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DRUG UTILIZATION EVALUATION OF ANTIBIOTICS IN INDIAN TERTIARY CARE HOSPITAL

Patil Radhika Hari, Abhinav Verma, AHM Vishwanath Swamy and Sanatkumar B. Nyamagoud *

Department of Pharmacy Practice, KLE College of Pharmacy, Hubballi - 580031, Karnataka, India.

Keywords:

Drug Utilization Evaluation (DUE), Antibiotics, Tertiary Care Hospital, Rational use of antibiotics, Departments

Correspondence to Author:
Sanatkumar B. Nyamagoud

Assistant Professor,
Department of Pharmacy Practice,
KLE College of Pharmacy, Hubballi - 580031, Karnataka, India.

E-mail: dr.sanathnyamagoud@gmail.com

ABSTRACT: Background: Infections occur when viruses, bacteria, or microbes enter the body and multiply. Control of infection is achieved by using antibiotics; hence scrutiny of antibiotic prescribing patterns is an important aspect of quality and standards of clinical practice. **Objective:** To evaluate and analyse drug utilization and prescription pattern of antibiotics in various in-patient departments of the hospital to ensure safe and effective use. **Methods and Material:** A Retrospective Observational Study was carried out in 6 inpatient departments of Vivekananda General Hospital, Hubballi over a period of 1 year. A total of 993 prescriptions were collected, and the results were analyzed using MS Excel 2020, and SPSS 16.0. **Results:** This study reveals that the majority of patients belonging to the age group 41-60 years, received antibiotic therapy. Most patients were prescribed with antibiotic Ceftriaxone, 21.19% (n=402). Majority of the patients received antibiotics for Prophylactic treatment (44.65%). It was found that most of the patients were prescribed only one antibiotic (43.1%) whereas only 2.51% of patients were prescribed more than 4 antibiotics. Also, the prescription duration for most antibiotics was either 3 or 5 days. **Conclusion:** The worldwide increase in antimicrobial resistance is of great concern, and it is the responsibility of the prescribers to develop good prescribing habits. This can be achieved by educating clinicians through CME, seminars on standard treatment guidelines, essential drug list, and role of sensitivity testing in rational antibiotic prescribing.

INTRODUCTION: Infections are a major breakthrough for poor prognostic conditions. Controlling of infection prevents morbidity or mortality rates accordingly. Thus, to overcome such manifestations, antibiotics can be a major outsource to regulate health management. Antibiotics have mutual & reciprocal effects. For decades, the problem of resistance is increasing in double-fold. The usage of fixed-dose or multiple antibiotic combinations helped overcome the aggregate interventions controlling the infection respectively [1].

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A scrutiny of antibiotic prescribing patterns is an important aspect of both quality and standards of clinical practice [2]. Superfluous and disproportionate use of antibiotics causes emblematic adverse effects such as an upsurge in morbidity and mortality, drug toxicity, protracted hospitalization period, inflation of costs, resistant microorganisms, and correlated infections [3].

Drug utilization evaluation was defined by WHO in 1977 as "the marketing, distribution, prescription, and use of drugs in a society, with special emphasis on the resulting medical, social, and economic consequences" [4, 5]. Drug utilization seeks to govern rational and irrational drug use to improve the overall quality of drug use. ATC/DDD Index 2022 is a readily available tool for presenting and comparing drug utilization or consumption statistics for research at the international level. ATC/DDD system allows uniformity in drug

groups. It portrays stable drug utilization criteria to allow comparisons of drug use between countries, regions, and other healthcare sectors and to investigate trends in drug use over time and in different conditions. ATC and DDD assignments are developed exclusively to maintain a durable and reliable system of drug use measurement. (ATC) the classification system is Anatomical Therapeutic Chemical (ATC) classification system, DDD is the assumed average maintenance dose per day for a drug used for its primary indication in adults. Only one DDD is allocated per ATC code and route of administration (e.g. oral formulation). DDDs provide a precise unit of measurement independent of price, currencies, package size and strength, enabling the researcher to evaluate trends in drug consumption and execute comparisons between various population groups [6].

MATERIALS AND METHOD

Study Site: This study will include the in-patients admitted to the Vivekananda General Hospital, Hubballi.

Study Design: It was a retrospective observational study.

Sampling Technique: 993 participants were selected by a Simple Randomized method as per the inclusion and Exclusion criteria mentioned in the study.

Study Period: This study was conducted for a period of 1 year (Aug 2021-Aug 2022).

Study Criteria:

Inclusion Criteria: The study included In-patient data for all ages with at least one antibiotic prescribed in their treatment plan, including its use in the prophylactic treatment or main therapy for at least one day in 6 In-patient departments (General Medicine, Paediatrics, Orthopaedics, Surgery, Obstetrics, and Gynaecology, Intensive Care Unit). Patients who are taking oral and/or IV antibiotic therapy. Patients with additional co-morbidities were also evaluated.

Exclusion Criteria: Patients who were prescribed with topical preparations (creams, ointments, lotions, *etc*.), ophthalmic preparations (eye drops, ear drops), transdermal patches, and suppositories. Departments were other than General Medicine, Paediatrics, Orthopaedics, Surgery, Obstetrics, and Gynaecology, Intensive Care Unit. Antibiotics used in chemotherapy. OPD patients. Prescriptions with missing information or obviously incorrect data. Antibiotics prescribed as Discharge medications.

Source of Data: Self-designed data collection form Patient Case Chart /Medication chart, Literature review, and Clinical progress chart.

Ethical Consideration: Ethical clearance for the study was obtained from the Institutional Ethical Committee KLE College of Pharmacy, Hubballi to carry out this project.

Study Procedure: A Retrospective observational study was carried out in 6 In-patient departments at Vivekananda General Hospital, Hubballi, using a self-designed data collection form, collected over 1 year (Aug 2021-Aug 2022). The study included participants as per the inclusion and Exclusion criteria mentioned in the study. Ethical Approval for the study was attained from the Institutional Ethical Committee (IEC) prior to the beginning of the study. A total of 993 prescriptions with oral and/or IV antibiotic prescriptions were collected scrutinized and analyzed during the study period.

The prescriptions were individually screened to assess the prescribing pattern of antibiotics. Antibiotics were classified as per ATC classification. The utilization of drugs was analyzed as per WHO prescribing indicators and presented as a percentage. ATC code of the antibiotics was recorded.

