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APPRAISEMENT OF DRUG UTILIZATION PATTERN OF ANTIMICROBIALS IN THE GENERAL MEDICINE DEPARTMENT OF A TERTIARY CARE TEACHING HOSPITAL - A PROSPECTIVE OBSERVATIONAL ANALYTICAL STUDY

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Keywords:

Drug utilization evaluation, Medication use review, Rationality

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ABSTRACT: AIM: To see the appraisement of drug utilization pattern of antimicrobials in the general medicine department of a tertiary care teaching hospital. **Methodology:** A prospective observational, analytical study was done on patients admitted in general medicine of Maharaja Institute of Medical Sciences, Vizianagaram, Andhra Pradesh, India information regarding age, gender, diagnosis, patients present/past medical history, treatment, drug interactions were recorded in a standard questionnaire(case report form). The drug utilization process was evaluated using quality indicators of drug use recommendations by WHO. PDD of drugs and maximally used antimicrobials were analyzed. **Results:** A total of 250 patients were included after excluding missing data. Out of 250 patients, 123 (49.2%) were male, and 127 (50.8%) were female, 183 (65.12%) was bacterial, 74 (26.33%) were viral, 22 (7.82%) were protozoal, 2 (0.7%) were fungal, and the p-value was 0.0213, cephalosporins were most prescribed antimicrobial (27.72%), and anti-helminthics were least (0.33%), and p-value was found to be 0.0016. Out of 18 UTI cases, 3 were male, and 15 were female, and the p-value was found to be 0.0219, and out of 22 cellulitis cases, 15 were male, and 7 were female, and the calculated p-value was 0.0335. **Conclusion:** Prescription by generic name, antimicrobials from EDL, rationality, and WHO indicators are encouraging findings. Deviation in the therapy of UTI and Cellulitis, polypharmacy, DI are the areas of concern. There is a need for more such studies, including a larger no. of patients and other departments to encourage patient safety.

INTRODUCTION: Drug use evaluation (DUE) is defined as an ongoing, systematic, criteria-based program of medicine evaluations that will help ensure appropriate medicine use. If therapy is determined to be inappropriate, interventions with physicians or patients will be necessary to optimize pharmaceutical therapy. This terminology is similar to that drug use review (DUR) and medication use review (MUR).

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Nowadays, drug utilization studies (DUS) are used as a potential tool in evaluating healthcare systems. Drug utilization studies are powerful tools to ascertain the role of drugs in society. They create a sound socio-medical and health economic basis for the healthcare decision making [1].

DUE can assess the actual process of medication prescribing, administration, or dispensing. It involves a comprehensive review of prescriptions and medication data before, during, and after dispensing to assure appropriate therapeutic decision-making and positive outcome.

The Need for DUE:

- To find the solution for problems indicated from World Health Organization (WHO) /

Management Sciences for Health (MSH) indicator studies.

- To identify and solve a high number of ADRs.
- To evaluate the signs of treatment failures.
- Excessive number of non-formulary medications used. Use of high-cost medicines where less expensive alternatives exist.
- Excessive number of medicines within a therapeutic category.

Objectives of a DUE are as Follows:

- To provide assurance that the pharmaceutical. Therapy meets current standards of care.
- For promoting optimal medication therapy.
- To help in preventing medication-related problems.
- It also helps us in identifying specific medicine use problems that require further evaluation.
- DUR will help in creating guidelines (criteria) for appropriate medicine use.
- It is useful in defining thresholds for quality of medicine use.
- It helps us in enhancing accountability in the medicine use process.
- It plays an important role in controlling pharmaceutical costs.

MATERIALS AND METHODOLOGY:

Study Site: The study was conducted in the general medicine department of Maharaja Institute of Medical Sciences, Nellimarla, Vizianagaram, Andhra Pradesh.

Study Period: The study was conducted for a period of 6 months from August 2019 to January 2020.

Study Design: Prospective observational analytical study.

Sample Size: A total of 250 patients were included in the study.

Inclusion Criteria:

- ✓ Age between 12 - 85.
- ✓ Pregnant women.
- ✓ Patients with any kind of infectious diseases.
- ✓ Patients of both genders.
- ✓ Patient with any kind of comorbidity.

Exclusion Criteria:

- ❖ Age less than 12 years.
- ❖ Patients with any other chronic complications. Like kidney disease, hepatic diseases, *etc.*
- ❖ Patients who were not willing to give the consent form.

Study Procedure:
Phase I:

- ❖ Obtaining consent from hospital authorities.
- ❖ Obtaining ethical clearance from institutional research and ethics committee.
- ❖ Literature survey.
- ❖ Design of data collected form.
- ❖ Collection of patient data, treatment chart from patient's case sheet of inpatients.

Phase Ii:

- After elimination of all the missing data the final sample size 250 (The missing data is due to sudden discharge, sudden death, incomplete data).
- To evaluate the rationality of antimicrobials.
- To check the most commonly used antimicrobials.
- To check the types of drug interactions.
- Data assessment and data evaluation and analysis by using Prism Graphpad software.

RESULTS AND DISCUSSION:

Gender: The data were collected prospectively for 250 patients, and drug utilization evaluation was done.

In this study, demographic characters showed that females (50.8%) were more affected with infectious diseases when compared to males (49.2%).

This is similar to a study conducted by Kala *et al.*, who concluded that females were more affected than males [2].

TABLE 1: GENDER WISE DISTRIBUTION OF INFECTIOUS PATIENTS

Gender	No. of Patients	Percentage
Male	123	49.2%
Female	127	50.8%
Total	250	100%

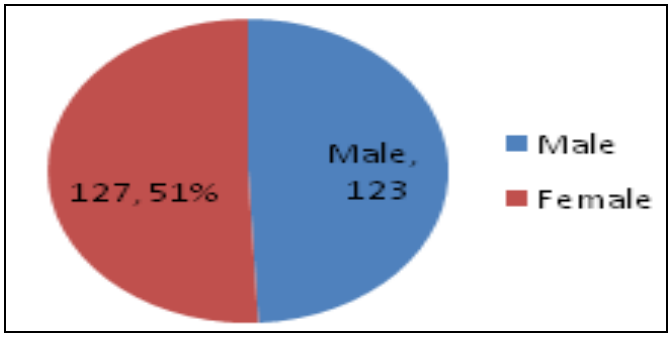

FIG. 1: GENDER WISE DISTRIBUTION OF INFECTIOUS PATIENTS

Age Wise Distribution: Maximum number of patients who were affected with infectious diseases were between the age group of 11-20 years (18.40%) followed by age group 51-60 (18%). This might be due to increased exposure to environmental triggers, which may cause infections. This in contrast with Nathiya *et al.*, who concluded that the age group 21-30 years were more affected [3].

