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Drug Utilization Evaluation on Antibiotics in ICUby Using WHO Indicators – A Prospectiveobservational Study

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Abstract:
BACK GROUND: *Drug Utilization Evaluation play a key role in managing healthcare system to understand, interpret, evaluate and improve the prescribing, administration and use of medications.*
AIM: *To evaluate and compare the drug utilization of antibiotics in Intensive Care Unit.*
METHOD: *A prospective, observational study was performed on 113 prescriptions. The total number of drugs, dose, route, sensitivity pattern and cost were collected from in-patient records. The Defined Daily Dose/100, PDD to the DDD ratio was also calculated for each in-patient.*
RESULTS: *Out of the 1094 drugs prescribed in the Intensive Care Unit, 188 antibiotics were prescribed with an average of 2(±0.5) drugs per prescription. The average length of stay was 4 (±2.3) days. Most frequently prescribed antibiotics were ceftriaxone (n=36) followed by metronidazole (n=24) and meropenem (n=12). The DDD/100 bed days for those drugs was 25.4, 13.6 and 7.9 respectively. The widely prescribed antibiotic combinations were piperacillin+tazobactam and cefoperazone+sulbactam. The PDD/DDD ratio was also calculated and it was found to be less than 1 for antibiotics which are prescribed in ICU.*
CONCLUSION: *There is a need of antibiotic usage guidelines and antibiotic culture sensitivity pattern test and restriction policies for the rational prescribing of antibiotics in critically ill patients.*
Key Words:*Drug Use Evaluation, Antibiotics, ICU, PDD, Sensitivity pattern, Defined Daily Dose.*

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I. Introduction

Drug utilization has been defined as the marketing, distribution, prescription and use of drugs in a society with special emphasis on the resulting medical and social consequences.[1] DUE ensures safety and efficacy of antibiotics to improve patients health status.[2] DUE is important for every drug but especially for the antibiotics as they are widely used in healthcare.[1] DUE is a vital component of clinical pharmacy practice.[2] Stewardship of antibiotics is an apt description of related activities that help optimize antibiotic therapy, ensuring the best clinical outcomes for the patient while lowering the risk of subsequent development of antibiotic resistance. Thus, in ICU antibiotic stewardship encompasses rapid identification of patients with bacterial infections, better empirical treatment selection, using pharmacokinetics-pharmacodynamic characteristics.[3] WHO launched a technical unit of measurement in connection with the Anatomical Therapeutic Chemical Classification. In the ATC classification system, the active substances are divided into different groups according to the system on which they act on their therapeutic, pharmacological and chemical properties. The purpose of the ATC/DDD methodology is to serve as a tool for producing good quality, usable and comparable drug utilization statistics [4]. Furthermore, calculatingthe cost, DDD/100 bed days, PDD/DDD ratio of antibiotics prescribed among patients admittedtoICUmightbemandatoryforfuturepolicies and procedures regarding antibiotics use in ICUs.[5]

II. Materials and Methods:

The study was conducted in intensive care unit (ICU) at Guntur private hospitals. A prospective hospital based non-experimental (observational study) was carried out for a period of 6 months i.e., from June to November 2019. Ethical clearance was obtained from the Institutional Review board & Hospital Ethics Committee. A total of 113 subjects were included in the study (considering a 95% confidence level, 5% margin of error and 10% non- response) by using n-master 2.0.

MATERIALS:

- Data collection form.
- Informed consent document.

STUDY CRITERIA:

INCLUSION CRITERIA:

Patients who were admitted in ICU, patient's with more than 1-year age group andpatients who were taking antibiotics were included in the study.

EXCLUSION CRITERIA:

Patient's with incomplete data and treatment charts without antibiotics were excluded, Patients who are not willing to participate in the study were excluded, Pregnant and lactating women were excluded.

STUDY METHOD:

This study is conducted in and around Guntur.A data collection form will be developed in which all the patient details are noted.Consent form will be taken from subjects who wish to participate in our study.The data source needed for the study was collected from case reports, treatment charts and lab reports in a specially designed patient data entry form.Data were analyzed for demographic variables; indication of admission in ICU, duration of ICU stay, total no. of antibiotics prescribed per patient was calculated according to the Anatomical Therapeutic chemical classification based on their chemical, pharmacological and therapeutic properties. The cost details of antibiotics were collected from pharmacy and hospital formulary.The outcome measures were measured using the below mentioned formula. [6]

$$\text{DDD/100 bed days} = \frac{\text{No. of units administered In the study period (g)} \times 100}{\text{DDD (g)} \times \text{No. of days in the study period} \times \text{No. of beds} \times \text{occupancy index.}}$$

$$\text{Occupancy index} = \frac{\text{Total inpatient service days for a period} \times 100}{\text{Total inpatient bed count} \times \text{No. of days in the study period}}$$

The average cost of most commonly used antibiotics was calculated by multiplying cost per unit dosage and the number of doses used in each patient. The prescribed daily dose (PDD) to the defined daily dose (DDD) ratio was also calculated for each patient.

STATISTICAL ANALYSIS:

Data were entered into Microsoft excel and analyses were performed accordingly. Descriptive statistics such as frequencies and percentages were calculated for categorical variables. Mean (±) and standard deviation (±) were computed for continuous variables. Graphic representations were used for visual interpretation of the analyzed data. The level $p< 0.05$ was considered as the cut off value or significance.