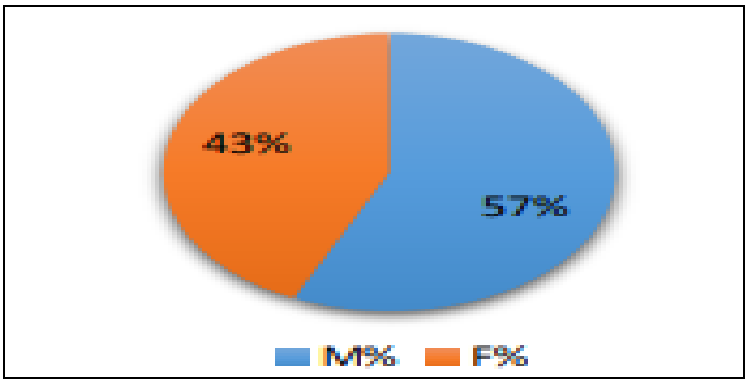
The DDD is the assumed average daily maintenance dose for a drug used for its main indication in adults. DDD/100 bed-days (Defined Daily Dose) of 10 most commonly prescribed antibiotics was calculated. The results were analyzed using MS Excel 2020, and SPSS 16.0. ATC/DDD Index 2022 tool was used for DUE of antibiotics. Results are represented in mean, percentage, tables, graphs, and pie charts.

RESULTS:

Gender Distribution of Subjects: Out of 993 subjects enrolled in the study, 56.9% were male (n=566), and 43% were female (n=427), as shown in the figure and table.

TABLE 1: % GENDER DISTRIBUTION OF PATIENTS ADMITTED IN A HOSPITAL

Sr. no.	Gender	Number of patients	Percentage
1	M	566	56.9 %
2	F	427	43 %

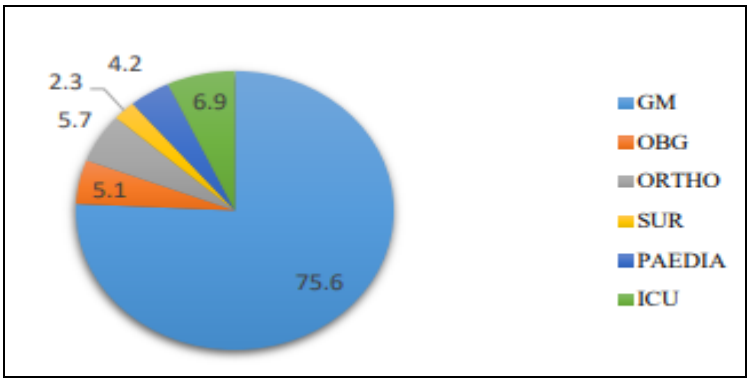


GRAPH 1: % GENDER DISTRIBUTION OF PATIENTS ADMITTED IN A HOSPITAL

Department Distribution of Subjects: Out of 993 subjects enrolled in the study of which, 75.6% (n=751) were in-patients of General Medicine, 5.1% (n=51) were in-patients of OBG, 5.7% (n=57) were in-patients of Orthopedics, 2.3% (n= 23) were in-patients of Surgery, 4.2% (n=42) were in-patients of Paediatrics and 6.9% (n=69) were in-patients of the ICU department.

TABLE 2: % DISTRIBUTION OF NUMBER OF PATIENTS ADMITTED IN RESPECTIVE DEPARTMENTS OF A HOSPITAL

Sr. no.	Department	Number of Patients	Number of Patients (%)
1	General Medicine (GM)	751	75.6
2	Obstetrics and Gynaecology (OBG)	51	5.1
3	Orthopaedics (ORTHO)	57	5.7
4	Surgery (SUR)	23	2.3
5	Paediatrics (PAEDIA)	42	4.2
6	Intensive care Unit (ICU)	69	6.9
	Total	993	



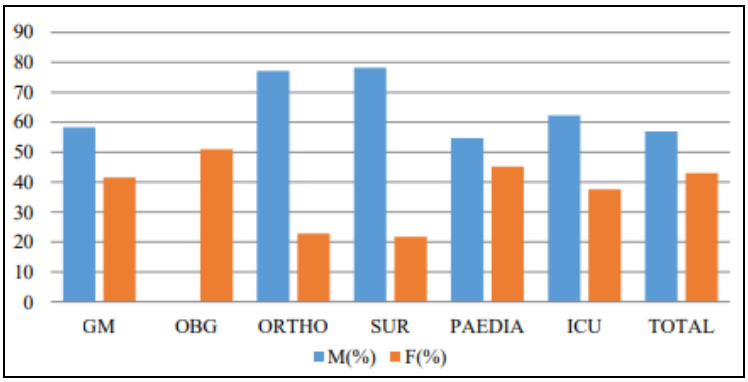
GRAPH 2: % DISTRIBUTION OF THE NUMBER OF PATIENTS ADMITTED IN RESPECTIVE DEPARTMENTS OF A HOSPITAL

Gender Distribution in Departments: The majority of the patients were Males in the following departments: - General Medicine (n=438), Orthopedics (n=44), Surgery (n=18), Paediatrics (n=23), ICU (n=43).

TABLE 3: GENDER-WISE DISTRIBUTION OF PATIENTS IN RESPECTIVE DEPARTMENTS OF A HOSPITAL

Sr. no.	Department	Number of male patients	M (%)	Number of female patients	F (%)
1	General Medicine (GM)	438	58.3	313	41.6
2	Obstetrics and Gynaecology (OBG)	0	0	51	51

3	Orthopaedics (ORTHO)	44	77.1	13	22.8
4	Surgery (SUR)	18	78.2	5	21.7
5	Paediatrics (PAEDIA)	23	54.7	19	45.2
6	Intensive care Unit(ICU)	43	62.3	26	37.6
	Total	566	56.9	427	43

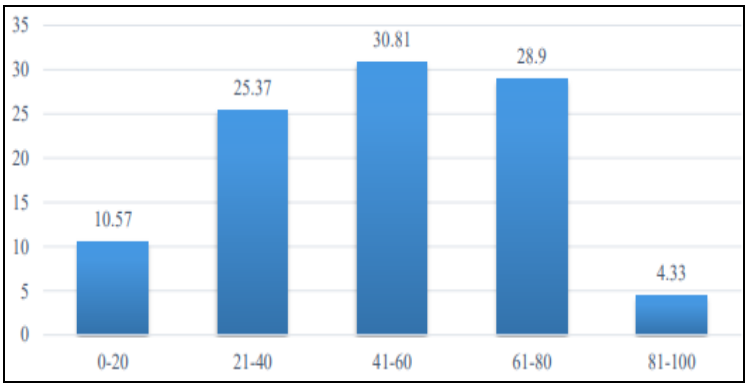


GRAPH 3: GENDER-WISE DISTRIBUTION OF PATIENTS IN RESPECTIVE DEPARTMENTS OF A HOSPITAL

Age Distribution: Most of the patients admitted to the hospital and received antibiotic therapy were 41-60 yrs. Patients in the age group of 81-100 yrs. were the least.