TABLE 2: AGE WISE DISTRIBUTION OF PATIENTS

Age Group	No. of Patients	Percentage
11-20	46	18.40%
21-30	37	14.8%
31-40	43	17.2%
41-50	38	15.2%
51-60	45	18%
61-70	26	10.4%
71-80	14	5.6%
81-90	1	0.4%
91-100	0	0%
Total	250	100%

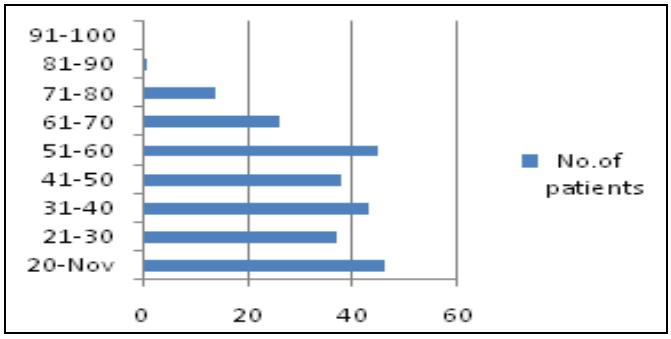

FIG. 2: AGE WISE DISTRIBUTION OF PATIENTS

Infection Wise Distribution: Out of 250 patients, 183 patients were affected with bacterial infections (65.12%), 74 patients (26.33%) were affected with viral infection, 22 patients (7.82%) were affected with protozoal infection, followed by 2 patients (0.71%) who suffered from fungal infection. The bio-statistical analysis was carried out for this data using the student t-test, and it was found to be significant, and the obtained p-value is 0.0213.

TABLE 3: INFECTION WISE DISTRIBUTION OF PATIENTS

	Bacterial	Viral	Protozoal	Fungal	Total
cases	183	74	22	2	281
(%)	65.12%	26.33%	7.82%	0.71%	100%

P-value: 0.0213. One- or two-tailed P value Two-tailed

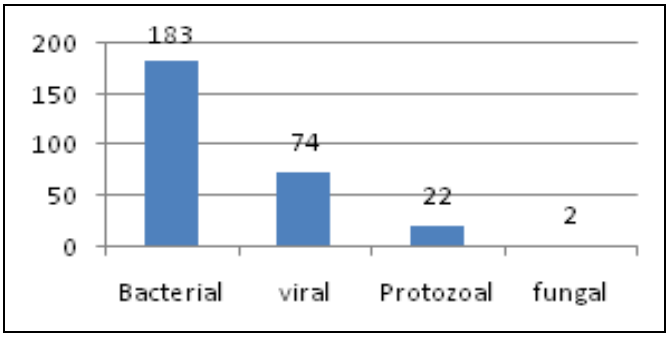

FIG. 3: INFECTION WISE DISTRIBUTION OF PATIENTS

Rationality Wise Distribution: Out of 250 prescriptions, 206 prescriptions (82.4%) were found to be rational, and 44 prescriptions (17.6%) were found to be irrational. This is similar to the study conducted by M. Praveen Kumar *et al.*, who concluded that rational prescriptions were more in number than irrational [4].

TABLE 4: RATIONALITY WISE DISTRIBUTION OF PRESCRIPTIONS

Rationality	No. of Patients	Percentage
Irrational	44	17.6%
Rational	206	82.4%
Total	250	100%

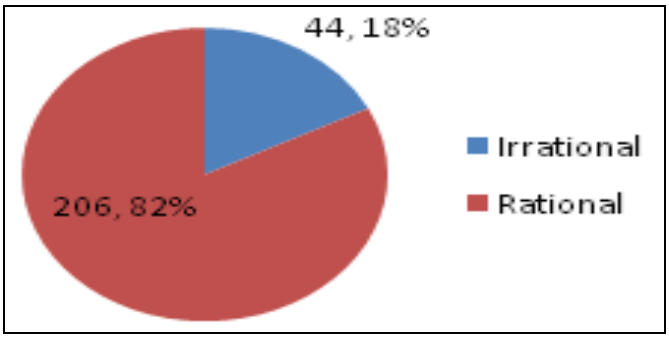

FIG. 4: RATIONALITY WISE DISTRIBUTION OF PRESCRIPTIONS

Prescription Wise Distribution of Anti-Microbials: The majority of antimicrobials were prescribed with generic names (65.64%) followed

by brand names (34.36%). Prescribing generic names may lower the cost of treatment, and it becomes easy for the hospital to maintain a proper inventory. This is in contrast with Kala *et al.*, who concluded that antimicrobials were mostly prescribed with brand names than generic names [5].

TABLE 5: PRESCRIPTION WISE DISTRIBUTION OF ANTIMICROBIALS

Prescribed as	No. of Antimicrobials	Percentage
Brand name	221	34.36%
Generic name	423	65.64%
Total	644	100%

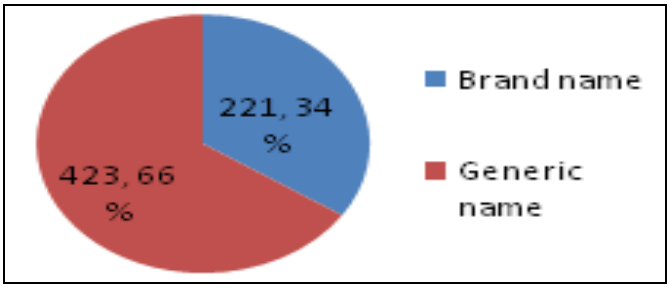

FIG. 5: PRESCRIPTION WISE DISTRIBUTION OF ANTIMICROBIALS

Route of Administration: Out of 250 prescriptions, 123 prescriptions (49.40%) were prescribed with combination of both oral and intravenous antimicrobials followed by 109 prescriptions (43.78%) were prescribed with intravenous and 7 prescriptions (6.82%) were prescribed with oral antimicrobials. This is in contrast with the work done by M. Praveen Kumar *et al.*, who concluded that most of the prescriptions were prescribed with intravenous followed by oral followed by combination of oral and intravenous antimicrobials [6].

TABLE 6: DIFFERENT ROUTES OF ADMINISTRATION OF ANTIMICROBIALS IN PATIENTS

Route of Administration	No .of Patients	Percentage
Parenteral	109	43.78%
Oral	17	6.82%
Parenteral +oral	123	49.40%
Total	249	100%

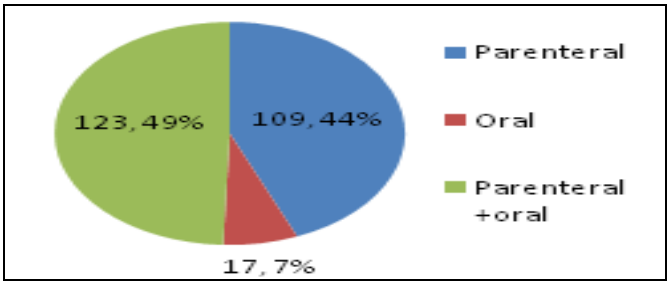

FIG. 6: DIFFERENT ROUTES OF ADMINISTRATION OF ANTIMICROBIALS IN PATIENTS

Co-Morbidities Wise Distribution: Out of 250 patients, 69 patients (26.95%) were found to be having cardiovascular co-morbidities with the highest incidence, followed by renal co-morbidities with a total of 55 patients (21.48%). This is in contrast with the study conducted by Vimlesh Kumar Meena, Meena Atray, and Apurva Agrawal, department of pharmacology, R. N. T medical college, India, who concluded that respiratory co-morbidities were highest in incidence.

