

A study on drug utilization evaluation of antibiotics in tertiary care hospital

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ABSTRACT

Studies like Drug utilization evaluation have an essential role in finding a prescription pattern of drugs prescribed in hospital for the rational use of antibiotics. An observational study conducted in a tertiary care hospital for six months among 200 patients. The study was conducted to assess prescribing pattern, the average cost of antibiotics prescribed. Also, the ten most commonly prescribed antibiotic's DDD/ 100bed- days and ATC were calculated. Most commonly prescribed antibiotic was Ceftriaxone, followed by Piperacillin/tazobactam. The average cost was Rs. 2742.5 ± 25135.19 for the prescribed antibiotics. Pharmacists and physicians play a significant role in decreasing patient problems and the problems related to antibiotics by creating awareness programs related standard prescribing guidelines in the hospital, which results in a reduction of the antibiotic resistance. Therefore it is essential to carry out a drug utilization review programme to study the rational use of antibiotics.



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INTRODUCTION

Infectious diseases are a prominent cause of mortality in the developing world. Antibiotics are one of the most important discoveries in the field of medical sciences and are widely used against infectious agents [1]. Morbidity and mortality rates have been decreased due to use of antibiotics in infectious diseases, Drug resistance and adverse effects are caused by irrational use of antibiotics [2]. Abuse and misuse of antibiotics in the community are due to lack of education, age and storing of antibiotics at

home [3]. Monitoring and using drugs in appropriate way is very essential for rationale use of drug [4].

Drug utilization evaluation

DUE can be referred as a structured, ongoing review of healthcare provider prescribing, pharmacist dispensing, and patient use of medication.

In drug utilization evaluation patient's prescription and medication data will be reviewed comprehensively before, during and after treatment or dispensing the drug to ensure medication decision making and patient outcomes are appropriate [5].

Drug therapy is one of the essential components of patient management. When a potent drug is introduced in therapy, there will be an increased chance of adverse drug reactions, increased medication cost, focus on drug use outcome, and it may lead to misuse of drugs.

Incorrect choice of the drug due to insufficient knowledge about the treatment, improper diagnosis may lead to adverse reactions, interactions of drug, cost of drugs will be affected. DUE (drug utilization evaluation) is recommended for identifying in the

improper and irrational use of drugs [6] [7].

For the assessment of prescribing, dispensing and distribution of medicines Prescription pattern monitoring studies (PPMS) is used as a tool. An international agency such as the World Health Organization (WHO), and also different developing countries have applied this tool if Due to improve the rationality of the medication and also to improve the health care system. Along with another medication auditing of antibiotics prescribing, the pattern is also essential to know the standard and quality of the clinical practice [8].

A tool like defined daily dosage (DDD) is also used in drug utilization resulting in the improvement of the quality of drug use [9]. Analytical study will also link demographic data with drug utilization [10]

Defined daily dose

It is average maintenance dose per day for a drug used for its main indication in adults, it is a measurement not necessarily prescribed.

WHO prescribing indicators

1. The average number of drugs per encounter
2. Percentage of encounters with an antibiotic prescribed
3. Percentage of drugs prescribed by generic name
4. Percentage of encounters with an injection prescribed
5. Percentage of drugs prescribed from the EDL (or) formulary

Rational use of medicines

Patients receive medications appropriate to their clinical needs, in doses that meet their requirements, for an adequate period, and at the lowest cost to them and their community [11].

Antibiotic resistance

The ability of bacteria and other microorganisms to resist the effects of an antibiotic to which they were sensitive. Antibiotic resistance is a significant concern of overuse of antibiotics. Also known as drug resistance.

Minimum inhibitory concentration .

It is the lowest concentration of a chemical, usually a drug which prevents visible growth of a bacterium or bacteria. It depends on the microorganism, the effected human bodily function and the antibiotic itself [12-14]

Aim

This study aimed to assess drug utilization evaluation of antibiotics in a tertiary care hospital.