III. Results

Demographic profile and patient characteristics:

The demographic data and patient characteristics in ICU are shown in Table 1. In ICU a total of 113 prescriptions were analyzed during the study period which includes 47 female and 66 male patients. The average age of the patients was `57(±20.1) years and average length of the stay (LOS) was 4 (± 2.3) days. A total of 1094 drugs were prescribed during the period of stay and antibiotics prescribed were 188 of total drugs.

Table 1: Demographic data and patient characteristics in ICU

CHARACTERISTICS NUMBER		ICU	
		Percentage (%)	*Number*
Gender	Male	58.4	66
	Female	41.6	47
Age distribution (years)	11 – 30	11.5	13
	31 – 50	23.0	26
	51 – 70	37.2	42
	71 – 90	26.5	30
	91 – 110	1.8	2
Mean (±) SD		57 (±) 20.1	

Drugs prescribed	1 – 6	15.9	18
	7 – 12	65.5	74
	13 – 18	18.6	21
Mean (±) SD		10 (±) 3.5	
Antibiotics prescribed	1 – 2	83.2	94
	3 – 4	16.8	19
Mean (±) SD		2 (±) 0.75	
Length of stay	1 – 3	59.3	67
	4 – 6	30.1	34
	7 – 9	8.0	9
	10 – 12	2.6	3
Mean (±) SD		4 (±) 2.3	

Category wise distribution of antibiotics:

Table.2. category wise distribution of antibiotics

S.NO	CATEGORY	NO. OF DRUGS	PERCENTAGE
1	Cephalosporins	70	37.2%
2	Penicillin	34	18.08%
3	Nitro-imidazoles	22	11.7%
4	Fluoroquinolones	18	9.6%
5	Carbapenems	15	8%
6	Others	29	15.42%

Table.2. The category wise distribution shows the, Cephalosporins (n=70,37.2%) were taken more by the patients followed by the penicillin (n=34, 18.08%) and nitroimidazoles (n=22,11.7%).

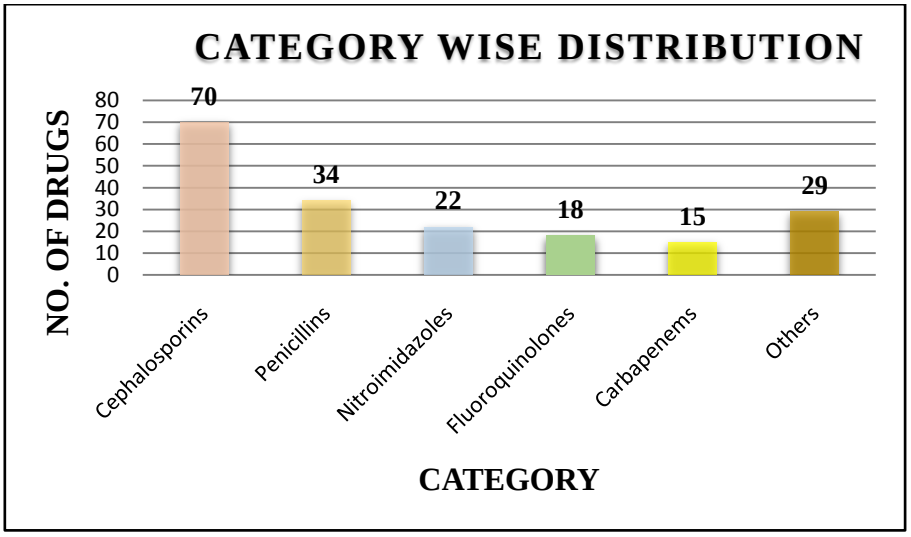

Fig.1. Category wise distribution.

Antibiotic wise distribution:

Table.3. Antibiotic wise distribution:

S.NO	ANTIBIOTIC	NO. OF TIMES PRESCRIBED	PERCENTAGE
1	Ceftriaxone	36	19.15%
2	Piperacillin + Tazobactam	27	14.3%
3	Metronidazole	24	12.7%
4	Cefoperazone + Sulbactam	13	6.9%
5	Meropenem	12	6.4%
6	Ofloxacin	9	4.8%
7	Azithromycin	8	4.3%
8	Amoxicillin + clavulanic acid	7	3.7%
9	Moxifloxacin	6	3.2%
10	Doxycycline	5	2.7%
11	Cefoperazone + Tazobactam	5	2.7%
12	Others	36	19.15%

Table.3 The Antibiotic wise distribution shows the, Ceftriaxone (n=36, 19.15%), Piperacillin + tazobactam (n=27, 14.3%), Metronidazole (n=24, 12.7%) were more prescribed than other antibiotics.