TABLE 7: COMORBIDITIES WISE DISTRIBUTION OF PATIENTS

S. no.	Co-morbidity	No. of Patients	Percentage
1	Cardiovascular	69	26.95%
2	Hepatic	17	6.64%
3	Renal	55	21.48%
4	Respiratory	34	13.28%
5	Gastro-intestinal	23	8.98%
6	Endocrine	35	13.67%
7	CNS	23	8.98%
	Total	256	100%

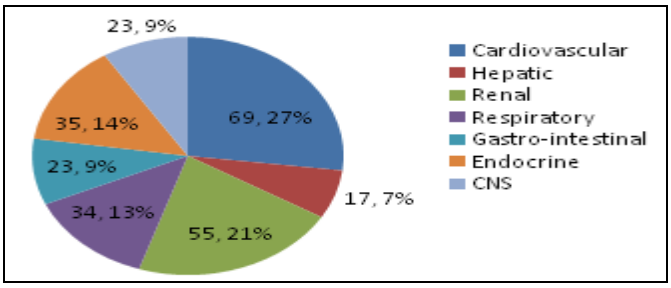

FIG. 7: GRAPHICAL REPRESENTATION SHOWING PATIENTS SUFFERING WITH DIFFERENT CO-MORBIDITIES

Anti-microbial Wise Distribution: A total of 644 antimicrobials were prescribed among which beta-lactam antibiotics (cephalosporins -27.72%, penicillins -10.39%) were most commonly prescribed followed by anti-malarials (9.24%).

This is because of their broad spectrum activity and convenient dosing regimen. The bio-statistical analysis was carried out for this data using student t test was found to be significant and the obtained p-value is 0.0016.

This result is in similar with Vimlesh Kumar Meena, Meena Atray and Apurva Agrawal, department of pharmacology, R. N. T medical college, India who concluded that beta-lactam antibiotics and anti-malarial drugs were most commonly prescribed.

TABLE 8: ANTIMICROBIAL DISTRIBUTION OF DRUGS

Type of Antimicrobial	No. of Patients	Percentage
Sulphonamide	9	1.48%
Fluoroquinolones	29	4.78%
Penicillins	63	10.39%
Cephalosporins	168	27.72%
Aminoglycosides	17	2.80%
Macrolides	34	5.61%
Lincosamides	27	4.45%
Glycopeptides	16	2.64%
Carbapenems	24	3.96%
Tetracyclines	43	7.09%
Nitrofurans	5	0.82%
Rifamycins	4	0.66%
Anti-tubercular	19	3.13%
Anti-fungal	8	1.32%
Anti-viral	29	4.78%
Anti-malarial	56	9.24%
Anti-amoebic	53	8.74%
Anti-helminthics	2	0.33%

P value (two tailed): 0.0016

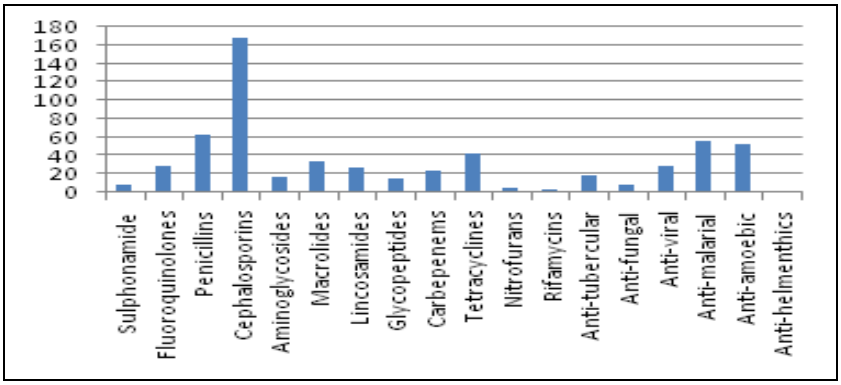

FIG. 8: GRAPHICAL REPRESENTATION OF ANTIMICROBIAL DISTRIBUTION OF DRUGS

Frequency of Anti-microbial Drugs Prescribed: More than half of the prescriptions were prescribed with combination therapy of antimicrobials (79.11%) followed by mono-therapy (20.88%).

This is in contrast with the work done by Jubaraj Singha *et al.*, who concluded that prescription with monotherapy was found to be higher than prescription with combination therapy.

TABLE 9: FREQUENCY WISE DISTRIBUTION OF ANTIMICROBIALS

S. no.	Drugs	No. of Patients	Percentage
1	Monotherapy	52	20.88%
2	Combination therapy	197	79.11%
3	Total	249	100%

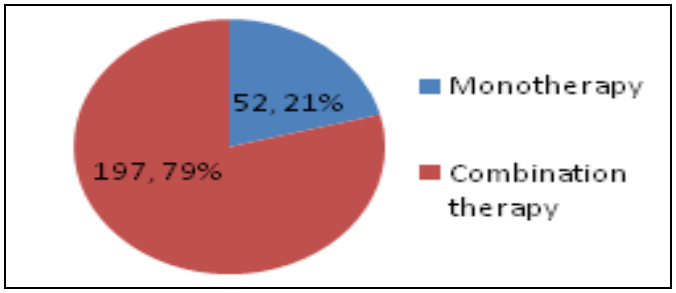

FIG 9: FREQUENCY WISE DISTRIBUTION OF ANTI-MICROBIALS

Anti-microbial Drug Utilization: Highest number of units were prescribed for beta-lactam antibiotics which include cephalosporins (30.06%), penicillins (11.37%) followed by anti-amoebic (12.19%).

This is in similar to the study conducted by Patel *et al.*, who concluded that beta-lactam antibiotics were prescribed most frequently [7].