Objective

1. To study the prescription pattern of antibiotics.
2. To determine the most commonly prescribed antibiotics.
3. To analyze prescriptions in comparison with WHO indicators.
4. To assess the average cost of antibiotics per prescription.

METHODOLOGY

Study site

A Descriptive observational study was conducted in inpatients of the department of General medicine at tertiary care hospital in Guntur region.

Study population

The study was carried out in patients aged above 18 years attending in tertiary care hospital.

Study duration

Study was carried out for six months, and data was collected in a pre-designed data collection form.

Sample Size

Total number of subjects: 200

Inclusion criteria

1. Patients of all age group of either sex having the prescription for antibiotics and are ready to participate in the study.
2. Male and female patients of age above 18 years.

Exclusion criteria

1. Patients without prescription antibiotics and those not willing to participate in the study.
2. Patients whose age is below 18 years.
3. Pregnant and lactating women.

Study procedure

Descriptive observational study

Step 1

A Descriptive observational study was conducted in a tertiary care hospital.

Step 2

Study procedure was explained, and data were collected with patient approval

Step 3

Patient data were collected in the pre-designed data collection form.

Step 4

The data include demographics (age, sex, past and present medical history of patients, diagnosis, history of medication, route of administration, category of antibiotic prescribed), medication from the prescription.

Step 5

The patient’s prescription was analyzed against WHO prescribing indicators were used.

Step 6

The Percentage of antibiotics was categorized according to their use. The data was statistically analyzed using the chi-square test, and the P-value was calculated.

Sources of data

1. Prescriptions of patients
2. Patient medication chart review
3. Case sheets of patients

RESULTS

Age distribution of patients were analyzed, and found that 3.5% of the prescriptions were falling to the age group of fewer than 20 years, followed by 36% of them were in the age group of 20-40 years, 37% between the group of 41-60 years, 22% between the group of 61-80 years and 1.5% above 80 years [Figure 1].

comorbidities of the study population were analyzed, and 41% were hypertensive, 4% had thyroid disorders and 2.5% of the patients with cardiovascular diseases [Figure 2].

cephalosporin’s (29.5) followed by penicillines(27.5) %, aminoglycosides (4.5%), Macrolide (10.5%), Nitroimidazoles (6%), Fluoroquinolones (13.5%),Carbapenems (7.5%), Tetracycline (7.5%), Glycopeptide (4.5%), Oxazolidinone (2.5%), Broad spectrum antibiotic (3%) and Lincosamide about (4%) in patients are the major classof antibiotics which were prescribed [Figure 3].

22% of the prescriptions had ceftriaxone, 18% with piperacillin/tazobactam, 14.5% with doxycycline

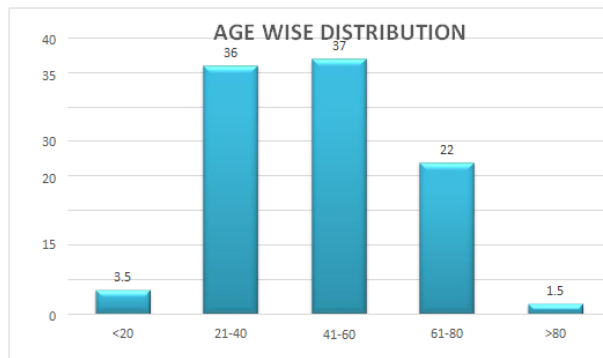


Figure 1: Age Wise Distribution

and 12% with meropenem, 9.5% of the prescriptions were prescribed with Cefoperazone [Figure 4].

Only one antibiotic was prescribed to most of the patient During the hospital stay, i.e. 118 patients, 67 patients with two antibiotics, eight patients with three antibiotics, seven patients with four antibiotics [Figure 5].

