"A Study On Therapeutic Evaluation Of Various Antibiotics Used In General Medicine Department In A Tertiary Care Teaching Hospital".

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ABSTRACT

BACKGROUND: -Antibiotics are the most commonly prescribed drug for infectious diseases. The extensive use of antibiotics may lead to unfavourable conditions such as antibiotic resistance, drug interactions, and adverse drug reactions.

OBJECTIVES: - To assess the prescribing pattern of antibiotics in medicine department at tertiary care teaching hospital.

METHODS: -A prospective observational study was conducted for a period of 6 months in the medicine department of Chigateri district Hospital, Davanagere.

RESULTS: - Among 200 patients, highest population of about 74 patients (37%) were presented with RTI. Cephalosporin was the most commonly prescribed antibiotic class (30.56%) among which ceftriaxone was most frequently used (30.17) and 18 ADRs were reported. Majority of the antibiotics (85.10%) were prescribed from NLEM. The antibiotic sensitivity pattern was analysed which revealed that klebsiella pneumonia was highly sensitive to followed by the other organisms and their sensitivity pattern.

CONCLUSION: -From our study results, we recommend that health practitioners need to abide by means of a standard treatment guideline (STG) to comply with a rational antibiotic prescription. The prescriber have to decrease empirical therapy and promote proper diagnosis based on definitive therapy as much as possible to decrease the hazards of antimicrobial resistance (AMR). Drug utilization review program have to be carried out to find out about the rational use of antimicrobials.

KEYWORDS:- Drug Utilization Evaluation, Prescribing pattern, Adverse Drug Reactions, Antibiotic Resistance.

I. INTRODUCTION

DUE (Drug Utilization Evaluation) has been advocated as a method for figuring out inappropriate or pointless drug use that screen, evaluate and promote rational drug remedy, several elements like irrational drug use(IDU), polypharmacy, wrong drug alternatives, incorrect dose, drug interaction(DI) have contributed to accelerated morbidity, mortality and health care charges[1].Infectious diseases are a major source of death in the growing world. Antibiotics are one of the most major findings in medicine and are wide spread in reducing infections[2]. Woefully, India is the country with the elevated consumption of antimicrobials[3].

The rational use of antibacterial agents being increasingly more identified as a necessary contributor to manage the international emergence of antimicrobial resistance (AMR), to limit side effects and to decrease the cost of treatment[4].Irrational use of medicinal drug effects in serious morbidity and mortality as properly as extra financial burden leading to reduction in the quality of drug and thereby wastage of assets, increased treatment cost, increased risk for unfavourable drug response and emergence of resistance. The most often considered irrational use of medication is excessive use of antibiotics[5].The trouble of overuse of antibiotics is a world phenomenon[6]. Prompt, appropriate, targeted antimicrobial remedy is existence saving[7]. Excessive and inappropriate use of antibiotics will increases drug resistance[8].Antimicrobial resistance (AMR) is viewed as a crucial public health concern, and has come to be a worldwide health threat[9]. Antibiotic resistance happens when an antibiotic is no longer effective at killing or limiting the increase of microorganism[10].

The WHO defines an ADR as "Any response to a drug which is noxious and

unintended, and which takes place at doses typically used in man for prophylaxis, diagnosis or therapy of disease, or for the modification of physiologic functions"[11].Prescription pattern study helps in figuring out irrational prescribing such as poly pharmacy, over prescription, wrong prescription etc[12].Thereby prescription pattern studies are a necessary indicator to choose the quality and widespread of clinical practice amongst healthcare professionals[13].

The present study aimed to identify prescribing pattern of antibiotics, ADR involved, antibiotic sensitivity and drug interactions. The drug utilization research allows the rational use of drugs and suggests a way to enhance prescribing habits.

OBJECTIVES
PRIMARY OBJECTIVES:
  To assess the prescribing pattern of antibiotics at tertiary care teaching hospital.

SECONDARY OBJECTIVES:
• To find out most commonly diagnosed infections
• To identify most frequently prescribed antibiotics for infections
• To find out if any ADR present in the prescription
• To study the pattern of antibiotic sensitivity

METHODOLOGY
SOURCE OF DATA:
The required data was collected from:
• Patient case sheet.
• Laboratory analysis report.
• Past medical and medication history.