TABLE 4: AGE DISTRIBUTION OF PATIENTS ADMITTED TO THE HOSPITAL

Age Group	Total Number of patients	Total Number of patients (%)
0-20	105	10.57
21-40	252	25.37
41-60	306	30.81
61-80	287	28.9
81-100	43	4.3



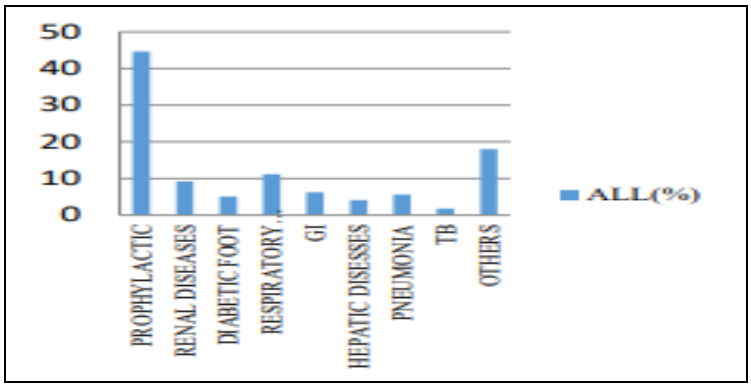
GRAPH 4: AGE DISTRIBUTION OF PATIENTS ADMITTED TO THE HOSPITAL

Distribution Based on Patient Condition: The study data revealed that antibiotic treatment was used the most for providing Prophylactic treatment at 44.65% (n=505) followed by Respiratory Diseases 11.2% patients, i.e. (n=127), Renal disease 9.2%(n=105), Gastro-Intestinal Diseases 6.2% patients i.e. (n=71) and the least in patients with Tuberculosis at 1.8%(n=21).

TABLE 5: % DISTRIBUTION BASED ON PATIENT CONDITION FOR WHICH ANTIBIOTIC IS PRESCRIBED IN A

Sr. no.	Condition	Number of patients	Number of patients (%)
1	Prophylactic	505	44.65
2	Renal diseases	105	9.2
3	Diabetic foot	58	5.1
4	Respiratory diseases	127	11.2
5	GI	71	6.2
6	Hepatic diseases	47	4.1
7	Pneumonia	64	5.6

8	TB	21	1.8
9	Others	204	18.03
10	Total	1131	

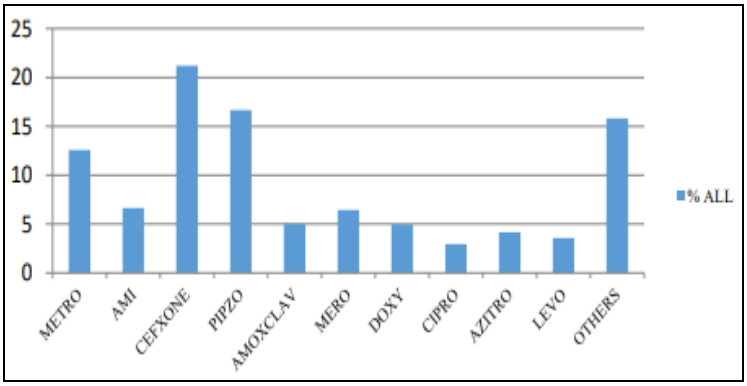


GRAPH 5: OVERALL % DISTRIBUTION OF THE NUMBER OF PATIENT AND CONDITION FOR WHICH ANTIBIOTIC IS PRESCRIBED IN A HOSPITAL

Percentage Distribution of Patients Based on Antibiotics Prescribed: It was found that most of the patients admitted to the hospital were prescribed with Ceftriaxone *i.e.* 21.19% (n=402). The antibiotic Ciprofloxacin was prescribed the least *i.e.*, 2.95% (n=56).

TABLE 6: OVERALL % DISTRIBUTION OF PATIENTS PRESCRIBED WITH ANTIBIOTICS IN A HOSPITAL

Antibiotic	Number of patients	Number of patients (%)
Metronidazole	239	12.59
Amikacin	126	6.64
Ceftriaxone	402	21.19
Piperacillin-tazobactam	316	16.65
Amoxicillin-clavulanic acid	95	5
Meropenem	122	6.43
Doxycycline	94	4.95
Ciprofloxacin	56	2.95
Azithromycin	79	4.16
Levofloxacin	68	3.58
Other Antibiotics	303	15.94
Total	1900	



GRAPH 6: OVERALL % DISTRIBUTION OF THE NUMBER OF PATIENTS PRESCRIBED WITH RESPECTIVE ANTIBIOTIC IN A HOSPITAL

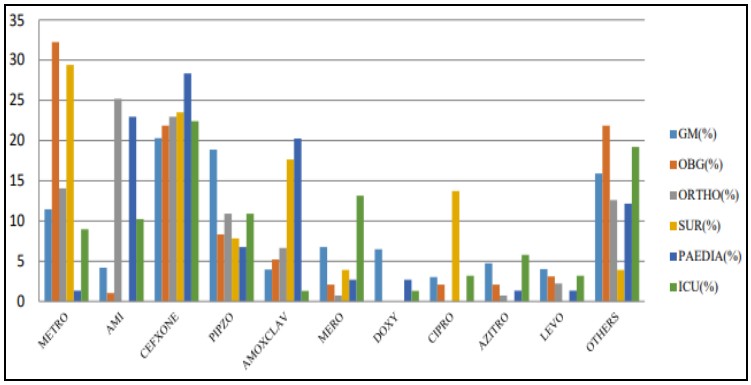
Percentage Distribution of Antibiotics Used in Different Departments: In GM, it was found that the drug Ceftriaxone was prescribed the most i.e.; 20.304% (n=282) and Ciprofloxacin was prescribed the least in the department i.e.; 3.024% (n=42).

In OBG, it was found that Metronidazole was prescribed the most i.e., 32.24% (n=31) and Amikacin was prescribed the least in the department i.e., 1.04% (n=1).

In Orthopedics, it was found that the drug Amikacin was prescribed the most i.e., 25.2% (n=34). Meropenem and Azithromycin were prescribed the least in the department i.e., 0.7407% (n=1). In Surgery, it was found that the drug Metronidazole was prescribed the most i.e.; 29.4% (n=15). Meropenem and other antibiotics were prescribed the least in the department i.e., 3.92% (n=2). In Pediatrics, it was found that the drug Amikacin was prescribed the most, i.e., 28.35% (n=21). Metronidazole, Azithromycin, and Levofloxacin were prescribed the least in the department, i.e., 1.35% (n=1). In ICU, it was found that the drug Ceftriaxone was prescribed the most, i.e., 22.4% (n=35). Amoxicillin–clavulanic acid and Doxycycline were prescribed the least in the department, i.e., 1.3% (n=2).