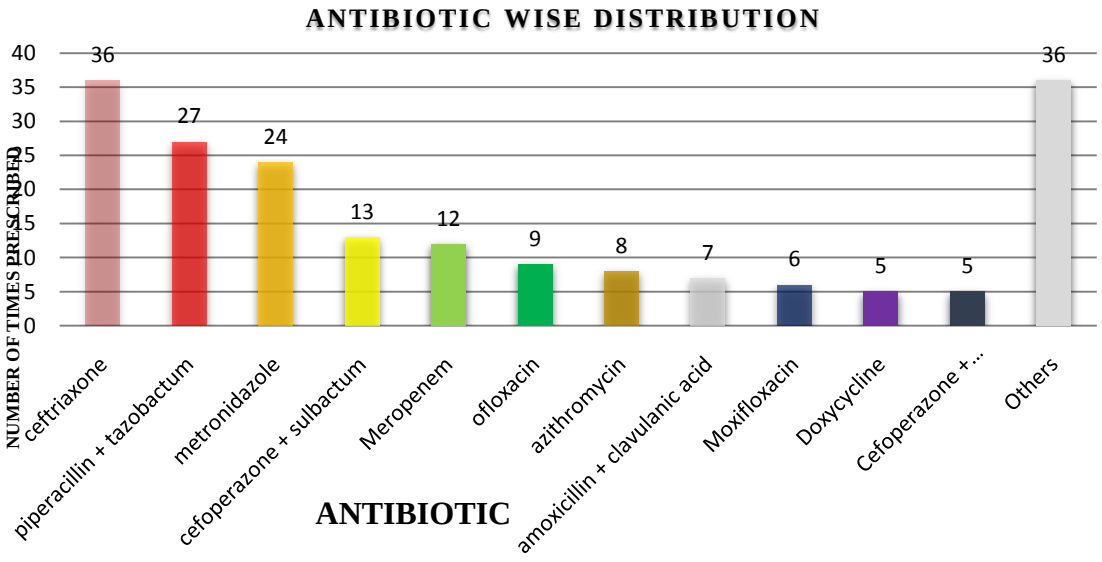

Fig.2. Antibiotic wise distribution.

Prescription containing single antibiotic:

Table.4. Prescription containing single antibiotic wise distribution:

S.NO	ANTIBIOTIC	NO. OF TIMES PRESCRIBED	PERCENTAGE
1	Ceftriaxone	36	28.3%
2	Metronidazole	24	18.9%
3	Meropenem	12	9.4%
4	Ofloxacin	9	7.1%
5	Azithromycin	8	6.3%
6	Moxifloxacin	6	4.7%
7	Doxycycline	5	3.9%
8	Cefixime	4	3.2%
9	Cefotaxime	3	2.4%
10	Amikacin	3	2.4%
11	Clindamycin	3	2.4%
12	Cefuroxime	3	2.4%
13	Others	11	8.6%

Table.4. shows the most frequently prescribed antibiotics in ICU. In ICU Ceftriaxone (n=36, 28.3%) was prescribed more followed by Metronidazole (n=24, 18.9%), Meropenem (n=12, 9.4%) while Amikacin, cefotaxime, clindamycin, cefuroxime was least prescribed.

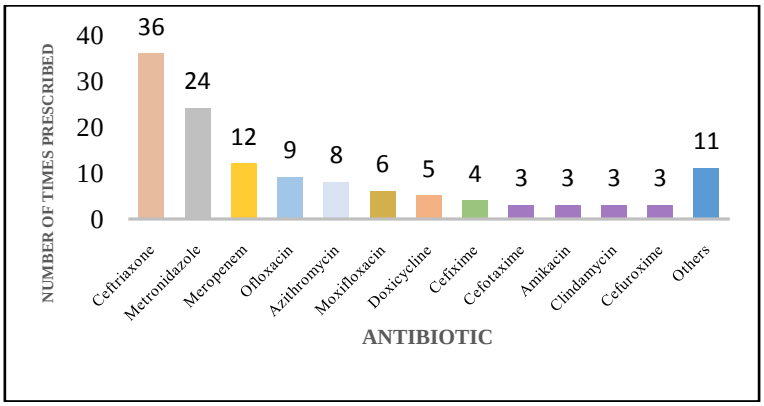

FIG.3 Prescription containing single antibiotic wise distribution.

TABLE.5. MOST FREQUENTLY USED ANTIBIOTICS IN ICU:

S.NO	DRUG	ATC CODE	ROUTE	DDD (gm)	TOTAL UNITS (gm)	DDD/100 BED DAYS
1	Ceftriaxone	J01DD04	P	2	203	25.375
2	Cefuroxime	J01DC02	P O	3 0.5	39 5	3.25 2.5
3	Gentamicin	J01GB03	P	0.24	0.96	1
4	Metronidazole	J01XD01	P O	2 2	109 3	13.625 0.375
5	Ofloxacin	J01MA01	P	0.4	7.2	4.5
6	Rifaximin	A07AA11	O	0.6	3.7	1.5416
7	Doxycycline	J01AA02	P O	0.1 0.1	0.4 0.4	1 1
8	Meropenem	J01DH02	P	3	95.4	7.95
9	Vancomycin	J01XA01	P	2	6	0.75
10	Cefepime	J01DE01	P	4	4	0.25
11	Amikacin	J01GB06	P O	1 1	4 3	1 0.75
12	Moxifloxacin	J01MA14	P O	0.4 0.4	2.8 0.8	1.75 0.5
13	Levofloxacin	J01MA12	P	0.5	2.5	1.25
14	Azithromycin	J01FA10	P O	0.5 0.3	1.5 7.2	0.75 6
15	Tigecycline	J01AA12	P	0.1	0.1	0.25
16	Cefixime	J01DD08	P O	2 2	4 2	0.5 0.25
17	Clindamycin	J01FF01	P O	1.8 1.24	25.2 0.6	3.5 0.125
18	Cefotaxime	J01DD01	P	4	12	0.75
19	Rifampicin	J04AB02	O	0.6	1.35	0.5625
20	Ethambutol	J04AK02	O	1.2	2.4	0.5
21	Isoniazid	J04AC01S	O	0.3	0.9	0.75
22	Ciprofloxacin	J01MA02	O	1	1	0.25

P-Parenteral, O-Oral, DDD-Daily Defined Dose.