STUDY SITE:
Chigateri district hospital (tertiary care teaching hospital) Davangere.
DURATION OF STUDY:
The study will be conducted for a period of six months.
STUDY DESIGN:
A prospective observational study.
PROPOSED SAMPLE SIZE:

200 case sheets of patient admitted in general medicine department of the hospital.
STUDY CRITERIA:
The study will be carried out by considering the following inclusion and exclusion criteria.

INCLUSION CRITERIA:
• Patient of either gender.
• Inpatient under antibiotic therapy.
• Patient admitted in general medicine department.
• Patient of age above 18 years.
• Prescription with atleast one antibiotic.
• Patient admitted for more than two days.
EXCLUSION CRITERIA:
• Patient who are treated from outpatient department who do not require hospital stay.
• Patient who are not willing to give informed consent to participate in the study.
• Patient with missing in sufficient data.
• Paediatric and pregnant women.
MATERIALS USED:
• Patient case sheets.
• Laboratory investigation charts.
• Data collection form.
• Lexicomp (A drug information software).
• Medscape interaction checker (multiple interaction checker).
• MS Excel (software).
• National antibiotic guideline 2014.
• National antibiotic guideline 2017.
• National List of Essential Medicine (2022).
• Sensitivity Form.

II. RESULT
1. Distribution of patient according to disease.
        In the study on analysing disease condition of study population it was noted that 37 %(n=74) were affected with respiratory tract infections(RTIs) followed by 25 %(n=50) with gastro intestinal disorders(GITs), 8.5% (n=17) with renal disorders, 3.5 %(n=7) with urinary tract infections(UTIs), 13.5 %(n=27) with blood disorders, 5.5%(n=11) with hepatic impairment, 16.5%(n=33) with other conditions.

Table 1: Distribution of patient according to disease.

DISEASE CONDITION	NUMBER OF PATIENTS(n=200)	PERCENTAGE (%)
Respiratory Tract Infections	74	37
Gastrointestinal Disorders	50	25
Renal Disorders	17	8.5
Blood Disorders	27	13.5

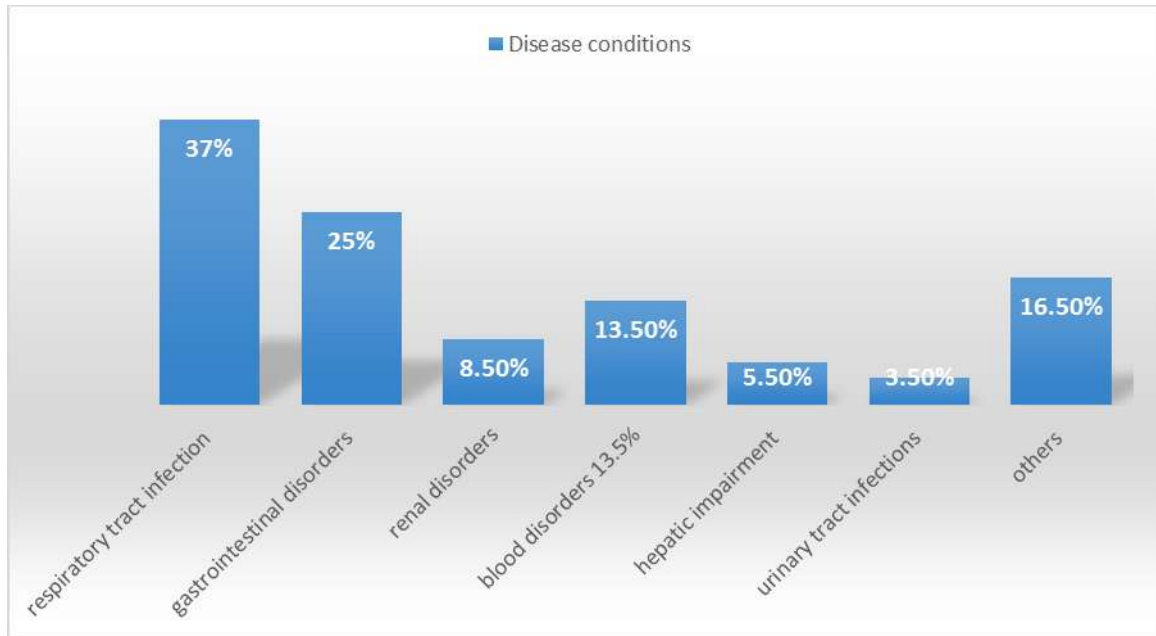|		
Hepatic Impairment	11	5.5
Urinary Tract Infections	7	3.5
Others	33	16.5

Figure 1: Distribution of patients according to disease.