TABLE 7: % DISTRIBUTION OF THE NUMBER OF PATIENTS PRESCRIBED WITH ANTIBIOTICS FOR RESPECTIVE ANTIBIOTIC AND DEPARTMENT OF A HOSPITAL

Antibiotic	GM	(%)	OBG	(%)	(%)	ORTH	SUR	(%)	PED	(%)	ICU	(%)
Metronidazole	159	11.45	31	32.2	19	14.07	15	29.4	1	1.35	14	8.97
Amikacin	58	4.176	1	1.04	34	25.2	0	0	17	22.95	16	10.24
Ceftriaxone	282	20.30	21	21.8	31	22.97	12	23.52	21	28.35	35	22.4
Pipzo	262	18.86	8	8.32	20	10.9	4	7.84	5	6.75	17	10.9
Amox-Clav	55	3.96	5	5.2	9	6.66	9	17.64	15	20.25	2	1.3
Meropenem	94	6.768	2	2.08	1	0.740	2	3.92	2	2.7	21	13.14
Doxycycline	90	6.48	0	0	0	0	0	0	2	2.7	2	1.3
Ciprofloxacin	42	3.024	2	2.08	0	0	7	13.72	0	0	5	3.2
Azithromycin	66	4.752	2	2.08	1	0.740	0	0	1	1.35	9	5.8
Levofloxacin	56	4.032	3	3.12	3	2.222	0	0	1	1.35	5	3.2
Other Antibiotics	224	15.91	21	21.8	17	12.6	2	3.92	9	12.15	30	19.2
Total	1388	99.72	96	99.8	135	96.10	51	99.96	74	99.9	156	99.65



GRAPH 7: % DISTRIBUTION OF THE NUMBER OF PATIENTS PRESCRIBED WITH ANTIBIOTIC FOR RESPECTIVE ANTIBIOTIC AND DEPARTMENT OF A HOSPITAL

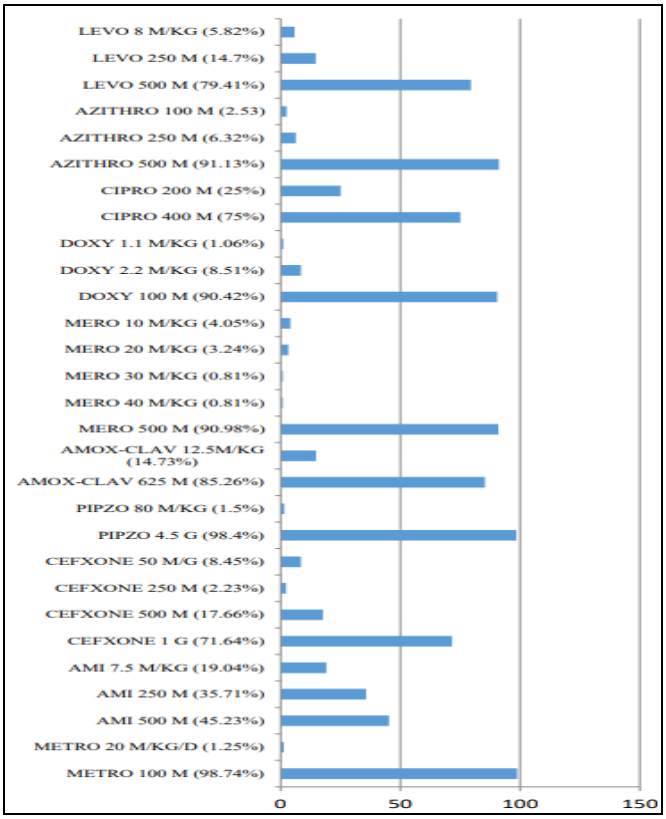
% Distribution of Patients Based on Dose of Antibiotic Prescribed: In patients where Metronidazole was prescribed, most patients were treated with a dose of 100mg i.e., 98.74%. In patients where Amikacin was prescribed, most of the patients were treated with a dose of 500mg i.e., 45.23%.

In patients where Ceftriaxone was prescribed, most patients were treated with a dose of 1gm i.e. 71.64%. In patients where Piperacillin + Tazobactam was prescribed, most patients were treated with a dose of 4.5gm i.e. 98.4%. In patients for where Amoxicillin-Clavulanic Acid was prescribed, most of the patients were treated with a dose of 625mg i.e. 85.26%. In patients where Meropenem was prescribed, most of the patients were treated with a dose of 500mg i.e. 90.98%. In patients where Doxycycline was prescribed, most of the patients were treated with a dose of 100mg i.e. 90.42%.

In patients where Ciprofloxacin was prescribed, most patients were treated with a dose of 400mg, i.e.75%. In patients for where Azithromycin was prescribed, most patients were treated with a dose of 500mg, i.e., 91.13%. In patients where Levofloxacin was prescribed, most of the patients were treated with a dose of 500 mg i.e., 79.41%

TABLE 8: % DISTRIBUTION OF PATIENTS BASED ON DOSE OF ANTIBIOTIC PRESCRIBED

Antibiotic And Dose	NO.PT (%)
Metro 100 M (98.74%)	98.74
Metro 20 M/Kg/D (1.25%)	1.25
Ami 500 M (45.23%)	45.23
Ami 250 M (35.71%)	35.71
Ami 7.5 M/Kg (19.04%)	19.04
Cefxone 1 G (71.64%)	71.64
Cefxone 500 M (17.66%)	17.66
Cefxone 250 M (2.23%)	2.23
Cefxone 50 M/G (8.45%)	8.45
Pipzo 4.5 G (98.4%)	98.4
Pipzo 80 M/Kg (1.5%)	1.5
Amox-Clav 625 M (85.26%)	85.26
Amox-Clav 12.5m/Kg (14.73%)	14.73
Mero 500 M (90.98%)	90.98
Mero 40 M/Kg (0.81%)	0.81
Mero 30 M/Kg (0.81%)	0.81
Mero 20 M/Kg (3.24%)	3.24
Mero 10 M/Kg (4.05%)	4.05
Doxy 100 M (90.42%)	90.42
Doxy 2.2 M/Kg (8.51%)	8.51
Doxy 1.1 M/Kg (1.06%)	1.06
Cipro 400 M (75%)	75
Cipro 200 M (25%)	25
Azithro 500 M (91.13%)	91.13
Azithro 250 M (6.32%)	6.32
Azithro 100 M (2.53%)	2.53
Levo 500 M (79.41%)	79.41
Levo 250 M (14.7%)	14.7
Levo 8 M/Kg (5.82%)	5.82