Table.5. shows the most frequently prescribed antibiotics in ICU with their DDD/100 bed days.

Prescription containing combination ofantibiotic:

Table.6. Prescription containing Combination of antibiotic wise distribution

S.NO	ANTIBIOTIC	NO. OF TIMES PRESCRIBED	PERCENTAGE
1	Piperacillin + Tazobactam	27	44%
2	Cefoperazone + sulbactam	13	21%
3	Amoxicillin + clavulanic acid	7	12%
4	Cefoperazone + tazobactam	5	8%
5	Meropenem + sulbactam	3	5%
6	Cefpirome + sulbactam	2	3%
7	Cefepime + tazobactam	2	3%
8	Ofloxacin + Ornidazole	1	2%
9	Ceftriaxone + sulbactam	1	2%

Table.6. shows the most frequently prescribed combination in ICU. In ICU Piperacillin + Tazobactam (n=27, 44%) was mostly prescribed than other antibiotic combination while Ceftriaxone + sulbactam (n=1, 2%), Ofloxacin + Ornidazole (n=1, 2%) were least prescribed.

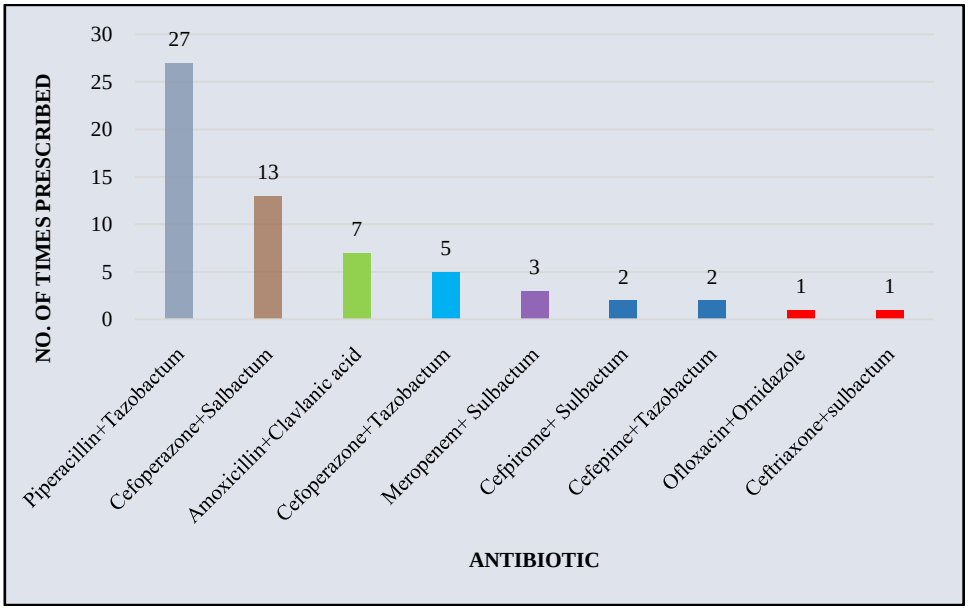

Fig.4. Prescription containing combination of antibiotics wise distribution.

TABLE.7. MOST FREQUENTLY USED COMBINATION THERAPY IN ICU:

S.NO	DRUG COMBINATION	ATC CODE	ROUTE	DDD (gm)	TOTAL UNITS (gm)	DDD/100 BED DAYS
1	Cefepime+Tazobactum	J01DE01	P	4	4.65	0.290625
2	Piperacillin+ Tazobactum	J01CR05	P	14	686.25	12.25446
3	Cefoperazone+ Sulbactum	J01DD62	P	4	109	6.8124
4	Cefoperazoe+ Tazobactum	J01DD62	P	4	56.25	3.515625
5	Amoxicillin+Clavulanic Acid	J01CR02	P	3	74.4	6.2
6	Cefpirome+ Sulbactum	J01DE02	P	2	14	1.75
7	Ofloxacin+ Ornidazole	J01RA09	O	1.5	3	0.5
8	Meropenem+Sulbactum	J01DH50	P	3	53	4.41667
9	Ceftriaxone + Sulbactum	J01DD63	P	3	12	1

Table.7. shows the most frequently used combination therapy in ICU along with their DDD/100 bed days.

Table 8: Most frequently used antibiotics in ICU with DDD/100 bed days

S.NO	ANTIBIOTIC	ROUTE	MALE (gm)	FEMALE (gm)
1	Ceftriaxone	Parenteral	17.25	8.75
2	Piperacillin + tazobactam	Parenteral	5.2446	6.67
3	Cefuroxime	Oral	2.5	0
		Parenteral	1.75	1.5
4	Metronidazole	Oral	0	0.56
		Parenteral	9.3125	4.3125
5	Ofloxacin	Parenteral	4.8	3.2
6	Cefoperazone + sulbactam	Parenteral	5.40625	2.25
7	Amoxicillin + clavulanic acid	Parenteral	3	3.2
8	Cefoperazone + tazobactam	Parenteral	0.9843	1.125
9	Amikacin	Oral	0.075	0
		Parenteral	0.05	0.5
10	Meropenem	Parenteral	5.166	2.783
11	Azithromycin	Oral	7.2	1.667
		Parenteral	0	0.75
12	Moxifloxacin	Oral	0.5	0