2.Commonly prescribed antibiotics.

Out of 200 prescriptions screened, a total of 517 antibiotics were prescribed among which the most frequently prescribed antibiotics are ceftriaxone, i.e.; 156(30.17%), followed by metronidazole i.e.; 83(16.05%) and least prescribed antibiotics are cefixime,levofloxacin gentamicin and amoxicillin i.e. 2(0.38%).

Table 2: Commonly prescribed antibiotics.

| ANTIBIOTICS PRESCRIBED	NUMBER OF PRESCRIPTION	PERCENTAGE (%)
Ceftriaxone	156	30.17
Metronidazole	83	16.05
Piperacillin/Tazobactam	72	13.73
Azithromycin	51	9.86
Ofloxacin	41	7.93
Doxycycline	25	4.83
Nitrofurantoin	20	3.86
Meropenem	15	2.90
Rifaximin	13	2.51
Ciprofloxacin	12	2.32
Amikacin	11	2.12
Linezolid	10	1.74
Cefixime	2	0.38
Levofloxacin	2	0.38
Gentamicin	2	0.38
Amoxicillin	2	0.38
TOTAL(N)	**517**	**100**
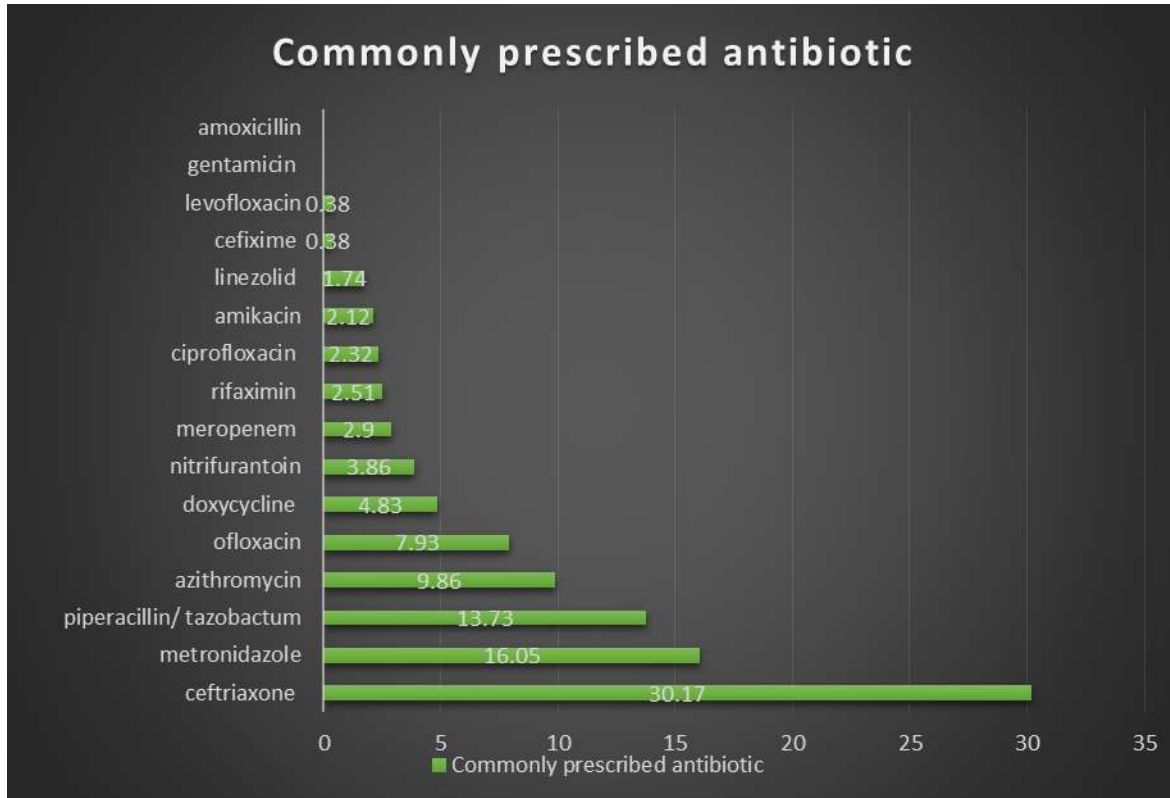
Figure 2: Commonly prescribed antibiotics.