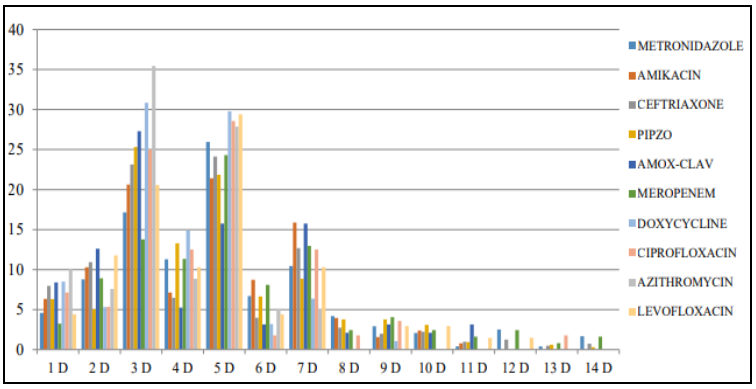


GRAPH 8: % DISTRIBUTION OF NUMBER OF PATIENT PRESCRIBED WITH RESPECTIVE ANTIBIOTIC AND DOSE

Distribution Based on the Number of Days Prescribed: In this study, antibiotics were prescribed for 1 to 21 days, but most were prescribed for 3 or 5 days. The antibiotics prescribed for 3 days include Piperacillin-Tazobactam (25.31%), Amoxicillin-Clavulanic Acid (27.3%), Doxycycline (30.85%) and Azithromycin (35.44%). The antibiotics prescribed for 5 days include Metronidazole (25.94%), Amikacin (21.42%), Ceftriaxone (24.12%), Meropenem (24.3%), Ciprofloxacin (28.57%) and Levofloxacin (29.41%).

TABLE 9: PERCENTAGE DISTRIBUTION BASED ON THE NUMBER OF DAYS PRESCRIBED

Days	1 D	2 D	3 D	4 D	5 D	6 D	7 D	8 D	9 D	10 D	11 D	12 D	13 D	14 D
Metronidazole	4.6	8.78	17.15	11.29	25.94	6.69	10.46	4.18	2.92	2.09	0.41	2.51	0.41	1.67
Amikacin	6.34	10.31	20.63	7.14	21.42	8.73	15.87	3.96	1.58	2.38	0.79	0	0	0
Ceftriaxone	7.96	10.94	23.13	6.46	24.12	3.98	12.68	2.73	1.99	2.23	0.99	1.24	0.49	0.74
Pipzo	6.32	5.06	25.31	13.29	21.83	6.64	8.86	3.79	3.79	3.1	0.93	0	0.62	0.31
Amox-Clav	8.4	12.6	27.3	5.25	15.75	3.15	15.75	2.1	3.15	2.1	3.15	0	0	0
Meropenem	3.24	8.91	13.77	11.34	24.3	8.1	12.96	2.43	4.05	2.43	1.62	2.43	0.81	1.62
Doxycycline	8.51	5.31	30.85	14.89	29.78	3.19	6.38	0	1.06	0	0	0	0	0
Ciprofloxacin	7.14	5.35	25	12.5	28.57	1.78	12.5	1.78	3.57	0	0	0	1.78	0
Azithromycin	10.12	7.59	35.44	8.86	27.84	5.06	5.06	0	0	0	0	0	0	0
Levofloxacin	4.41	11.76	20.58	10.29	29.41	4.41	10.29	0	2.94	2.94	1.47	1.47	0	0



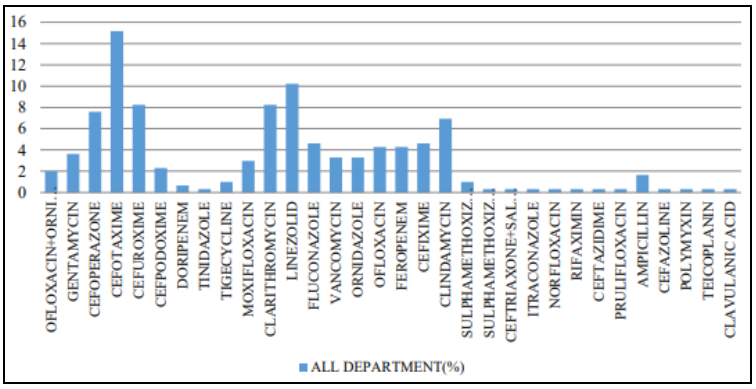
GRAPH 9: PERCENTAGE DISTRIBUTION BASED ON THE NUMBER OF DAYS PRESCRIBED

Overall % Distribution of Other Antibiotics Used in a Hospital: In other drugs, some of the most prominently used antibiotics include, Cefotaxime 15.18% (n=46), Linezolid 10.23% (n=31), Clarithromycin 8.25% (n=25), Cefuroxime 8.25% (n=25) and Cefoperazone 7.59% (n=23).

TABLE 10: OVERALL % DISTRIBUTION OF OTHER ANTIBIOTICS USED IN A HOSPITAL

Sr. no.	Other Antibiotics prescribed in all departments of hospital	Number of patients	Other Antibiotics prescribed in all departments of hospital (%)	Sr. no.	Other Antibiotics prescribed in all departments of hospital	Number of patients	Other Antibiotics prescribed in all departments of hospital (%)
1	Ofloxacin Ornidazole	6	1.98	18	Cefixime	14	4.62
2	Gentamycin	11	3.63	19	Clindamycin	21	6.93
3	Cefoperazone	23	7.59	20	Sulphamethoxi zole Trimethoprime	3	0.99
4	Cefotaxime	46	15.18	21	Sulphamethoxi zole	1	0.33
5	Cefuroxime	25	8.25	22	Ceftriaxone Salbactum	1	0.33
6	Cefpodoxime	7	2.31	23	Itraconazole	1	0.33
7	Doripenem	2	0.66	24	Norfloxacin	1	0.33
8	Tinidazole	1	0.33	25	Rifaximin	1	0.33
9	Tigecycline	3	0.99	26	Ceftazidime	1	0.33
10	Moxifloxacin	9	2.97	27	Prulifloxacin	1	0.33
11	Clarithromycin	25	8.25	28	Ampicillin	5	1.65
12	Linezolid	31	10.23	29	Cefazoline	1	0.33