TABLE 10: ANTI-MICROBIAL DRUG UTILIZATION

S. no.	Type of Anti microbial	Total no. of Units Administered	Percentage
1	Sulphonamide	26	2.11%
2	Fluoroquinolone	48	3.9%
3	Penicillin	140	11.37%
4	Cephalosporin	370	30.06%
5	Aminoglycoside	33	2.68%
6	Macrolide	42	3.41%
7	Lincosamide	60	4.87%
8	Glyco-peptide	37	3.01%
9	Carbapenem	57	4.63%
10	Tetracycline	73	5.93%
11	Nitrofuran	10	0.81%
12	Rifamycin	9	0.73%
13	Anti-Tubercular	18	1.46%
14	Anti-fungal	10	0.81%
15	Anti-viral	60	4.87%
16	Anti-malarial	87	7.07%
17	Anti-amoebic	150	12.19%
18	Anti-helminthics	1	0.08%
	Total	1231	100%

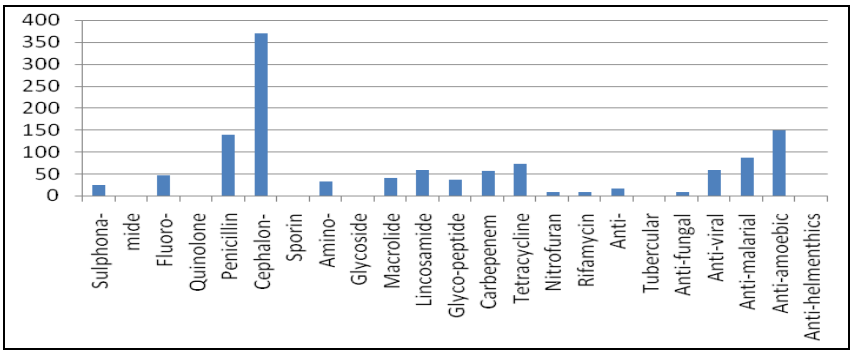

FIG. 10: TOTAL NO. OF UNITS ADMINISTERED FOR DIFFERENT ANTIMICROBIALS

Prevalence o Disease on Gender Basis: Out of 250 patients, 183 patients were found to be suffering from bacterial infection out of which 88 patients were male, and 95 were female, 74 patients were suffering from viral infections out of which 34 patients were male, and 40 were female, 2 patients were found to be suffering from fungal infections out of which 1 patient was male, and 1 was female, and 22 patients were found to be suffering from protozoal infections out of which 14 were male, and 8 were female.

TABLE 11: PREVALENCE OF THE DISEASE ON GENDER BASIS

S. no.	Disease	Male	Female	Total
1	Bacterial	88	95	183
2	Fungal	1	1	2
3	Viral	34	40	74
4	Protozoal	14	8	22

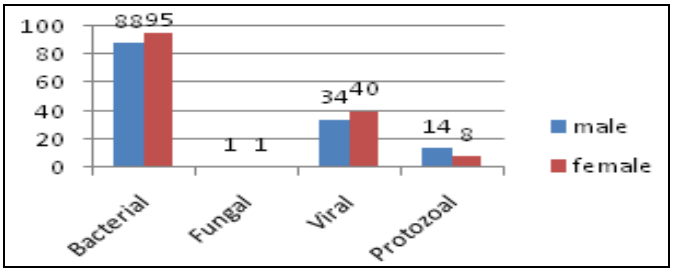

FIG. 11: PREVALENCE OF THE DISEASE ON GENDER BASIS

Comparison of Infection to Rationality: Out of 183 bacterial cases, 146 were found to be rational, and 37 were irrational; out of 74 viral cases, 58 were found to be rational, and 16 were found to be irrational, out of 2 fungal cases both of them were rational and out of 22 protozoal cases 18 were found to be rational, and 4 were irrational.

TABLE 12: COMPARISON OF TYPE OF INFECTION TO RATIONALITY

Rationality	Bacterial	Fungal	Viral	Protozoal
Rational	146	2	58	18
Irrational	37	0	16	4
total	183	2	74	22

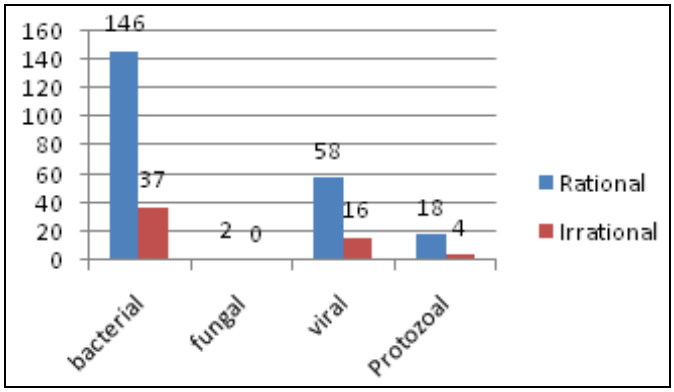

FIG. 12: COMPARISON OF TYPE OF INFECTION TO RATIONALITY

Comparison of Disease to Age: Out of 250 patients a highest number of bacterial infections were found between the age group of 51-60 years (19.67%), the highest number of viral infections were found between the age group of 31-40 years (25.67%), the highest number of protozoal infections were found between the age group of 21-30 years (31.81%) and fungal infection were distributed between the age groups of 31-40 years (50%) and 41-50 years (50%). The bio-statistical analysis was carried out for this data using two-way ANOVA was found to be significant.

TABLE 13: COMPARISON OF TYPE OF INFECTION WITH REFERENCE TO AGE

S. no.	Age Group	Bacterial	Viral	Fungal	Protozoal	% Bacterial	% Viral	% Fungal	% Protozoal
1	11-20	31	14	0	6	16.93%	18.91%	0%	27.27%
2	21-30	25	12	0	7	12.56%	16.21%	0%	31.81%
3	31-40	27	19	1	3	14.75%	25.67%	50%	13.63%
4	41-50	31	11	1	2	16.93%	14.86%	50%	9.09%
5	51-60	36	13	0	3	19.67%	17.56%	0%	13.63%
6	61-70	24	3	0	1	13.11%	4.05%	0%	4.54%
7	71-80	12	2	0	0	6.55%	2.70%	0%	0%
8	81-90	1	0	0	0	0.54%	0%	0%	0%
9	91-100	0	0	0	0	0%	0%	0%	0%
	total	183	74	2	22	100%	100%	100%	100%

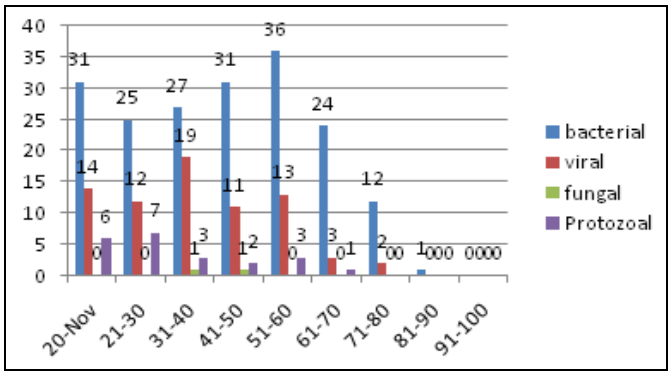

FIG. 13: COMPARISON OF TYPE OF INFECTION WITH REFERENCE TO AGE. Type of test: Two-way ANOVA Row factor: 0.0174 Column factor: <0.0001.