3.Class of antibiotics prescribed.

The total 517 antibiotics were prescribed to the patients, out of which cephalosporin found to be the most widely prescribed antibiotic class i.e. 158(30.56%) followed by nitro imidazole which is about 83(16.05%),the least prescribed class of antibiotic was oxazolidinones, i.e;10(1.93%).

Table 3: Class of antibiotics prescribed.

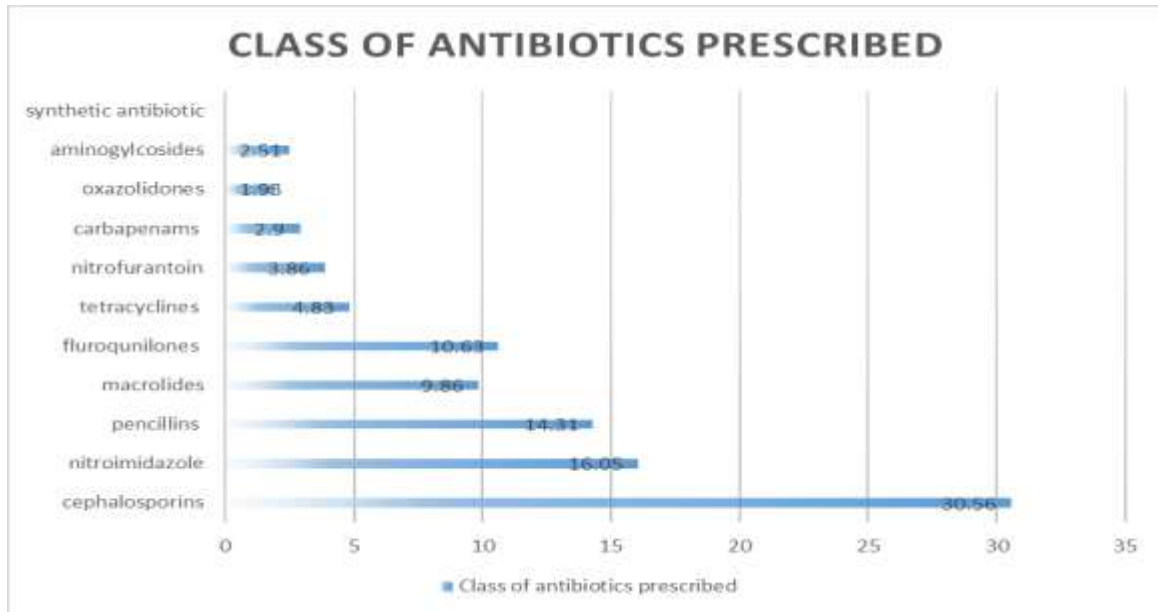| CLASS OF ANTIBIOTICS	NUMBER OF PRESCRIPTIONS	PERCENTAGE (%)
Cephalosporin	158	30.56
Nitroimidazole	83	16.05
Penicillin	74	14.31
Macrolide	51	9.86
Fluroquinolones	55	10.63
Tetracycline	25	4.83
Nitrofurantoin	20	3.86
Carbapenams	15	2.90
Oxazolidinone	10	1.93
Aminoglycoside	13	2.51
Synthetic antibiotics	13	2.51
TOTAL(N)	**517**	**100**

Figure 3: Class of antibiotics prescribed.