		Parenteral	0.5	1.25
13	Meropenem + sulbactam	Parenteral	2.33	1.5
14	Cefotaxime	Parenteral	0.375	0.375
15	Cefixime	Oral	0.1	0.15
		Parenteral	0.5	0
16	Cefepime + tazobactam	Parenteral	0.15	0.703125
17	Gentamicin	Parenteral	0	1
18	Doxycycline	Oral	0	1
		Parenteral	0.5	0.5
19	Cefepime	Parenteral	0	4
20	Levofloxacin	Parenteral	0	1.25
21	Clindamycin	Oral	0.125	0
		Parenteral	7.2	0
22	Ciprofloxacin	Oral	0.25	0
23	Rifampicin	Oral	0.5625	0
24	Isoniazid	Oral	0.75	0
25	Ethambutol	Oral	0.5	0
26	Tigecycline	Parenteral	0.25	0
27	Rifaximin	Oral	1.54167	0
28	Cefpirome + sulbactam	Parenteral	1.75	0
29	Ofloxacin + ornidazole	Oral	0.5	0
30	Ceftriaxone + sulbactam	Parenteral	1	0
31	Vancomycin	Parenteral	0.75	0

Table 8 shows the DDD/100 bed days of most frequently used antibiotics in ICU among males and females. The ceftriaxone DDD/100 bed days was found to be more among males and females. The P-value of DDD/100 bed days was $1.79*10^{\wedge-8}$ i.e., there was statistical difference between males and females.

NUMBER OF ANTIBIOTICS PRESCRIBED:

TABLE.9. Number of antibiotics prescribed in a prescription:

S.NO	NO. OF ANTIBIOTICS PER PRESCRIPTION	NO. OF CASES	PERCENTAGE
1	Single Antibiotic	62	55%
2	Double Antibiotic	32	28%
3	Triple Antibiotic	18	16%
4	Tetra Antibiotic	1	1%

Table.9. shows that the number of antibiotics per prescription in ICU. In ICU one antibiotic (n=62, 55%) per prescription was found to be more. The average number of antibiotics prescribed per prescription in ICU was found to be 2 (± 0.75).

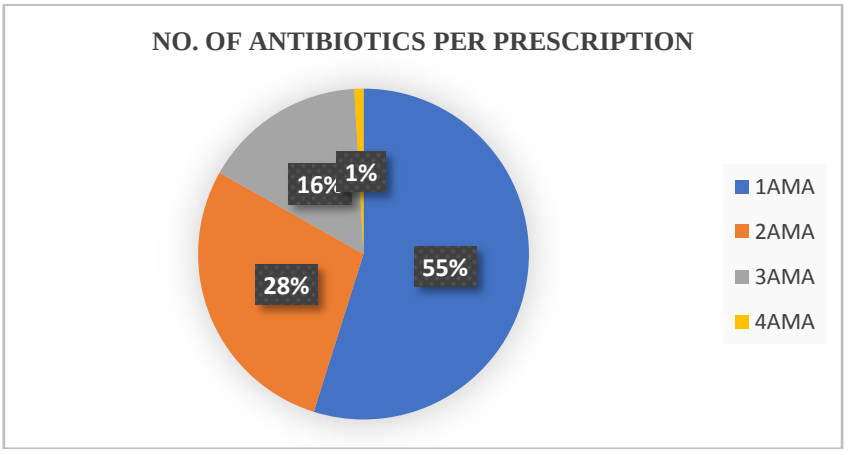

Fig.5. Number of antibiotics per prescription in ICU.

DOSAGE FORM WISE DISTRIBUTION:

Table 10: Type of dosage form prescribed.

S.NO	DOSAGE FORM	TYPE OF DOSAGE FORM PRESCRIBED	PERCENTAGE
1.	Injections	180	95.75%
2.	Tablets	8	4.25%

Table.10. shows the type of dosage form prescribed in ICU. In ICU the dosage form like injections (n=180,95.75%) was mostly prescribed followed by tablets (n=8, 4.25%).

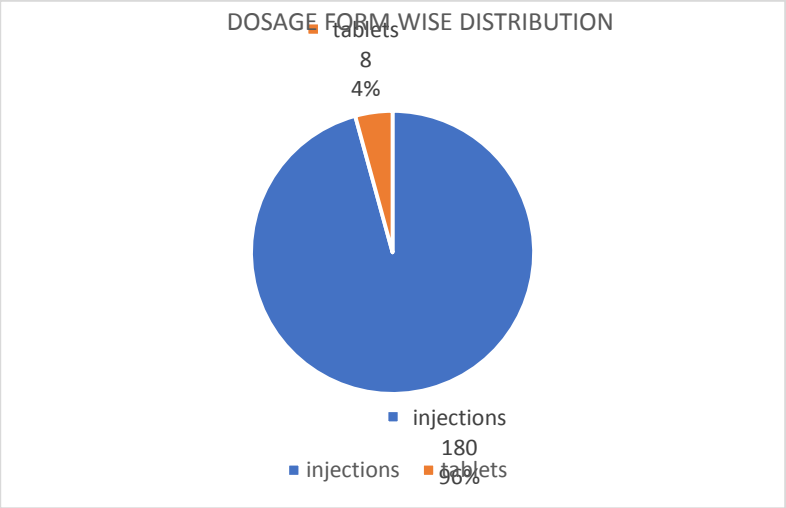

Fig6. Type of dosage form prescribed in ICU.