13	Fluconazole	14	4.62	30	Polymyxin	1	0.33
14	Vancomycin	10	3.3	31	Teicoplanin	1	0.33
15	Ornidazole	10	3.3	32	Clavulanic Acid	1	0.33
16	Ofloxacin	13	4.29	Total	303		
17	Feropenem	13	4.29				

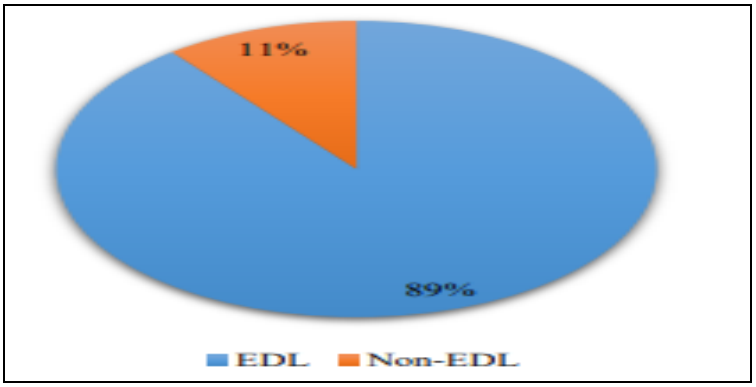


GRAPH 10: OVERALL % DISTRIBUTION OF OTHER ANTIBIOTICS USED IN A HOSPITAL

Percentage of Drugs Prescribed from the Essential Drugs List: In this study, it was found that 89.47% of antibiotics were prescribed from WHO Essential Drug List (EDL) 2021 and 10.52% of prescribed antibiotics were not from EDL [7].

TABLE 11: PERCENTAGE OF DRUGS PRESCRIBED FROM THE ESSENTIAL DRUGS LIST

Percentage by EDL	Frequency	Percentage
EDL	1700	89.47
Non-EDL	200	10.52
Total	1900	



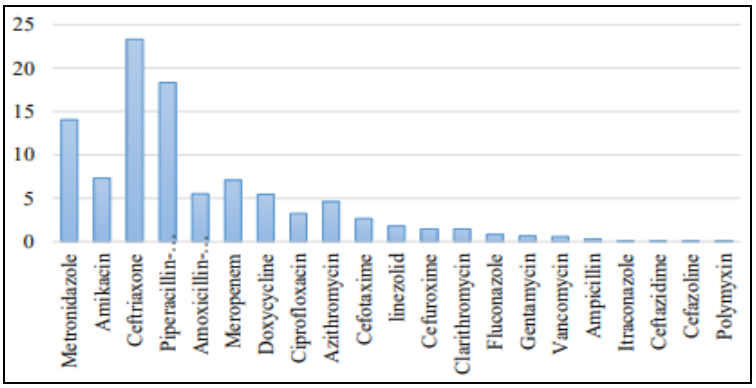
GRAPH 11: DRUGS PRESCRIBED FROM WHO EDL

Percentage Distribution of Antibiotics from EDL: 1700 drugs used for providing antibiotic therapy belonged to the category of EDL antibiotics. Out of these, the antibiotics prescribed the most include Ceftriaxone 23.31%, (n=403), followed by Piperacillin-Tazobactam 18.32% (n=316) and Metronidazole 14.05% (n=239).

TABLE 12: PERCENTAGE DISTRIBUTION OF ANTIBIOTICS BASED ON EDL

EDL Antibiotics	Number of patients	Number of patients (%)
Metronidazole	239	14.05
Amikacin	126	7.308
Ceftriaxone	402	23.31
Piperacillin-tazobactam	316	18.32
Amoxicillin-clavulanic acid	95	5.51
Meropenem	122	7.07
Doxycycline	94	5.45
Ciprofloxacin	56	3.24

Azithromycin	79	4.58
Cefotaxime	46	2.66
linezolid	31	1.79
Cefuroxime	25	1.45
Clarithromycin	25	1.45
Fluconazole	14	0.81
Gentamycin	11	0.63
Vancomycin	10	0.58
Ampicillin	5	0.29
Itraconazole	1	0.058
Ceftazidime	1	0.058
Cefazoline	1	0.058
Polymyxin	1	0.058
Total	1700	

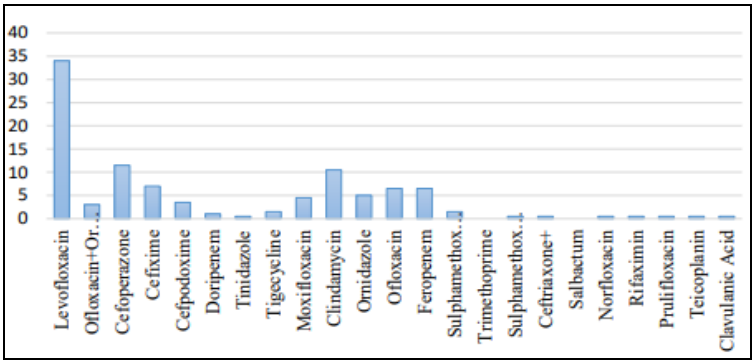


GRAPH 12: PERCENTAGE DISTRIBUTION OF EDL ANTIBIOTICS

Percentage Distribution of Antibiotics from Non-EDL: 200 drugs used for providing antibiotic therapy belonged to the Non-ELD antibiotics category. Out of these, the antibiotics prescribed the most include Levofloxacin 34% (n=68), followed by Cefoperazone 11.5% (n=23) and Clindamycin 10.5% (n=21).

TABLE 13: PERCENTAGE DISTRIBUTION OF NON-EDL ANTIBIOTICS

Sr. no.	Non-ELD Antibiotics	Number	Number of patients (%)
1	Levofloxacin	68	34
2	Ofloxacin-Ornidazole	6	3
3	Cefoperazone	23	11.5
4	Cefixime	14	7
5	Cefpodoxime	7	3.5
6	Doripenem	2	1
7	Tinidazole	1	0.5
8	Tigecycline	3	1.5
9	Moxifloxacin	9	4.5
10	Clindamycin	21	10.5
11	Ornidazole	10	5
12	Ofloxacin	13	6.5
13	Feropenem	13	6.5
14	Sulphamethoxizole-Trimethoprime	3	1.5
15	Sulphamethoxizole	1	0.5
16	Ceftriaxone-Sulbactam	1	0.5
17	Norfloxacin	1	0.5
18	Rifaximin	1	0.5
19	Prulifloxacin	1	0.5
20	Teicoplanin	1	0.5
21	Clavulanic Acid	1	0.5
	Total	200	