4. Distribution of antibiotics prescribed from NLEM.

Out of 517 antibiotics prescribed, majority of the antibiotics of about 85.10% were prescribed from National List of Essential Medicines. Physicians should be motivated to prescribe more from NLEM.

Table 4: Distribution of antibiotics prescribed from NLEM.

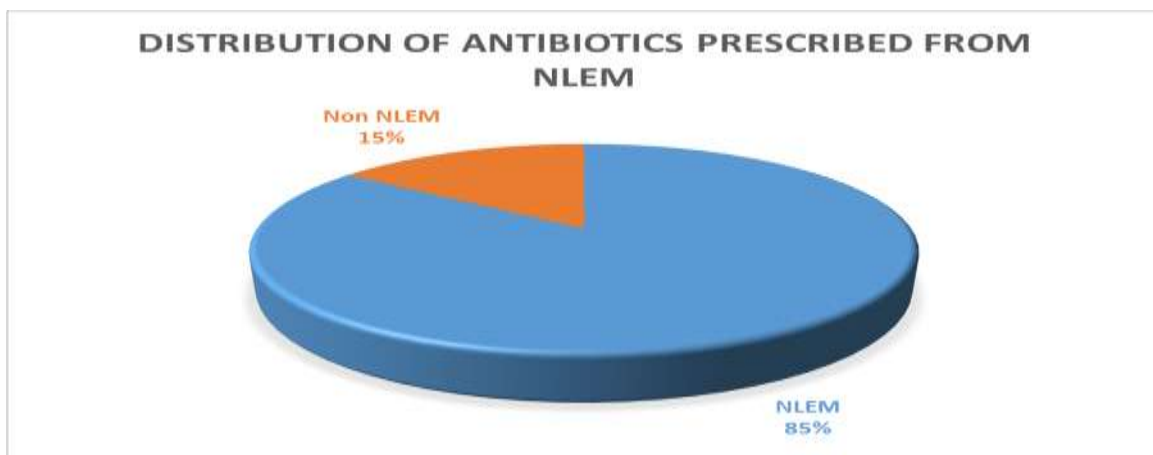| ANTIBIOTICS PRESCRIBED	NUMBER OF ANTIBIOTICS	PERCENTAGE (%)
NLEM	440	85.10
Non NLEM	77	14.89
TOTAL(N)	**517**	**100**

**Figure 4: Distribution of antibiotics prescribed from NLEM.**

5. Sensitivity Pattern of Antibiotics.

The study shows different strains of organisms that were isolated from the patient's culture test. Out of total 27 organism isolated the most common organism were Klebsiella pneumonia 25.9 %(7), followed by E.coli 22.2 %(6), Staphylococcus aureus 11.1 %(3) were reported in the culture samples.

Table5: Organisms isolated.

ORGANISM	NUMBER OF PATIENTS(n=25)	PERCENTAGE (%)
Klebsiella Pneumoniae	7	25.9
E.coli	6	22.2
Staphylococcus aureus	3	11.1
Pseudomonas aeruginosa	2	7.40
Enterococcus faecium	2	7.40
Candida known albicans	1	3.70
Candida tropicalis	1	3.70
Pasturella multocida	1	3.70
Citrobacter freundii	1	3.70
Enterobacter cloacae	1	3.70
Streptococcus dysgalactiae	1	3.70
Staphylococcus epidermis	1	3.70
TOTAL(N)	**27**	**100**
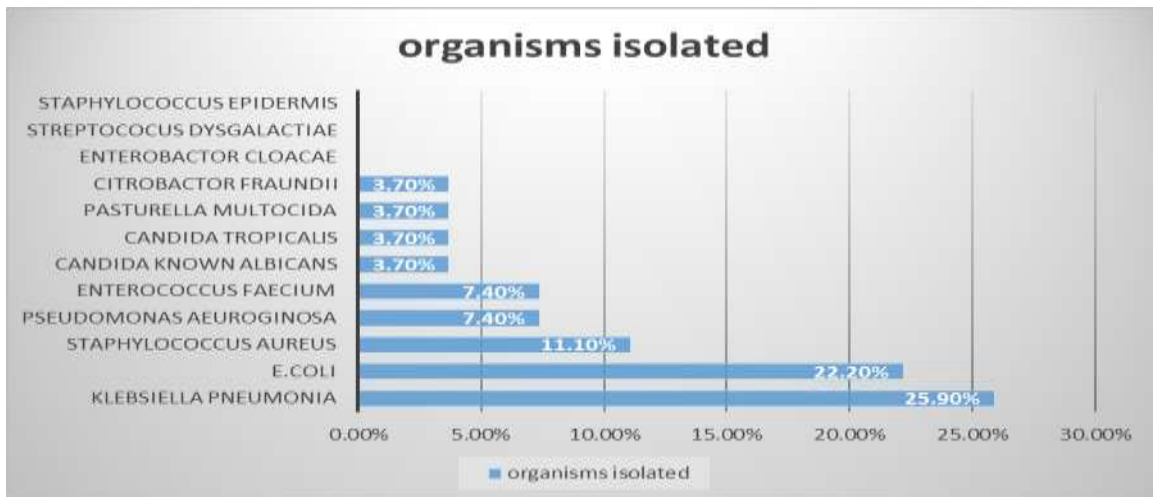
**Figure 5: Organisms isolated.**