PPP/DDD RATIO WISE DISTRIBUTION:

Table.11. PDD/DDD ratio of antibiotics.

S.NO	DRUG NAME	MALES	FEMALES	P – VALUE 0.65
1	Cefepime + tazobactum	0.6	0.5625	
2	Ceftriaxone	1	1	
3	Piperacillin + tazobactum	0.578066	0.78769	
4	Cefuroxime	0.667	1	
5	Gentamicin	0	0.667	
6	Cefoperazone + sulbactam	0.672	0.65	
7	Metronidazole	0.71875	0.75	
8	Ofloxacin	1	1	
9	Amoxicillin + clavulanic acid	0.8	0.8	
10	Cefoperazone + tazobactam	0.654	0.561	
11	Rifaximin	0.873	0	
12	Doxycycline	1	1	
13	Meropenem	0.696166	0.567	
14	Vancomycin	1	0	
15	Cefepime	0	0.5	
16	Amikacin	1	0.5	
17	Moxifloxacin	1	1	
18	Ceftriaxone + sulbactam	1	0	
19	Cefpirome + sulbactam	1	0	
20	Levofloxacin	0	1	
21	Ofloxacin + ornidazole	0.66	0	
22	Azithromycin	1	1	
23	Meropenem + sulbactam	0.8335	0.667	
24	Tigecycline	0.5	0	
25	Cefixime	1	1	
26	Clindamycin	0.7223333	0	
27	Cefotaxime	0.5	0.5	
28	Isoniazid	1	0	
29	Ethambutol	0.667	0	
30	Rifampicin	0.75	0	
31	Ciprofloxacin	1	0	

Table.11. shows the average PDD/DDD ratio of antibiotics among males and females. The PDD/DDD ratio of all antibiotics which was prescribed in ICU was found to be ≥ 1 for both males and females. The P-value for PDD/DDD ratio was 0.65 i.e., there is no significant difference between males and females.

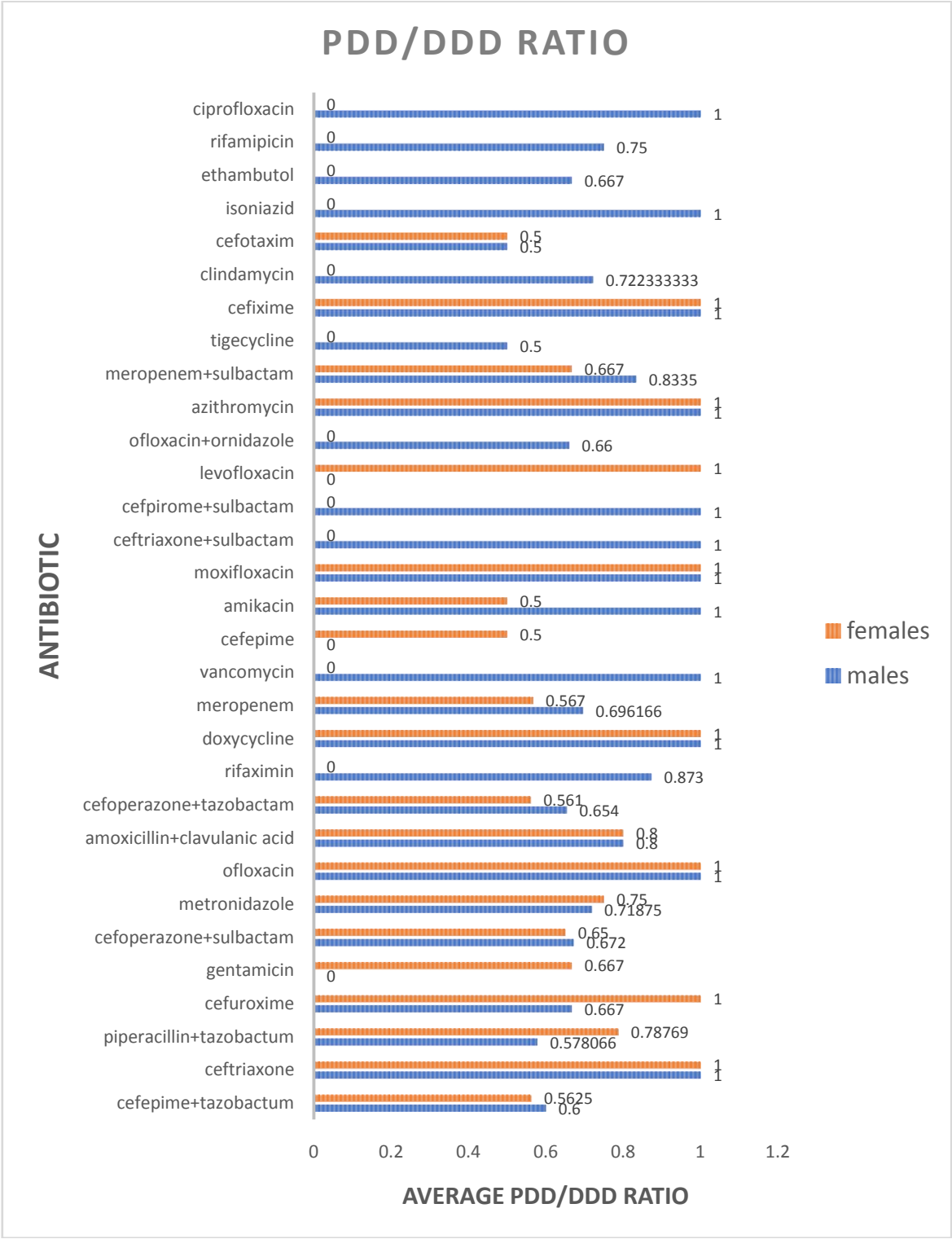

Fig.7. PDD/DDD ratio wise distribution.

