORIGINAL ARTICLE

DRUG UTILIZATION STUDY ON ANTIBIOTICS USE IN LOWER RESPIRATORY TRACT INFECTION

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ABSTRACT

Introduction: Antibiotics are commonly prescribed for the lower respiratory tract infection. But if antibiotics are not used rationally then there will be increase chances of resistance of bacteria as well as increase in the total cost of treatment. This study was conducted to see the antibiotics utilization pattern.

Aim: This drug utilization study was conducted to evaluate the pattern of antibiotics use in Medicine Department of a Krishna Hospital, Karad, Maharashtra, India. Method: Data was retrospectively collected. The obtained data was examined and were subjected to descriptive statistical analysis using Microsoft excel.

Result: 96 case records were examined of which 46.87% were LRTI(nonspecific LRTI& acute bronchitis) and 51% were pneumonia. Female accounted for 53.12% and male for 46.87 % of total cases. The World Health Organization (WHO) indicators (utilization in defined daily doses (DDD); DDD/1000inhibitant/day) were used and the ATC/DDD method was implemented. The most frequently prescribed antibiotic was ceftriaxone, followed by Azithromycin.

Conclusion: The DDD/1000inhibitant/day of Azithromycin was the highest (5.74). Average treatment period was found to be 5.42 and 6.52 for LRTI (nonspecific LRTI and Acute Bronchitis) and pneumonia respectively. A total of 96 cases studied; in which 33cases had mono-antibiotic therapy (33.37%) and rest contained poly-antibiotics therapy (66.63%).Prescribing by generic names has to be encouraged.

Key words: Drug utilization, Antibiotics, DDD (defined daily dose), lower respiratory tract infection

INTRODUCTION

Lower respiratory tract infections (LRI) are generally more serious than upper respiratory infections. LRIs are the leading cause of death among all infectious diseases.(1) The two most common LRIs are bronchitis and pneumonia, pneumonia is the fourth leading cause of death.(2)

Lower respiratory tract infections (LRI) are an important problem to society. They occur frequently and are associated with significant morbidity and mortality. LRI impose a considerable cost to the nation.(3)

Initially LRIs are usually managed by general practitioners (GPs). Use of Antibiotic prescription in LRI remains controversial. On the one hand, it is usually of bacterial origin, is associated with a high morbidity and mortality, and needs to be rapidly treated with an antibiotic. On the other hand, in a case of LRI, it is difficult to exclude the diagnosis of community-acquired pneumonia (CAP) in out-patients, and most of the times self-limiting illnesses, and prescription of antimicrobials may cause increased antimicrobial resistance. Because LRI is one of the major reasons for antibiotic treatment and because changes in antibiotic resistance patterns are a threat to its effective treatment, there is increasing concern about antibiotic prescription in the community.(4)

There are more effective drugs (medicines) today on the market than ever before. Patients are better educated, have greater expectations from health care, and they use multiple sources of health care. Still, drugs are not frequently used to their full potential or according to the generally accepted criteria. All prescribing may not necessarily be based on patient needs and all patient needs are not necessarily met with drug therapy. Consequently, there is as much concern about inappropriate and expensive prescribing, as about under-prescribing. The development of drug utilization (DU) as a research area made it possible to study drug prescribing and drug usage in a scientific and formal manner.(5) Developing countries have limited funds available for health care and drugs and it becomes very important to prescribe drugs rationally so that the available funds can be utilized optimally. DU Studies aids in commenting about unnecessary and irrational

prescribing which increases burden of cost of therapy, also causes loss of working hours (either due to hospitalization or morbidity).[6] These are definitely not affordable for a developing country like India.

In the recent years studies on drug utilization have become a potential tool to be used in the evaluation of health systems. The methodology used in these studies has mainly consisted in the comparison of consumption using defined daily doses (DDD) of the drugs consumed.

Drug utilization among outpatient is frequently monitored in many countries but the studies on inpatient are rare and incomplete. Studies of drug utilization in respiratory tract infection are low. The objective of present study is to focus on the trends in the antimicrobial utilization in lower respiratory tract infections. This information is not disease specific but reflects overall rates and illustrates trends in utilization of antimicrobials in the treatment of lower respiratory tract infection.

MATERIALS AND METHOD

The present study was conducted after obtaining the permission of ethical committee of our institution in Krishna Institute of Medical Sciences Deemed University, Karad. The present study included patients of lower respiratory tract infection who were admitted to medicine ward of the hospital.

It was an eighteen month (January 2011 to June 2012) non-interventional retrospective study, observational study and the data was collected from the Medical Record Room. The proforma for collecting the data was designed. The data collected were subjected to descriptive statistical analysis using Microsoft excel.