Most Commonly used Anti-microbial: Out of all antimicrobial classes, these five classes were found to be most commonly used.

Gender Wise Distribution of UTI: Out of 18 UTI cases, 15 were found to be female, and 3 cases were found to be male. The bio-statistical analysis was carried out for this data using the student t-test was found to be significant and the obtained p-value is 0.0219.

TABLE 14: MOST COMMONLY USED ANTI-MICROBIAL

Anti-microbial	No. of Patients
Cephalosporins	168
Penicillins	63
Anti malarials	56
Anti amoebic	53
Tetracyclines	43

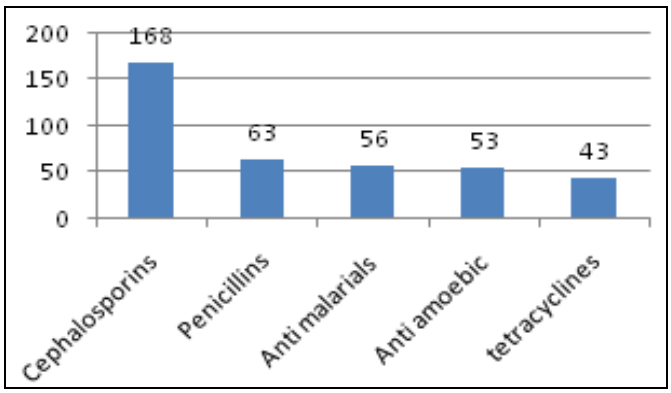

FIG. 14: MOST COMMONLY USED ANTI-MICROBIAL

TABLE 15: GENDER WISE DISTRIBUTION OF UTI

Gender	UTI
Male	3
Female	15

P-value: 0.021. One or two-tailed P-value: Two-tailed

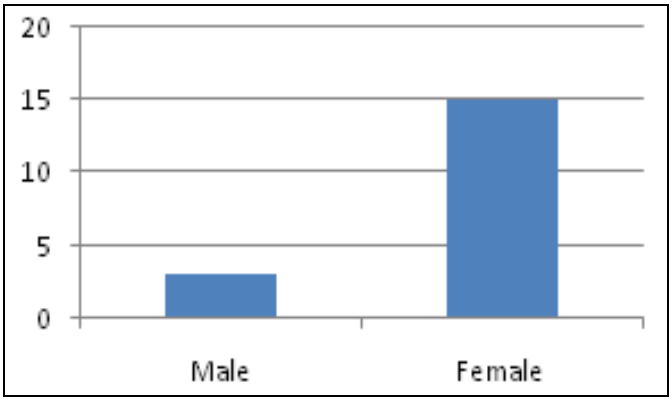

FIG. 15: GENDER WISE DISTRIBUTION OF UTI

Deviation in the Line of Treatment as Per IDSA Guidelines: Out of 13 complicated UTI cases, 6 cases (49.15%) deviated, and out of 5 uncomplicated UTI cases, 4 cases (80%) deviated from therapy as mentioned in IDSA guidelines. This is contrast with the work done by Patil *et al.*, [8].

Types of UTI in the Study Population: Out of 250 patients, a total of 18 patients were suffering from UTI among which 13 patients were of complicated UTI and 5 were suffering from uncomplicated UTI.

Uncomplicated UTI occurs in individuals who lack structural or functional abnormalities of the urinary tract that interfere with normal flow of urine, while complicated UTI occurs in patients with functional or structural abnormalities of genito-urinary tract.

This is in contrast with the work done by Patil *et al.* who concluded that complicated UTI was found in more individuals than uncomplicated UTI [9].

TABLE 16: DEVIATION IN THE LINE OF TREATMENT AS PER IDSA GUIDELINES

Type of UTI	No. of Patients with Deviation	Drugs to be Prescribed	% of Deviation
Complicated	06	First line: Fosfomycin, Nitrofurantoin, Co-trimoxazole. Second line: Ciprofloxacin, Levofloxac in, Ofloxacin	46.15%
Uncomplicated	04	First line: Ciprofloxac in, Levofloxacin, Ciprofloxac in extended release Second line: Piperacillin-tazobactum, Ampicillin-Salbactum, Gentamicin	80%

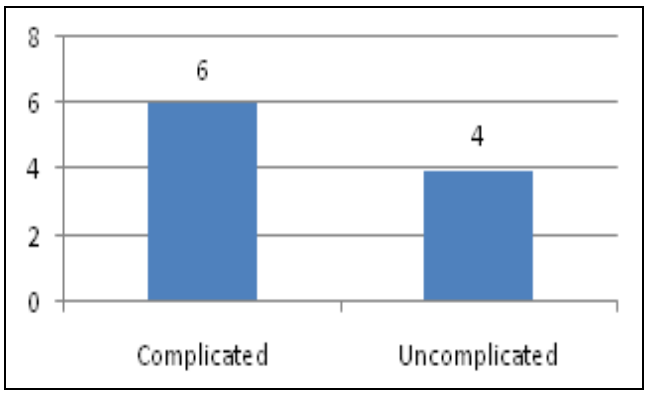

FIG. 16: DEVIATION IN THE LINE OF TREATMENT AS PER IDSA GUIDELINES

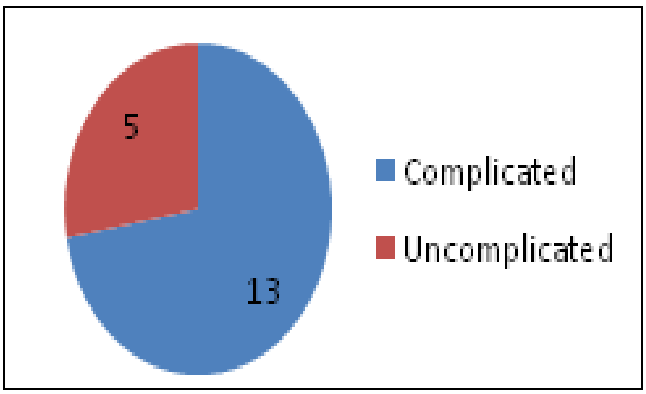

FIG. 17: TYPES OF UTI IN THE STUDY POPULATION

TABLE 17: TYPES OF UTI IN THE STUDY POPULATION

Type	No. of Cases	Percentage
Complicated	13	72.22%
Uncomplicated	05	27.78%
Total	18	100%

Gender Wise Distribution of Cellulitis: Out of 22 cellulitis cases, 7 cases were found to be female and 15 cases were male. The bio-statistical analysis was carried out for this data using student t-test, and it was found to be significant, and the obtained p-value is 0.0335.