COST WISE DISTRIBUTION:

Table.12. Cost wise distribution of antibiotics:

CATEGORY	ANTIBIOTIC	AVERAGE COST
Cephalosporins	Cefepime + tazobactam	□ 1,015.90
	Ceftriaxone	□ 340.88
	Cefuroxime	□ 3,015.50
	Cefoperazone + sulbactam	□ 3,988.78
	Cefoperazone + tazobactam	□ 5,474.88
	Cefepime	□ 432.00
	Ceftriaxone + sulbactam	□ 3,416.00
	Cefpirome + sulbactam	□ 1,270.95
	Cefixime	□ 60.95
	Cefotaxime	□ 148.00
Penicillin	Piperacillin + tazobactam	□ 2,562.19
	Amoxicillin + clavulanic acid	□ 963.66
	Meropenem	□ 8,942.58
	Meropenem + sulbactam	□ 12,806.00
Fluoroquinolone	Ofloxacin	□ 504.49
	Moxifloxacin	□ 226.63
	Ciprofloxacin	□ 7.58
	Levofloxacin	□ 686.40
	Ofloxacin + ornidazole	□ 81.60
Macrolide	Azithromycin	□ 125.70
	Clindamycin	□ 2,952.67
Aminoglycoside	Gentamicin	□ 60.00
	Amikacin	□ 561.33
Tetracycline	Doxycycline	□ 15.60
	Tigecycline	□ 7,868.00
Nitroimidazoles	Metronidazole	□ 192.44
Others	Rifaximin	□ 110.23
	Isoniazid + rifampicin + ethambutol	□ 37.62
	Vancomycin	□ 1,635.96

Table.12. shows the average cost of antibiotics during the study period. The cost of antibiotics was calculated by multiplying cost per unit dosage and the number of doses used in each subject. Among them the average cost of meropenem + sulbactam (□ 12,80600) was high, while ciprofloxacin (□ 7.58) cost was low.

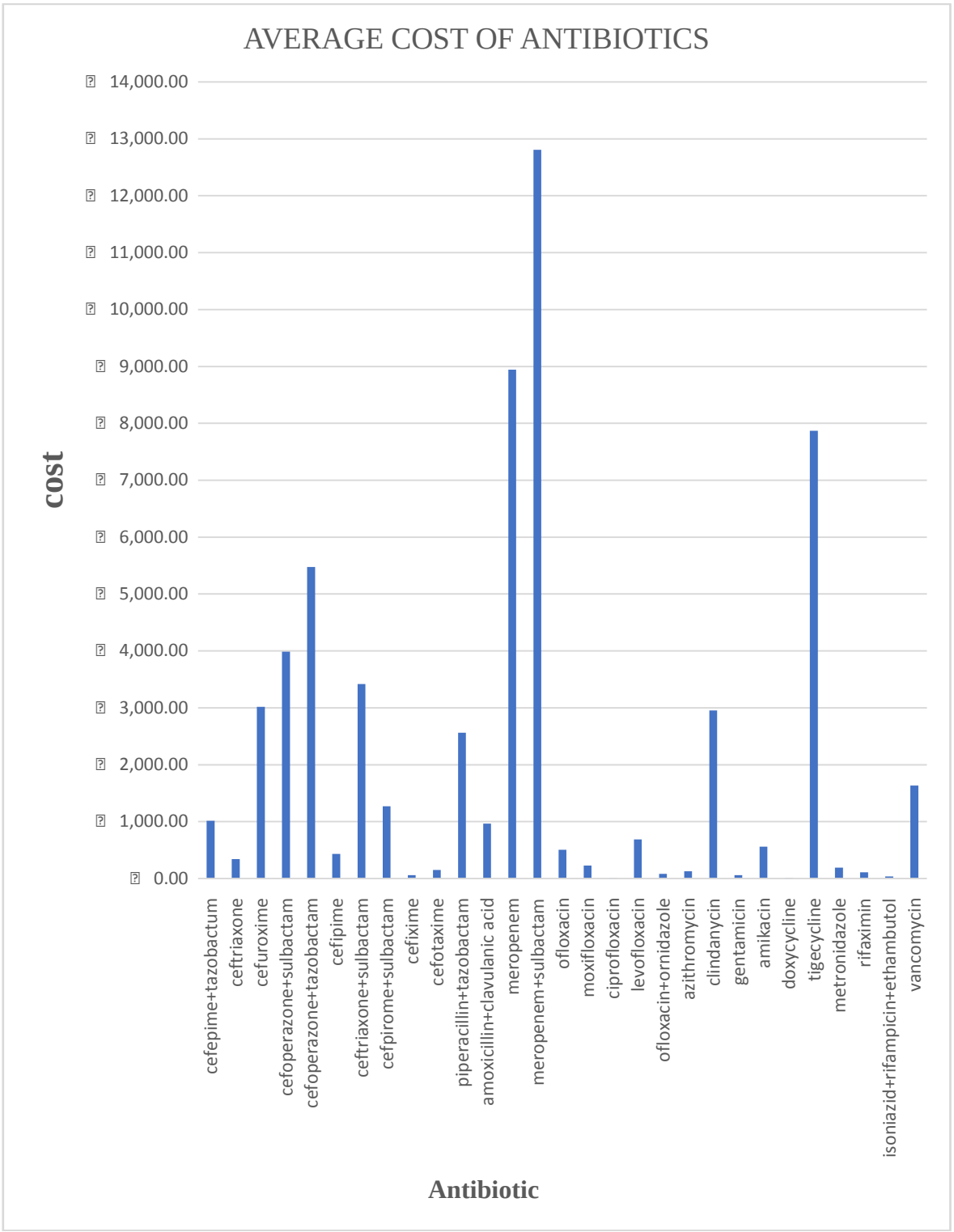

Fig.8. cost of antibiotics wise distribution during the study period.