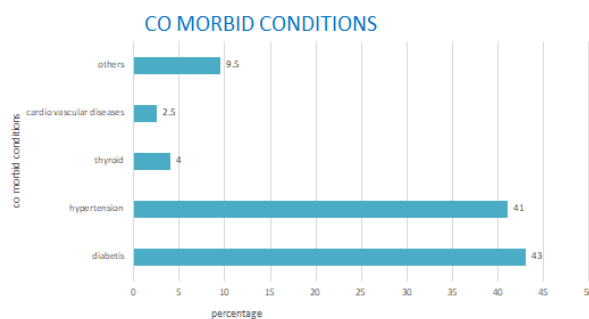


Figure 2: Comorbid conditions

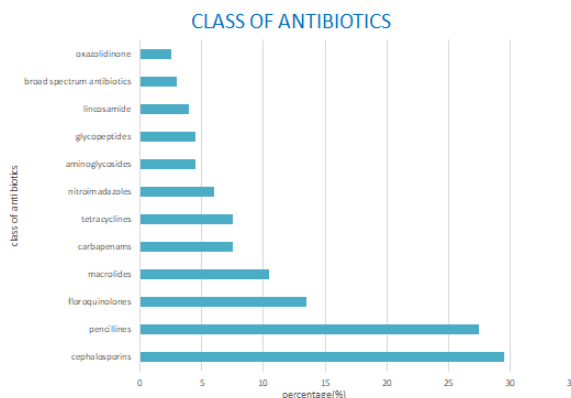


Figure 3: Class of Antibiotics

P<0.05 is considered significant Gender, age and duration of treatment and it was found that, single antibiotic was prescribed for 67 males, 38 female patients were prescribed with only one antibiotic. [Figure 6]

The patients in the age group of 41-60 and 61 -80 were prescribed with a one. 57% patients were

Table 1: Factors affecting the number of antibiotics prescribed (n= 200)

		n	No of antibiotics			P value
			1 antibiotic	2 antibiotics	>2 antibiotics	
Gender	Male	112	67	38	7	0.0040
	Female	88	51	29	8	
Age	<20	7	5	2	0	0.1640
	21-40	72	43	20	9	
	41-60	71	44	18	9	
	61-80	47	24	19	4	
	>80	3	1	2	0	
Duration of stay	<5 Days	55	28	17	10	0.0574
	5 Days	39	14	17	8	
	>5 Days	106	50	34	22	