TABLE 18: GENDER WISE DISTRIBUTION OF CELLULITIS

Gender	Cellulitis
Male	15
female	7

P-value: 0.0335. One or two-tailed P-value: Two-tailed

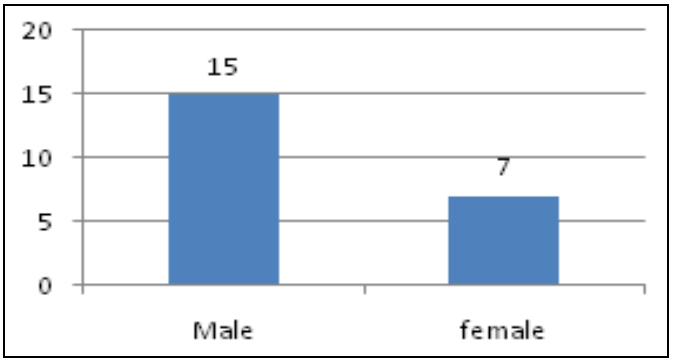

FIG. 18: GENDER WISE DISTRIBUTION OF CELLULITIS

Deviation in the Line of Treatment as Per Crest Guidelines: Out of 22 cellulitis cases, no patients were found in class-I, 8 patients were suffering with class-II cellulitis, out of which 2 patients deviated from the therapy, 2 out of 6 patients in class-III cellulitis deviated from therapy, 6 out of 8 patients deviated from the therapy mentioned as per CREST guidelines. This is similar to the study conducted by Patil, *et al.*, who concluded that most of the cellulitis patients were found in class-III and IV [10].

TABLE 19: DEVIATION IN THE LINE OF TREATMENT AS PER CREST GUIDELINES

Cellulitis	No. of Patients Diagnosed	No. of Patients with Deviation	Drugs to be Prescribed	% of Deviation
Class 1	0	0	-	-
Class 2	8	2	Flucloxacill in / ceftriaxone /clarithromycin/clindamycin	25%
Class 3	6	2	Flucloxallin/ clarithromycin/ clindamycin/ piperacill in + tazobactum	33.3%
Class 4	8	6	Benzyl-penicillin + ciprofloxac in + clindamycin, Vancomycin + piperacillin / tazobactum	75%

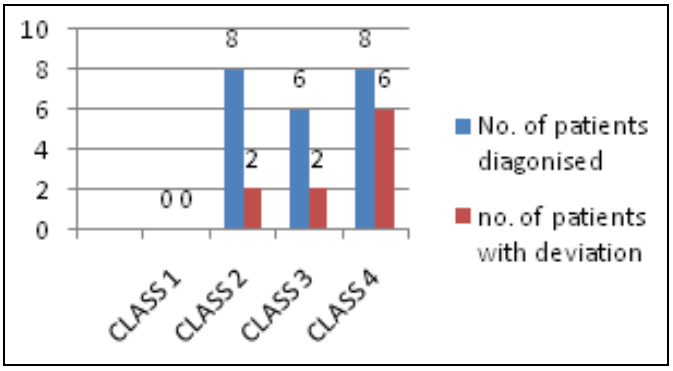

FIG. 19: DEVIATION IN THE LINE OF TREATMENT AS PER CREST GUIDELINES

Distribution of Drugs as Per EDL: A total of 644 antimicrobials were prescribed in 250 cases, out of which 595 antimicrobials (92.39%) were from the essential drug list, which is similar to the study conducted by Kala *et al.*, who concluded that most of the prescribed antibiotics were from essential drug list. Drugs from EDL should be promoted for optimal use of resources and safety [11].

Drug Interactions with Antimicrobials in Total Cases: Out of 250 prescriptions, 98 prescriptions showed drug-drug interactions. The reason for the incidence of drug-drug interaction may be due to polypharmacy used in the treatment of infection and also comorbid conditions.

TABLE 20: DISTRIBUTION OF DRUGS AS PER EDL

No. of Anti microbial Drugs	No. of Drugs in EDL	Percentage
644	595	92.39%

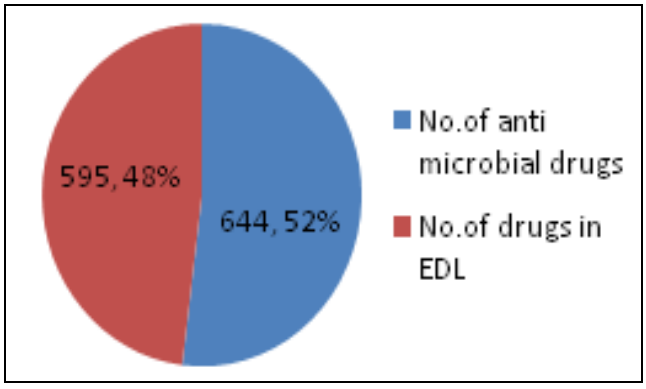

FIG. 20: DISTRIBUTION OF DRUGS AS PER EDL

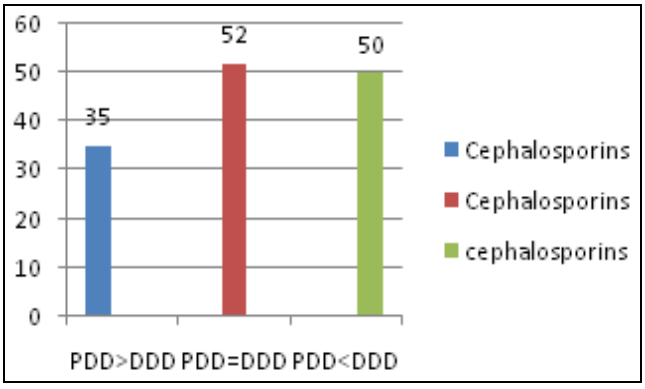

FIG. 21: COMPARISON OF PDD AND DDD VALUES

TABLE 21: COMPARISON OF PDD AND DDD VALUES

Drug	PDD>DDD	PDD=DDD	PDD<DDD
Sulphonamides	0	9	0
Fluoroquinolones	7	12	9
Penicillins	10	2	37
cephalosporins	35	52	50
aminoglycosides	8	2	10
macrolides	31	3	5
Lincosamide	4	2	23
Glycopeptides	2	6	9
Carbapenems	1	4	21
Tetracyclines	27	9	15
Nitrofurans	0	5	0
Rifamycins	2	0	2
Anti-tubercular	0	20	0
Anti-fungal	1	4	4
Anti-viral	1	10	17
Anti-malarial	12	4	45
Anti-amoebic	26	9	16
Anti-helminthics	0	1	0

While comparing PDD and DDD values Cephalosporin's were found to be higher in all the three categories with respect to antimicrobials

TABLE 22: COMPARISON OF PDD AND DDD VALUES

Class of Antimicrobials with Highest Number	PDD>DDD	PDD=DDD	PDD<DDD
Cephalosporins	35		
Cephalosporins		52	
cephalosporins			50

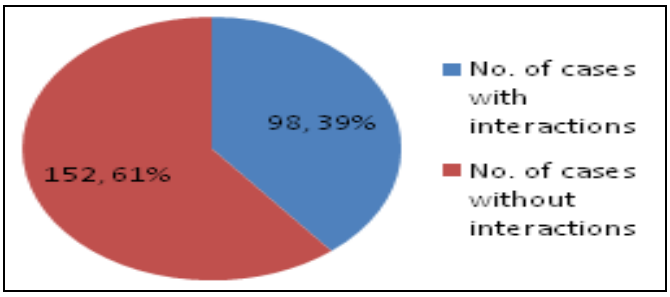

FIG. 22: DRUG INTERACTIONS IN TOTAL CASES

Drug Interactions with Anti-microbials in Total Cases: The drug interactions are categorized as mild, moderate, and severe.