IV. Discussion:

DUE is the mainstay for the rational use of drugs. It helps policy makers for designing guidelines [(1)]. The use of antibiotics is essential in critically ill Patients with serious infections. In fact, it is known that antibiotics are used widely in the ICU's [(7)]. However, it is well known that antibiotic over usage can promote the emergence of multidrug-resistant bacteria in these units [(8)]. Therefore, different strategies have been evaluated to control antibiotic use[(7)]. The present study was to evaluate and improve the use of antibiotics in ICU. During the study period, we audited 113 prescriptions with antibiotics from ICU. The cost incurred for various antibiotics were also noted. The data collected were analyzed and summarized accordingly.

The demographic results of patients revealed that more male patients were admitted in ICU. The mean age of patients was 57 (±20.1) years and the LOS was 4 (±2.3) days. In ICU, a mean of 10(±3.5) drugs and a mean of 2(±0.75) antibiotics were prescribed per patient.(**as shown in table 1)**The data was similar to studies conducted by Bincy Benjamin et al., (2016) in medical and respiratory intensive care units of a tertiary care teaching hospital in south India. In ICU, the most frequently prescribed antibiotic was ceftriaxone(n=36,28.3%) followed by metronidazole(n=24%,18.9%) and meropenem(n=12,9.4%) **(as shown in table.4 & fig. 3).** The DDD/100 bed days for ceftriaxone, metronidazole and meropenem were found to be 25.4, 13.6 and 7.95 respectively**(as shown in table.5)** The generally prescribed antibiotic combination was piperacillin+tazobactam(n=27,44%)and cefoperazone+sulbatctam(n=13,21%) **(as shown in table.6 & fig.4).** The DDD/100 bed days for piperacillin+tazobactam and cefoperazone+sulbactam were found to be 12.25 and 6.81 respectively**(table.7)**

In our study site, the total number of beds in ICU was 14 and the occupancy index was 0.28. In ICU 22 antibiotic monotherapies were prescribed and 9 antibiotic combination therapies were given to the patients. The extensively prescribed monotherapy was ceftriaxone. The probable reason could be due to its extreme long half-life (8 hr). with the respect to the type of dosage form, injections **(as shown in table.10 & fig.6)** were mostly prescribed in the ICU. We also calculate the PDD/DDD ratio for the antibiotics and it was found to be less than 1**(as shown in table.11 & fig. 7)**. That means the antibiotic dose per day which were prescribed in ICU was found to be according to the WHO guidelines.The P-value for PDD/DDD ratio was 0.65 i.e., there is no significant difference between males and females.

The study reveals that there is a high rate of consumption of antibiotics in the ICU. An appropriate method of treatment involves selection and utilization of antibiotics by considering the sensitivity pattern of antibiotics [(9)]. In ICU antibiotics were prescribed without conducting culture sensitivity pattern and this may lead to increased risk of antibiotic resistance in the ICU. Therefore, health system policy makers should consider implementing reasonable administration guidelines for antibiotics through appropriate drug policies. [(10)] In future, clinical pharmacists have a greater responsibility to take prominent roles in antibiotic stewardship program at every hospital.

V. Conclusion:

The present study on drug utilization evaluation on antibiotics in ICU by using WHO indicators which was a prospective observational study. The study reveals that a wide class and percentage of antibiotics were prescribed in ICUs. Majority of patients receive more than 2 antibiotics during the ICU stay. As the patients were critically ill, majority of the antibiotics were prescribed as injections. Ceftriaxone was the most frequently prescribed monotherapy and piperacillin+tazobactam was mostly prescribed antibiotic combination in ICU. The cost of the antibiotics and also the cost of other drugs were also high per patient. The PDD/DDD ratio of all the antibiotics was found to be less than 1.

In ICU the antibiotic consumption was high.So,there is a need of implementing antibiotic stewardship program in ICU for proper usage of antibiotics to the patients in order to prevent the risk of development of the resistant. Development of the antibiotic policies, culture sensitivity pattern tests, will greatly helpful for the physicians, to select the specific drug and exact dose.

LIMITATIONS:

The data pertaining to our study was only related to ICU, there was no follow-up data after the subject shifting to the general ward. we have not assessed the overall cost of drug therapy which would have helped to understand the financial burden of ICU patients.

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CONFLICT OF INTEREST:

The author declares no conflict of interest.

Abbreviations Used:

ICU: Intensive Care Unit, **DDD:** Defined Daily Dose, **PDD:** Prescribed Daily Dose, **LOS:** Length of Stay, **DUE:** Drug Utilization Evaluation, **ATC:** Anatomical Therapeutic Chemical, **WHO:** World Health Organization.

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