6. Antibiotics causing ADR.

The major antibiotics causing adverse drug reactions in patients were found to be Ceftriaxone in 38.8% (7), followed by Piperacillin/Tazobactam in 22.2% (4), Azithromycin in 11.1% (2), Metronidazole in 11.1% (2), Ofloxacin in 11.1% (2) and Meropenem in 5.55% (1) of the patients were being reported in the study.

Table 6: Antibiotics causing ADR.

| NAME OF DRUG	NUMBER OF ADR(n=18)	PERCENTAGE (%)
Ceftriaxone	7	38.8
Piperacillin/Tazobactam	4	22.2
Azithromycin	2	11.1
Metronidazole	2	11.1
Ofloxacin	2	11.1
Meropenem	1	5.55
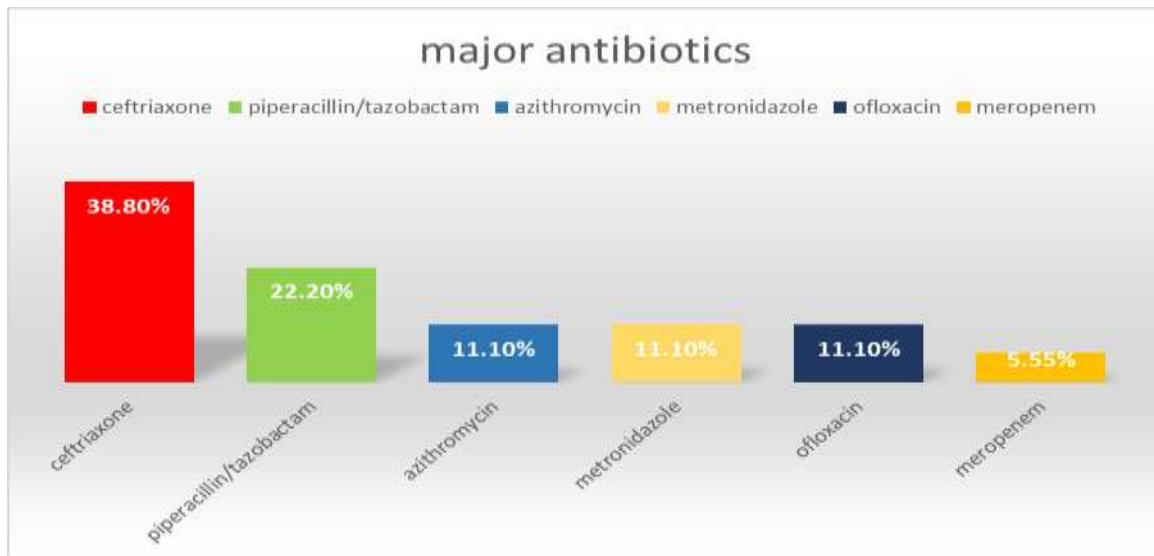
Figure 6: Antibiotics causing ADR.