Among 98 prescriptions, a total of 166 interactions were found, out of which 97 were mild (58.43%), 54 were moderate (32.53%), and 15 were severe (9.03%).

TABLE 23: DRUG INTERACTIONS IN TOTAL CASES

Total no. of Cases	No. of Cases with Interactions	No. of Cases without Interactions	Percentage of Cases with Interactions
250	98	152	39.2%

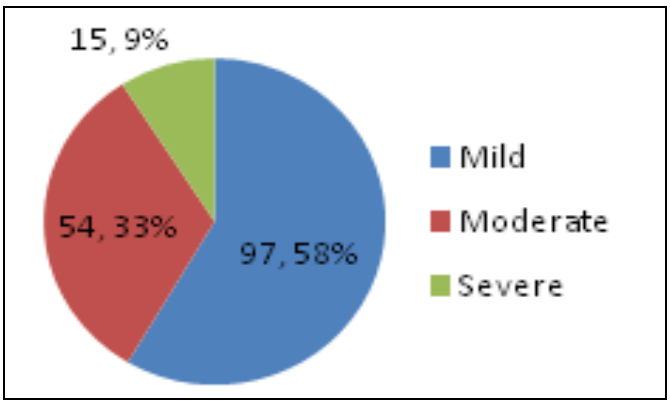

FIG. 23: DRUG INTERACTIONS WITH ANTI-MICROBIALS IN TOTAL CASES

Drug Interactions in between Different Anti-microbials: While considering the drug interactions between antimicrobials and antimicrobials 20were found to be mild (46.66%), 17 were moderate (50%), and 2 were severe (3.34%).

TABLE 24: DRUG INTERACTIONS WITH ANTI-MICROBIALS IN TOTAL CASES

Type of Drug Interaction	No. of Interactions	Percentage
Mild	97	58.43%
Moderate	54	32.53%
Severe	15	9.03%
Total	166	100%

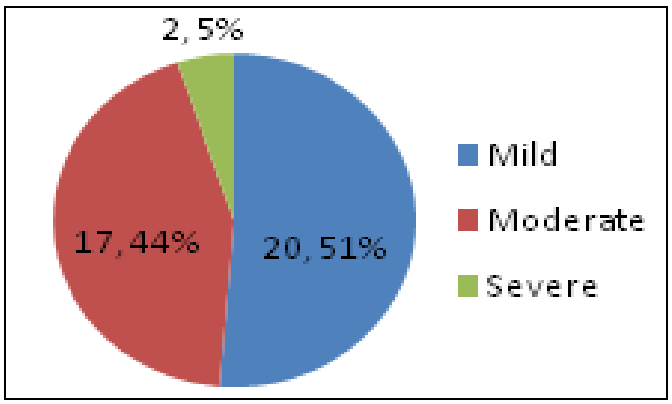

FIG. 24: DRUG INTERACTIONS BETWEEN ANTI-MICROBIALS

Drug Interactions between Anti-microbials and Other Drugs: While considering interactions between antimicrobials and other concomitant drugs 77 were mild (47.09%), 37 were moderate (30.1%), and 13 were severe (22.81%).

TABLE 25: DRUG INTERACTIONS BETWEEN DIFFERENT ANTI-MICROBIALS

Type of Drug Interaction	No. of Interactions	Percentage
Mild	20	46.66%
Moderate	17	50%
Severe	2	3.34%
Total	39	100%

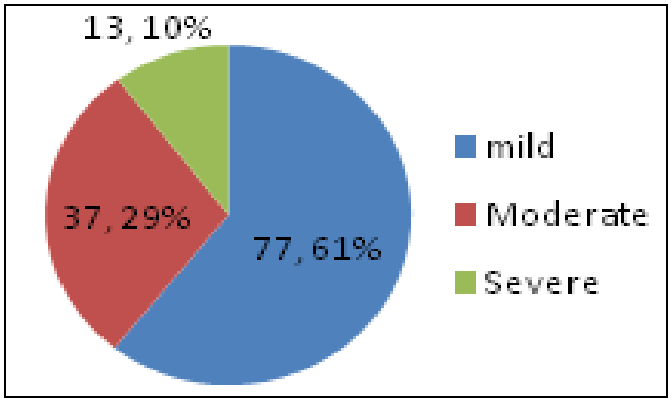

FIG. 25: DRUG INTERACTIONS BETWEEN ANTI-MICROBIALS AND OTHER DRUGS

WHO Indicators: Average number of drugs per prescription was 0.3%, average number of anti-microbials per prescription was 0.4%, percentage of antimicrobials encountered with generic name was 66.4%, percentage of prescriptions encountered with antimicrobials was 99.6%, percentage of antimicrobials prescribed intravenously was 56.8% and percentage of antimicrobials from essential drug list was 92.3%. while comparing our work with Jubaraj Singha *et al*, the following parameters have lesser percentage, which include average no. of drugs per prescription, average no. of antimicrobials per prescription, percentage of antimicrobials encountered with generic name, percentage of antimicrobials prescribed intravenously and remaining parameters were found to be having higher percentage which include percentage of prescriptions encountered with antimicrobials and percentage of anti-microbials from EDL.

TABLE 26: DRUG INTERACTIONS BETWEEN ANTI-MICROBIALS AND OTHER DRUGS

Type of Drug Interaction	No. of Interactions	Percentage
mild	77	47.09%
Moderate	37	30.1%
Severe	13	22.81%
Total	127	100%

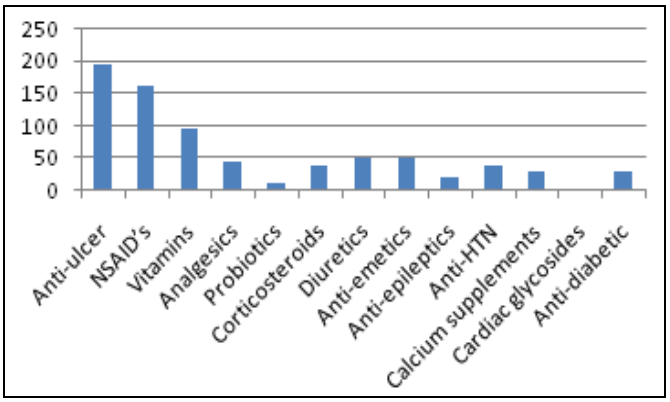

FIG. 26: CONCOMITANT DRUGS PRESCRIBED IN THE TREATMENT

Concomitant Drugs Prescribed in the Treatment: Among the concomitant medications, anti-ulcer drugs were prescribed in 25.65% of the cases followed by NSAID's in 21.22% of the cases.