Anatomical therapeutic chemical (ATC) classification and defined daily dose (DDD) system was used for the quantification of drug utilization. Following formula of defined daily dose was used for calculation and results obtained were expressed in terms of defined daily dose per 1000 inhabitants per day (DDD / 1000 inhabitants / day).[7] DDD/1000 inhabitants/day may provide a rough estimate of the proportion of the study population that may be treated daily with certain drugs.

Formula: $$\text{DDD/1000inhabitants/day} = \frac{\text{Total use of a drug(mg) during the study period}}{\text{DDD (mg)} \times \text{Duration of study} \times \text{Total sample size}} \times 1000$$

RESULT

The study monitored the drug utilization pattern to the patients treated to lower respiratory tract infection in medicine department at Krishna Hospital, Karad.

A total of 96 case records of the patients with different presenting symptoms were analyzed.

Table 1: Sex wise distribution of cases

Illness	Cases (%)	Male (%)	Female (%)
LRTI*	45 (46.87)	20 (20.83)	25 (26.04)
Pneumonia	51 (53.13)	25 (26.04)	26 (27.08)

*LRTI includes diagnosed cases of nonspecific Lower respiratory tract infection & acute bronchitis in all tables.

Table 2: Associated illnesses

Illness	DM	HTN	IHD	RHD	PTB	COPD	Anaemia
LRTI	3	5	1	1	3	0	0
Pneumonia	9	6	9	0	7	8	2

Table 3: Average hospital stay and number of Antimicrobial agents used, State of the patients at the time of discharge

Illness	Duration	Drugs	Improved	Unchanged	Expired
LRTI	5.46	1.933	40	3	2
Pneumonia	6.52	2.215	42	5	4

Table 4: Number and percentage of culture and sensitivity performed, Mono -antibiotic therapy

Illness	Culture & Sensitivity	Mono-Antibiotic Therapy
LRTI	15(33.33%)	20(20.83%)
Pneumonia	23(45.09%)	13(13.54%)

Table 5: Distribution of individual AMAs

Drug	LRTI Pts (%)	Pneumonia Pts (%)
Penicillins		
Amoxicillin + Clavulanic acid	5 (11.11)	1 (1.96)
Piperacillin + Tazobactam	1 (2.22)	5 (9.80)
Cephalosporins		
Cefotaxime	2 (4.44)	1 (1.96)
Cefadroxil	1 (2.22)	0 (0)
Cefoperazone	2 (4.44)	0 (0)
Cefepime	1 (2.22)	6 (11.76)
Cefixime	8 (17.77)	10 (19.60)
Cefuroxime	1 (2.22)	0 (0)
Ceftriaxone	25 (55.55)	30 (58.82)
Ceftriaxone + Sulbactam	2 (4.44)	
Ceftriaxone + Tazobactam	0 (0)	5 (9.80)
Cefpodoxime	0 (0)	1 (1.96)
Macrolide		
Azithromycin	17 (37.77)	25 (49.01)
Flouroquinolones		
Ciprofloxacin	2 (4.44)	3 (5.88)
Ciprofloxacin + Tinidazole	1 (2.22)	0 (0)
Levofloxacin	4 (8.88)	5 (9.80)
Moxifloxacin	2 (4.44)	3 (5.88)
Tetracycline antibiotic		
Doxycycline	2 (4.44)	0 (0)
Aminoglycoside		
Gentamicin	0 (0)	1 (1.96)
Nitroimidazole antibiotic		
Metronidazole	3 (6.66)	5 (9.80)

Table 6: ATC code, DDD, PDD and DDD/1000inhabitants/day of the drugs

Name of the drug	ATC code	DDD (mg)	PDD	DDDs/1000 inhabitants/day
Penicillins				
Amoxicillin (O)	J01CR02	1000	1000	0.0380
Amoxicillin (P)		3000	2000	0.2793
Piperacillin	J01CA12	14000	15153.9	0.5359
Cephalosporins				
Cefotaxime	J01DD01	4000	2000	0.1618
Cefadroxil	J01DB05	2000	500	0.0238
Cefoperazone	J01DD12	4000	2000	0.1428
Cefepime	J01DE01	2000	3225.81	0.9521
Cefixime	J01DD08	400	363.2	0.8474
Cefuroxime	J01DC02	500	1000	0.0761
Ceftriaxone	J01DD04	2000	2226.72	5.2368
Cefpodoxime	J01DD13	400	400	0.1904
Macrolide				
Azithromycin	J01FA10	300	502.7	5.7447
Flouroquinolones				
Ciprofloxacin (ORAL)	J01MA02	1000	933.3	0.1599
Ciprofloxacin (P)		500	400	0.2132
Levofloxacin	J01MA12	500	500	0.7046
Moxifloxacin	J01MA14	400	400	0.3808
Tetracycline Antibiotic				
Doxycycline	J01AA02	100	150	0.1142
Aminoglycoside				
Gentamicin	J01GB03	240	160	0.1269
Nitroimidazole Antibiotic				
Metronidazole	G01AF01	500	1368.42	1.9804

All the case records had the complete documentation of information, including patient's demographic characteristics, diagnosis, drug names, dose route and frequency of intake. Observations of the study are presented in the form of different tables.