7. Reaction observed during ADR.

The reaction seen in patients were Eosinophilia in 5.55%, Skin rash in 5.55%, Constipation in 11.1%, Hypotension in 5.55%, Vomiting in 11.1%, Drowsiness in 5.55%, Dizziness in 11.1%, Headache in 5.55%, Nausea in 11.1%, Appetite loss in 5.55%, Insomnia in 5.55%, Fatigue in 5.55%, Chills in 5.55%, Confusion in 5.55% patients were being reported.

Table 7: Reaction observed during ADR.

TYPE OF REACTION	NUMBER OF ADR(n=18)	PERCENTAGE (%)
Eosinophilia	1	5.55
Skin rash	1	5.55
Constipation	2	11.1
Hypotension	1	5.55
Vomiting	2	11.1
Drowsiness	1	5.55
Dizziness	2	11.1
Headache	1	5.55
Nausea	2	11.1
Appetite loss	1	5.55
Insomnia	1	5.55
Fatigue	1	5.55
Chills	1	5.55
Confusion	1	5.55
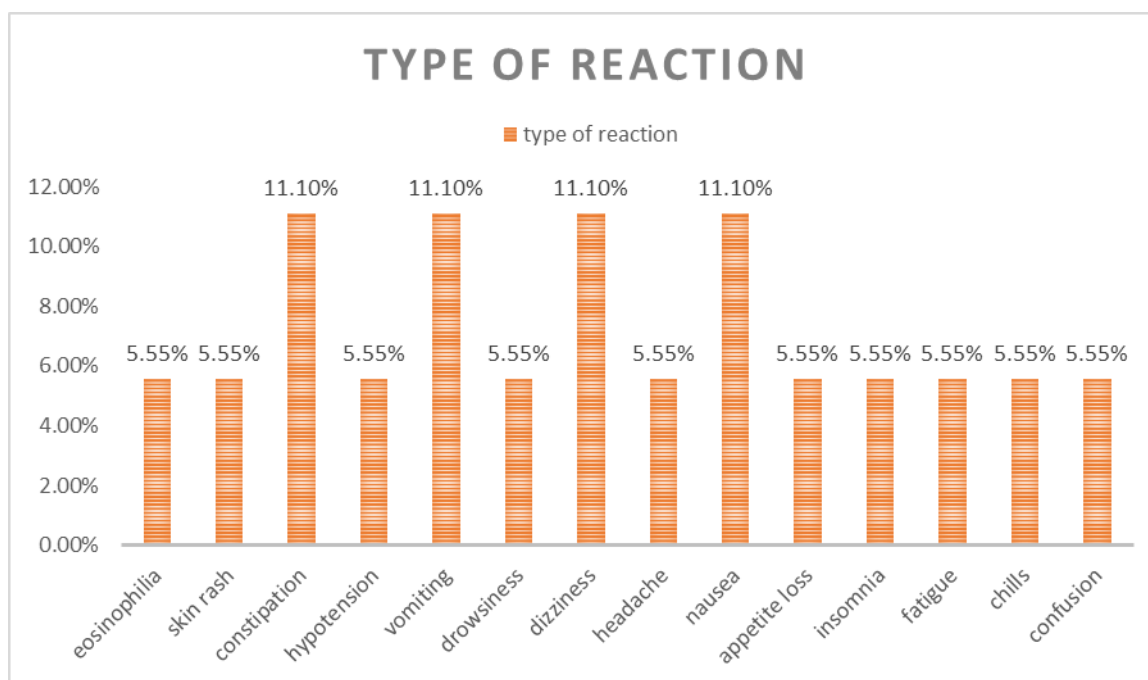
Figure7: Reaction observed during ADR.

III. DISCUSSION

Antibiotics are supposed to be viewed as the second most often prescribed drugs in the world. A majority of infectious ailments can be dealt with antibiotic therapy. Antibiotic resistance is a world hazard to creating nations. Prescribing pattern of drugs displays the attitude of the physicians.

In this study majority of antibiotic usage was for respiratory tract infections (n=74, 37%) followed by gastrointestinal tract infections (n=50, 25%), which complied with a study conducted by **Mohanty BKet al**[14] in Rajahmundry. The other condition were least antibiotic usage was for urinary tract infections (n=7, 3.5%). This was supported by the study conducted by **Ravi PSet al**[15] in Nepal.