Antiulcer drugs were prescribed in highest percentage to relieve the symptoms of GI irritation caused due to antibiotics, and NSAID's are prescribed to relieve inflammatory reactions due to infections.

TABLE 27: WHO INDICATORS

WHO Prescribing Indicators	% Obtained
Average no. of drugs per prescription	0.3%
Average no. of antimicrobials per prescription	0.4%
Percentage of drug by generic names	66.4%
Percentage of encounters with an antimicrobials prescribed	99.6%
Percentage of encounters with an injection	56.8%
Percentage of encounters with EDL prescribed	92.3%

This is similar to the study conducted by Farhan Ahmed Khan, Vinod Kumar Singh and Preeti Singh who concluded that anti-ulcer drugs and NSAID's were the most frequently used concomitant drugs [12].

TABLE 28: CONCOMITANT DRUGS PRESCRIBED IN THE TREATMENT

Drugs	No. of Prescriptions	Percentage
Anti-ulcer	197	25.65%
NSAID's	163	21.22%
Vitamins	96	12.5%
Analgesics	45	5.86%
Probiotics	10	1.30%
Corticosteroids	38	4.95%
Diuretics	51	6.64%
Anti-emetics	51	6.64%
Anti-epileptics	19	2.47%
Anti-HTN	39	5.08%
Calcium supplements	29	3.78%
Cardiac glycosides	2	0.26%
Anti-diabetic	28	3.65%

Some Encouraging Findings in Present Study: In our study we found that rationality of prescriptions was more than that of irrationality. Drugs are mostly prescribed with generic names that that of brand names. Most of the prescribed antimicrobials are from Essential Drug List (EDL).

Areas of Concern in Present Study: Deviation in the treatment of UTI was observed while comparing with the treatment prescribed in IDSA guidelines. Deviation in the treatment of cellulitis was observed while comparing with the treatment prescribed in CREST guidelines. A significant number of drug interactions was observed with antimicrobials.

Limitations of Present Study: The sample size which we considered in the evaluation was less, and it should be further expanded. Our Evaluation work was confined to only the general medicine department, and it should be further expanded to other departments. The total study was done in a single tertiary care hospital, and it can be expanded to more tertiary care hospitals, which will give the scope to include more patients.

CONCLUSION: Out of all the infectious diseases, bacterial infections were found to be dominant. Rationality is high when compared to irrationality, which is a good indication and helps in the improvement of patient quality of life. A significant percentage (34.36%) was prescribed with brand names. The physician should be aware while prescribing drugs with brand names as there is a chance of occurrence of dispensing errors and sometimes which may lead to an economic burden. Beta lactam antibiotics were most commonly prescribed cephalosporins particularly.

Patients were counselled regarding the side effects of beta lactam antibiotics for the safety and efficacy of drug usage. Cardiovascular comorbidities were more commonly seen in patients, followed by renal complications. We have advised the patient regarding the etiology, lifestyle modifications, and precautions to be taken. Most of the prescriptions were prescribed with drugs according to EDL, which indicates that the quality of prescription is very much appreciated. Cephalosporin prescribing pattern was found to be complicated in accordance with PDD and DDD values.

In some prescriptions, PDD of Cephalosporin's was much higher than DDD, and in some prescriptions, it was less. Deviation in the line of treatment was clearly observed in cellulitis therapy in accordance with CREST guidelines which is to be concentrated by the physician so that deviations are to be avoided. Much more deviations were observed in UTI therapy in accordance with IDSA guidelines which is to be concentrated by the physician so that deviations are to be avoided. A significant percentage of drug interactions were observed with antimicrobials and discussed with physician regarding serious drug interactions and physician acceptance ratio was also appreciated. Further, research is to be carried out by using large sample size with more number of departments.

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CONFLICTS OF INTEREST: There were no conflicts of interest.

REFERENCES:

1. Nathiya: A study on drug utilization pattern of antimicrobials in outpatient department of medicine at tertiary care hospital. International Journal of Research in Pharmacy and Science 2014; 4(2): 40-45.

2. Kala: Drug utilization evaluation of antibiotics in district hospital Rudraprayag. Journal of Drug Delivery & Therapeutics 2018; 8(6): 87-90.
3. Nathiya D, Pandey K and Sharma RK: A study on drug utilization pattern of antimicrobials in outpatient department of medicine at tertiary care hospital. International Journal of Research in Pharmacy and Science 2014; 4(2): 40-45.
4. Praveen Kumar PM, Bhanu Prasad BK, Pratyusha D, Swathi G, Priya GS and Iram NSR: Drug utilization evaluation of third generation cephalosporins in a tertiary care hospital. International Journal of Current Pharmaceutical and Clinical Research 2019; 1(9): 15-34.
5. Kala: Drug utilization evaluation of antibiotics in district hospital Rudraprayag. Journal of Drug Delivery & Therapeutics 2018; 8(6): 87-90.
6. Kumar MP, Prasad BK, Pratyusha D, Swathi G, Priya G. SN and Iram SR: Drug utilization evaluation of third generation cephalosporins in a tertiary care hospital. International Journal of Current Pharmaceutical and Clinical Research 2019; 1(9): 15-34.
7. Patel SR, Shah AM, Shah RB and Buch JG: Evaluation of drug utilization pattern of antimicrobials using ATC/DDD system in intensive care unit of a tertiary care teaching hospital. International Journal of Medical Science and Public Health 2016; 1(5).
8. Patil SS, Venu AP and Doddayya H: Urinary tract infection: a study of drug use evaluation in a tertiary care teaching hospital. European Journal of Pharmaceutical and Medical Research 2018; 5(7): 358-62.
9. Patil SS, Venu AP and Doddayya H: Urinary tract infection: a study of drug use evaluation in a tertiary care teaching hospital. European Journal of Pharmaceutical and Medical Research 2018; 5(7): 358-62.
10. Patil SS, Sreekanth, Baby B, Sravani A, Geethika G and Hiremath D: Cellulitis: A study of drug use evaluation in a tertiary care teaching hospital. In J of Pharm Practice 2018; 11(3):
11. Kala: Drug utilization evaluation of antibiotics in district hospital Rudraprayag. Journal of Drug Delivery & Therapeutics 2018; 8(6): 87-90.
12. Khan FA, Singh VK, Sharma S and Singh P: A prospective study on the antimicrobial usage in the medicine. Department of a Tertiary Care Teaching Hospital 2013; 7(7): 1343-46.

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