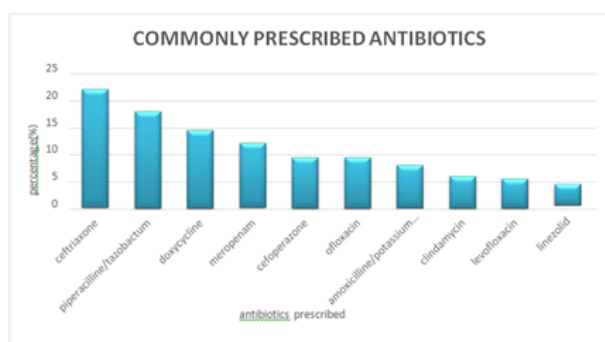


Figure 4: Commonly prescribed antibiotics

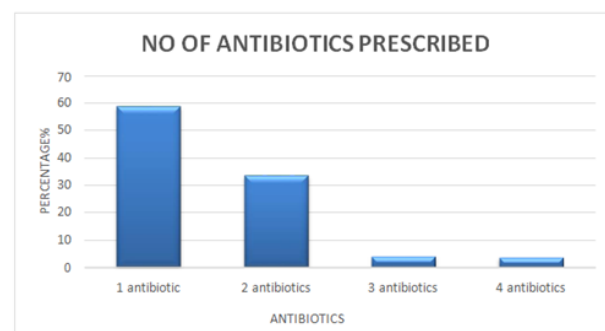


Figure 5: Number of antibiotics prescribed

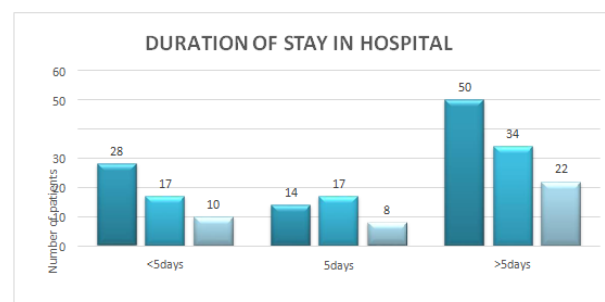


Figure 6: Duration of stay

cured completely by the therapy and about 37% responses were controlled no improvement. [Figure 7]

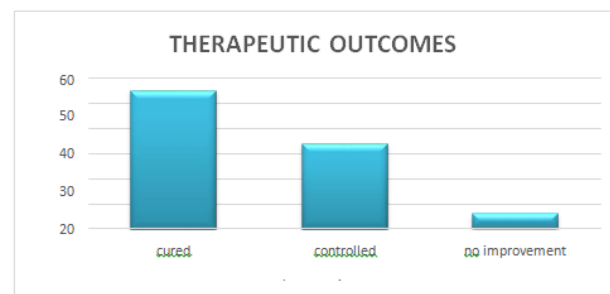


Figure 7: Therapeutic outcomes

DDD/100 bed –days for 10 most common antibiotics were calculated in the study. During the study period, the antibiotic use was found to be 0.4774 DDD/100 bed – days. The average occupancy index was 0.40. Anatomical Therapeutic Chemical [ATC].

DISCUSSION

The current study on drug utilization evaluation was carried out in inpatient in the department of general medicine of a tertiary care hospital. 200 prescriptions were analyzed depending on inclusion criteria and exclusion criteria. Out of 200 prescriptions, categorization of gender had revealed that the majority of the study population was males with 112 patients contributing 56%. Same study was done by Jubaraj Singh et al. (2018) also reported that the majority of patients were male. [Table 1]

Most of the prescriptions were in the age group of 41-60 with 74 patients (37%) followed by age group

Table 2: DDD/100 bed- days and ATC code of antibiotics

Sl.no	Name of the antibiotic	Dose	DDD/100 Bed- day	ROA	ATC code
1	Ceftriaxone	1gm	0.137	IV	J01DD04
2	Piperacillin/tazobactam	4.5gm	0.031	IV	J01CR05
3	Doxycycline	100mg	0.080	IV	J01AA02
4	Meropenem	1gm	0.136	IV	J01DH02
5	Cefoperazone	1.5gm	0.029	IV	J01DD02
6	Ofloxacin	400mg	0.026	IV	J01MA01
7	Amoxicillin/potassium clavulanate	625mg	0.0046	ORAL	J01FF01
8	Clindamycin	300mg	0.0083	IV	J01MA16
9	Levofloxacin	500mg	0.0019	Oral	J01CR02
10	Linezolid	500mg	0.005	IV	J01XX08

Table 3: Average cost of antibiotics (n=200)

		n=200	Cost of antibiotics Mean \pm SD	P value
Gender	Male	112	2294.17 \pm 24062.52	0.610
	Female	88	1566.4 \pm 4602.68	
Age	<20	7	884.95 \pm 2006.89	0.719
	21-40	72	2021.59 \pm 46709.78	
	41-60	71	3145.87 \pm 26134.244	
	61-80	47	721.63 \pm 4842.01	
	>80	3	171.33 \pm 197.84	
Duration of stay	<5 Days	55	1174.91 \pm 8554.95	0.324
	5 Days	39	5187.52 \pm 31565.23	
	>5 Days	106	1865.38 \pm 19024.16	
	Total	200	2742.5 \pm 25135.19	