In the culture and sensitivity 23.91%, 13.04% and 4.34% Klebsiella, Coagulase positive staphylococci and streptococci were isolated respectively.

Among the total of 96 cases, there were 33 prescriptions contained single antibiotic (33.37%).

Table 7: Comparison of PDD and DDD

PDD > DDD	PDD < DDD	PDD = DDD
Pipercillin	Amoxacillin (P)	Moxifloxacin
Cefepime	Cefotaxime	Levofloxacin
Cefuroxime	Cefadroxil	Amoxicillin (O)
Ceftriaxone	Cefoperazone	Cefpodoxime
Azithromycin	Cefixime	
Doxycycline	Cefpodoxime	
Metronidazole	Ciprofloxacin (ORAL)	
	Ciprofloxacin (P)	
	Gentamicin	

The PDD can vary according to both the illness treated and national therapy traditions. For anti-infective, for instance, PDDs vary according to the severity of the infection. The DDDs for most anti-infective are based on treatment of moderately severe infections. In hospital care, much higher doses are frequently used and this must be considered when using the DDD as a unit of measurement.

DISCUSSION AND CONCLUSION

In general practice, the therapeutic approach for lower respiratory tract infection is primarily empirical and the main aim of the physicians is to treat as specifically as possible. The present study indicates the general trends of use of antibiotics in lower respiratory tract infection in medicine department.

Drug utilization studies have the potential to make objective evaluation and analysis of health professionals work and provide them with feedback to stimulate thinking about their practice and looking for ways to improve their own performance. These studies should become a method of increasing job satisfaction and means of education for health professionals, rather than being perceived as threat or another bureaucratic burden.[8] Antibiotic resistance is an emerging problem and has become a major threat to the medical field. Excessive and in appropriate use of antibiotic has been a major contributor to this ever growing problem.[9]

Demographic characteristics showed that percentage of females suffering from infection was more than males (Table: 2)

In this study the diagnosis of LRTI (Non Specific LRTI and Acute Bronchitis) accounted for 46.87% and pneumonia of 53.13% of total cases analyzed. Further it was noted that a majority of the pneumonia patients

were in the age group of 51-70 years (38.29%) and of the lower respiratory tract infection in the age group of 20 – 40.

When prescriptions were screened thoroughly, the number of prescriptions of mono-antibiotic prescription (single antibiotic/prescription) were 33 (34.37%) where prescriptions containing poly-antibiotic therapy were 63 (65.625%). Further it was noted that majority of mono-antibiotic prescription were prescribed for diagnosis of LRTI (20 cases, 20.83%) and in pneumonia it was comparatively less (13 cases, 13.54%). This presentation represent that poly-antibiotic prescriptions were more preferred than mono-antibiotic therapy.

Most of the drugs are prescribed by brand name. Prescribing by generic name helps the hospital pharmacy to have better inventory control. These will also aid the pharmacy to purchase the drugs on contract basis, as the number of brand is less, reduce the confusion among the pharmacists while dispensing. Generic drugs are often more economic than the branded ones. Prescribing by brand name may be an evidence of vigorous promotional strategies by pharmaceutical companies.

Culture was done in 33.33% and 45.10% of LRTI and Pneumonia cases respectively. 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. 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.

In the culture and sensitivity 23.91%, 13.04% and 4.34% Klebsiella, Coagulase positive staphylococci and streptococci were isolated respectively. The patients isolated with organisms were commonly prescribed with the combination of beta lactam and macrolide antibiotics. Ceftriaxone and Azithromycin were preferred antibiotics. In two cases of Klebsiella pneumonia associated with Ischemic heart disease and chronic obstructive pulmonary diseases, Cefepime fourth generation cephalosporin was used. In cases associated with Diabetes, Metronidazole was used, the reason might be increased risk of infection which is seen with Diabetes. The patients have been treated according to the Guidelines for the management of pneumonia given by PGIMER Chandigarh guidelines and BTS.[10] Out of the 6 patients who had expired 4 were diagnosed aspneumoniaand 2 were diagnosed as LRTI and the causes of death was cardio pulmonary arrest.

Drug consumption data were expressed as defined daily doses (DDD) per 1000 inhabitants per day. The highest value of 5.744 DDD/1000 inhabitants/day was accounted for Azithromycin indicating that it was the popular drug of choice as a broad spectrum antibiotic, followed by ceftriaxone with the value of 5.236 DDD/1000 inhabitants/day.

To conclude, it is evident from the present study that, in Medicine Department, for lower respiratory tract infections antibiotics were commonly prescribed in poly-antibiotics form to treat the infection. The most commonly used antibiotic was ceftriaxone followed by azithromycin and cefixime. Prescribing by generic names has to be encouraged.

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