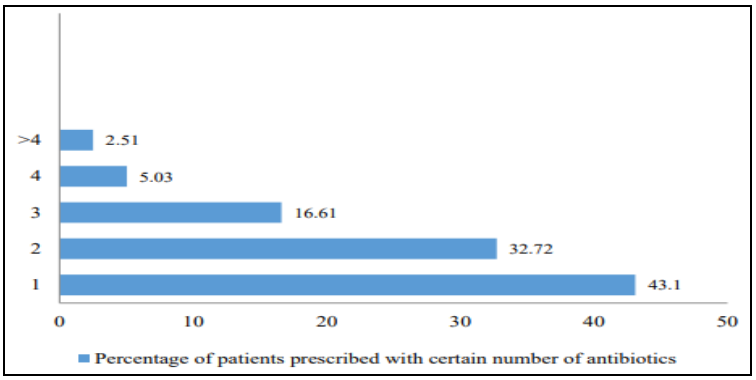


GRAPH 13: PERCENTAGE DISTRIBUTION OF NON-EDL ANTIBIOTICS

Percentage of Patients Prescribed with Certain Number of Antibiotics: The study found that 428 patients (43.1%) were prescribed with only one antibiotic whereas 325 patients (32.72%) were prescribed 2 antibiotics. 165 patients (16.61%) were prescribed 3 tablets while 50 patients (5.03%) were prescribed 4 antibiotics. There were 25 patients (2.51%) who were prescribed more than 4 antibiotics.

TABLE 14: PERCENTAGE OF PATIENTS PRESCRIBED WITH A CERTAIN NUMBER OF ANTIBIOTICS (%)

Number of antibiotics	Number of Patients	Percentage of patients prescribed with certain Number of antibiotics (%)
1	428	43.1
2	325	32.72
3	165	16.61
4	50	5.03 >4
25	2.51	
Total	993	



GRAPH 14: PERCENTAGE OF PATIENTS PRESCRIBED WITH A CERTAIN NUMBER OF ANTIBIOTICS (%)

Most Frequently Used Antibiotics: Who ATC/DDD Index: 2022 The ATC code and DDD, according to WHO ATC/DDD Index 2022 of the most frequently used antibiotics are mentioned below [6].

TABLE 15: FREQUENTLY USED ANTIBIOTICS

Antibiotic	ATC Code	DDD	ROA	Frequency
Metronidazole	J01XD01	1.5 gm	P	239
Amikacin	J01GB06	1 gm	P	126
Ceftriaxone	J01DD04	2 gm	P	402
Piperacillin tazobactam	J01CR05	14 gm	P	316
Amoxicillin clavulanic acid	J01CR02	1.5 gm, 3 gm	O P	95
Meropenem	J01DH02	3 gm	P	122
Doxycycline	J01AA02	0.1 gm	P/O	94
Ciprofloxacin	J01MA02	1 gm, 0.8 gm	O P	56
Azithromycin	J01FA10	0.3 gm, 0.5 gm	O P	79
Levofloxacin	J01MA12	0.5 gm	P/O	6

DISCUSSION: Drug utilization evaluation is an important system that helps to understand and study the clinical use of drugs in a population and how it influences the healthcare system. Antibiotic resistance is increasing rapidly at a fast pace which is a major public health concern worldwide. It has been observed that the countries which have higher per capita antibiotic consumption also have the highest resistance rates. In India, the prevalence range of use of antibiotics is 24-67%, which ultimately contributes to the widespread irrational use of antibiotics that finally leads to the emanation of resistance. The emergence of antibiotic resistance is a major concern because these are associated with a threefold higher rate of mortality, a substantial increment in the duration of stay and a significant increase in overall hospital expenses. It has been observed that countries with higher per capita antibiotic consumption also have the highest resistance rates [8, 9].

In our study a total of 993 prescriptions were analyzed out of which 57% were males and 43% were females. Out of the 993 subjects enrolled in the study, 75.6% (n=751) were in-patients of General Medicine, 5.1% (n=51) were in-patients of OBG, 5.7% (n=57) were in-patients of Orthopedics, 2.3% (n= 23) were in-patients of Surgery, 4.2% (n=42) were in-patients of Paediatrics and 6.9% (n=69) were in-patients of the ICU department Majority of the patients were Male in General Medicine, Orthopedics, Surgery, Paediatrics, and ICU department. The majority of the patients admitted to the hospital that received antibiotic therapy belonged to the age group of 41-60 year constituting 30.81% of total patients followed by age groups 61-80, 21-40and 0-20 constituting 28.9, 25.37 and 10.57 percent respectively.

Patients belonging to the age group of 81-100 yrs. were the least (4.33%). This study revealed that antibiotic treatment was used the most for providing Prophylactic treatment (44.65%) followed by Respiratory Diseases (11.2%), Renal disease(9.2%), Gastro-Intestinal (6.2%) patients, and the least in patients with Tuberculosis at 1.8%. It may be because most patients with comorbid conditions admitted to the hospital for more than 3 days were 40-60 years old. It was found that most of the patients admitted to the hospital were prescribed with antibiotic Ceftriaxone i.e. 21.19% (n=402), followed by piperacillin-tazobactam, and metronidazole i.e 16.65, 12.59 in percent respectively. The antibiotic Ciprofloxacin was prescribed the least i.e., 2.95% (n=56). Other antibiotics comprised 15.94% of the total antibiotics prescribed. The antibiotic Ceftriaxone was prescribed the most in GM (20.304%) and ICU department (22.4%). Metronidazole was prescribed the most in OBG (32.24%) and Surgery department (29.4%). Amikacin was prescribed the most in Orthopedics (25.2%) and Pediatrics department (28.35%). Cephalosporins were our study's most frequently prescribed antibiotics because of their broad spectrum, suitable dosing regimens and minimal side effects.

The extensively used antimicrobial in our study was Ceftriaxone concerning Beg et al in Uttarakhand, where Ceftriaxone was most commonly prescribed. Ceftriaxone is a third-generation cephalosporin with broad spectrum of activity towards a wide range of organisms. A similar study by Sharma N et al., 2014 also highlighted the use of cephalosporin and aminoglycoside as the top two prescribed drugs. [10, 11] Most of the patients in this study were prescribed adult standard doses of antibiotics since most of the patients in the study are adults. However, in the paediatric population mg/kg/day or mg/kg/dose was used as the base for a prescription. Antibiotics in this study were prescribed between 1 and 21 days, though most antibiotics were prescribed for either 3 or 5 days.