Table 4: WHO Indicators

Indicators assessed	Data value
Average no of drugs per encounter	1.065
Percentage of drugs prescribed by generic name	9.85%
Percentage of encounters with an injection prescribed	92.5%
Percentage of drugs prescribed from the EDL (or) formulary	97.1%

of 21-40 with 72 patients (36%). Similar study was conducted by Uvaidullah Korai et al. (2019) showed that most of the prescriptions were in the age between 51-70 years.[Table 2]

Comorbid conditions categorization was analyzed and found that most of the patients had diabetes with 86 patients contributing 43% results were almost same to the study conducted by Gowthami et al., (2016)

Study reports that a significant class of antibiotics prescribed were cephalosporins for 54 patients (29.5%) followed by penicillin's prescribed for 52

patients (27.5%) and was similar to the study conducted by Venugopal D et al. (2014) also found cephalosporins being mostly prescribed. [Table 3]

The most commonly prescribed antibiotics were Ceftriaxone prescribed in 44 cases (22%) followed by piperacillin/tazobactam in 36 patients (18%) during the hospital stay which is almost equal to study conducted by Nikhileshanand et al. (2016).

The single antibiotic was prescribed in most of the prescription during the study period had (53%), which was found to be same with study done by Bahram fariborzfarsad et al. (2016).

Patient's therapeutic outcomes reports during the hospital stay show that 55% of patients were cured completely, 34% controlled response was showed by the patient on therapy and around 6 % condition were not improved. Similar study was done by Randad RD et al. (2017) also noted the maximum number of patients were cured. [Table 4]

The current study reports WHO indicators with Average of drugs per encounter-1.065, Percentage of drugs prescribed by generic name-9.85%, Percentage of encounters with an injection prescribed-92.5%, Percentage of drugs prescribed from the EDL (or) formulary-97.1 and the study was compared to a study conducted by Kanishk Kala et al., (2018) Percentage of the drug by generic name was 33 and Percentage of antibiotic prescribed was 82.74. Percentage of drugs with EDL was 66.16

The current study reports the average cost of antibiotics prescribed. The average cost was Rs. 2742.5 ± 25135.19 for the prescribed antibiotics, which can be compared with a study done by Sanojpanicker et al. (2017) the average cost of antibiotics was Rs. 1945.29 ± 2175.39 .

CONCLUSION

The study provides insight regarding Drug Utilization Evaluation of antibiotics carried out in the inpatient department of a tertiary care hospital. The purpose here is to assess the prescription pattern of antibiotics usage and encourage rational use of antibiotics to avoid resistance which is an alarming global threat. In our study, 200 prescriptions were analyzed according to WHO indicators; cost-effective analysis was done. According to the study, most commonly prescribed antibiotics were found to be Ceftriaxone. DDD of top 10 antibiotics was found to be minimum, but the Percentage of drugs prescribed with the generic name was found to be below. In contrast, the average number of drugs per prescription and Percentage of drugs prescribed from EDL was found to be satisfactory.

The study highlights the need to encourage generic prescribing to avoid medication errors and continuous educational training programs to keep prescribing guidelines up-to-date.

In the study period, we have also observed improper use of antibiotics by patients like lack of medication adherence, OTC use of certain antibiotics which may contribute to antibiotic resistance.

To minimize the problem and promote rational use of proper counselling of patients regarding the disease, medication use required, thereby enhancing the role of a clinical pharmacist.

Clinical pharmacist should ensure the proper drug administration techniques by using new drug administration forms for accurately assessing drug administration and drug charges.

Rescheduling the missed antibiotic doses for accurately transcribing the antibiotic drug therapy, thereby antibiotic resistance can be reduced DUE conducted by the pharmacist assists in drug-product and entity selection.

The clinical pharmacist can provide their services by inspecting patient care area and nursing station regarding antibiotic storage and take-up necessary steps to avoid drug resistance.

To maintain professional competence pharmacist should play an active role by obtaining patients medication histories and also maintaining accurate reports of newer or investigational antibiotics as a part of DUE to reduce patients morbidity and mortality and economic burden of the antibiotic therapy.

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Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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