The most prominently used antibiotic in other antibiotics was Cefotaxime 15.18% (n=46). Study reveals that antibiotics prescribed in hospital were in accordance with WHO Essential Drug List (EDL) 2021 as 89.47% of the antibiotics were prescribed from the same list and 10.52% were from Non- EDL. Ceftriaxone (23.31%) was the most commonly prescribed antibiotic from EDL and Levofloxacin (34%) from Non- EDL respectively thus the study reveals This study reveals that 1-8 numbers of antibiotics were prescribed for the treatment, and the majority of the patients were treated with a single antibiotic (43.1%). The study found that most patients were only prescribed one antibiotic, i.e., 43.1% (n=428),

whereas only 2.51% (n=25) were prescribed more than 4 antibiotics.

CONCLUSION: The prescribers hold responsibility for rational antimicrobial prescribing. The number of drugs and dosage regimen for the antibiotics prescribed should be carefully monitored to prevent polypharmacy and interactions resulting from irrational drug use. The selection of empirical antibiotics should be made based on culture sensitivity tests which will prevent the causation of antimicrobial resistance and sub-therapeutic efficacy. Educating and updating clinicians through CME, seminars on the essential drug list, standard treatment guidelines and role of sensitivity testing in rational antibiotic prescribing. On the other hand it is also important to educate patients on antibiotic resistance and its effects with the help of pamphlets and counseling.

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REFERENCES:

1. Gowthami B, Spurthi T and Summiah Afreen S: Drug utilization of antibiotics in general medicine department of a Tertiary care Hospital. IJPP 2016; 8: 6.
2. Sneha Pallavi P, Teja Sree B and Krishnakanth PV: Study of prescription patterns of antibiotics in tertiary care hospital. International Journal of Biomedical Research 2016; 7(6): 372-374.
3. Brown EM: Interventions to optimize antibiotic prescribing in hospitals: the UK approach. In antibiotic policies: theory and practice Edited by: Gould IM and Meer JWM. New York, Kluwer Academic/ Plenum Publishers; 2005:159-183.
4. World Health Organization. Introduction to Drug Utilization Research. [Internet]. Oslo, Norway: WHO; 2003 [cited 2020 Dec 22]. Available from: https://apps.who.int/iris/handle/10665/42627
5. Soltani R, Khorvash F and Pazandeh F: Antimicrobial resistance pattern of nosocomial infections at areferral teaching hospital. Journal of Pharmaceutical Care 2020; 8(1): 26-34.
6. WHOCC - ATC/DDD Index [Internet]. Whocc.no. 2022 [cited 2022 Jul 28]. Available from: https://www.whocc.no/atc_ddd_index/
7. WHO model list of essential medicines - 22nd list, 2021 [Internet]. Who.int. 2022 [cited 2022 Jul]. Available from: https://www.who.int/publications/i/item/WHO-MHP-HPS EML-2021.02
8. Hatcher JC, Dhillon R and Azadian B: Antibiotic resistance mechanisms in the intensive care unit. J Intensive Care Soc 2012; 13(4): 297-303.
9. Bisht R, Katiyar A, Singh R and Mittal P: Antibiotic resistance – A global issue of concern. Asian J Pharm Clin Res 2009; 2(2): 34-9.
10. Beg MA, Bawa S, Anjoom M and Vishal S: Study of antimicrobial prescribing pattern in a tertiary care teaching hospital at Dehradun, Uttarakhand, India - A tool to teach clinical pharmacology to MBBS students. International Journal of Basic & amp; Clinical Pharmacology 2016; 5(6): 2444-2448.
11. Sharma N, Bhargava M, Mahawar D, Parakh R and Sharma, D: Usage of antibiotics in postoperative patients in a tertiary care teaching hospital in India. International Journal of Pharmaceutical Research and Bioscience 2014; 3(2): 99-105.
12. Kirubel Minsamo Mishore, Evaluation of Medication Use Pattern Among Patients Presenting to the Emergency Department of Hiwot Fana Specialized University Hospital, Using WHO Prescribing Indicators. Frontiers in Pharmacology 2022; 11: 1-7.
13. Harish Govind Naik S: Drug Utilization Study on Antibiotics Use in Lower Respiratory Tract Infection - [Internet]. Bibliomed.org. 2022 [cited 2022 Jul]. Available from: https://www.bibliomed.org/?mno=47070
14. Sarah Mousavi1 R: Drug Utilization Evaluation of Antibiotics in Intensive Care Units of a Referral Teaching Hospital. Journal of Pharmaceutical care 2021; 9(1): 31-38.
15. Kutyabami P: Evaluation of the Clinical Use of Ceftriaxone among In-Patients in Selected Health Facilities in Uganda. MDPI 2021; 10(799): 1-14.
16. Hu X, Zhang X, Wang Y and Xie X: Cross-sectional study on the drug utilization and evaluation indicator of antibiotics used in pediatric population. BMC Health Services Research 2021; 21(1).
17. Orlando V, Monetti V, Moreno Juste A, Russo V, Mucherino S, Trama U, Guida A and Menditto E: Drug Utilization Pattern of Antibiotics: The Role of Age, Sex and Municipalities in Determining Variation Risk Management and Healthcare Policy 2020; 13: 63-71.
18. Venkateswarulu BS: Drug use evaluation of antibiotics in non teaching tertiary care hospital. World Journal of Current Medical and Pharmaceutical Research 2019; 1: 55-58.
19. Solanki N: Drug Utilization Pattern and Drug Interaction Study of Antibiotics Prescribed to Orthopedic Patients in Private Hospital. Archives of Pharmacy Practice 2019; 10(4): 114-117.
20. Kala K, Sodhi RK and Jain UK: Drug utilization evaluation of antibiotics in district hospital Rudraprayag, Journal of Drug Delivery and Therapeutics 2018; 8(6): 87-90 DOI: http://dx.doi.org/10.22270/jddt.v8i6.2022
21. Randad RD, Bhagwate ST and Mohd. Khalid Inamdar MK: Drug utilization study of some antibiotic in indoor setting at tertiary care teaching hospital in Central India: a descriptive study, International Journal of Basic & Clinical Pharmacology, 2017; 6(5):1123-1126.
22. Sanoj Panicker: Drug Utilization Evaluation Of Antibiotics At A Tertiary Care Hospital. The Tamil Nadu Dr Mgr Medical University, Chennai – 600 032. 2016; 1-63.

23. Pathak A, Gupta VK, Maurya A, Kumar A and Singh A: Assessment of drug prescribing pattern using WHO indicators in hospitalized patients at a tertiary care teaching hospital in rural area of India. International J of Basic & Clinical Pharmacology 2016; 5(3): 651-655.

24. Gowthami B: Drug utilization evaluation of antibiotics in general medicine department of a tertiary care hospital. International Journal of Pharmaceutical Sciences 2016; 8(6).

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