Antibiotic utilization can assist in fastening the habits of rational use of antibiotics which means at right dose, for right length and at right cost.24 In our study, 517 antibiotics were prescribed, commonly given antibiotics were ceftriaxone (n=156, 30.17%), metronidazole (n=83, 16.05%) and least prescribed were levofloxacin (n=2, 0.38%). Our findings appeared similar with the study conducted by **Meher B Ret al**[16] in Pondicherry in which ceftriaxone was prescribed for majority of patients (30.03%) and least prescribed were levofloxacin (5.09%).

The current study reports on major class of antibiotics prescribed among patients were cephalosporin (n=158, 30.56%) followed by nitroimidazole (n=83, 16.05%). This study was similar to a study conducted by **Farhan A K et al**[17] in Moradabad, UP, also found that cephalosporin were mostly prescribed and nitroimidazole usage was found to be maximum.

It was found in our study that 517 antibiotics (85.10%) were from National List of Essential Medicine (NLEM) 2022. 77 antibiotics (14.89%) were non-National List of Essential Medicine (NLEM). Most commonly prescribed antibiotic was ceftriaxone (30.17%) which is from the NLEM.Similar results found in studies conducted in Nepal by **Khadka A et al**[12],In which 62.5% of antimicrobial prescribed were from National List of Essential medicine (NLEM) The prescription from Essential Drug List wanted to be promoted and availability of Essential Drug List to be maintained in ward , but it doesn't match with the result obtained from the similar study conducted in Bangladesh by **Maliha A et al**[18]in which only 52.9% of the prescribed antibiotics were from the Essential Drug List (EDL) of WHO. Most commonly used antibiotic was cefuroxime (22.5%) which is excluded from the Essential Drug List (EDL) of WHO. Prescribing from the EDL is an accurate medical practice and improves the rational use of drug treatment.

Antibiotic resistance is one of the major problem faced during antibiotic prescription. A total of 27 organism had been isolated from the specimen sent for culture and sensitivity testing. The small range of specimens may however, restrict conclusions about antibiotic resistance. The most common organisms are K.pneumoniae, E.coli and S.aureus. This study was similar to a study conducted in Nepal by **Ravi P S et al**[15], in which K.pneumoniae and H.influenza were the common organisms isolated.

In this study, maximum ADRs were reported with ceftriaxone (38.8%), piperacillin/tazobactam (22.2%) and ofloxacin (11.1%). Similar study conducted by **Kavita D et al**[10] in Ghaziabad shows that maximum ADRs were reported with Beta lactam 40.4% (ceftriaxone, amoxicillin-clavulanic acid, cefotaxim, tazobactam), followed by quinolones 15.8% (ofloxacin, levofloxacin).

In our study the most common ADR was nausea, vomiting, constipation, dizziness (11.1%) followed by eosinophilia, skin rash, hypotension, drowsiness, headache, appetite loss, insomnia, fatigue, chills, confusion (5.55%), but it does not match with the result obtained from similar study conducted by **Kavita D et al**[10] in Ghaziabad in which the most common ADR was abdominal pain (12.7%), dyspnoea, nausea and vomiting, cough (9.52%), diarrhoea (8.75%), headache (7.9%), fatigue (5.5%), vertigo (4.7%), pain in multiple joints, rashes (3.96%), tingling sensation, body ache (3.17%), constipation, itching and inflammatory swelling, anxiety, throat pain (2.38%), restlessness, change in stool colour (1.58%), tinnitus, hallucinations, pedal oedema, nasal blockage, oral ulcer (0.8%).

IV. CONCLUSION

The present study gives an overview of prescribing pattern of antibiotics in medicine department in a tertiary care hospital.The most prevalent disease in the study was respiratory tract infections (RTIs). The most commonly prescribed antibiotic in the study population was ceftriaxone followed by metronidazole and cephalosporin, nitroimidazole are the most commonly recommended antibiotic class.Most of the drugs are prescribed from National List of Essential Medicines (NLEM).Antibiotic sensitivity pattern revealed that Klebsiella pneumoniae was the commonly observed organism.Maximum ADRs were reported with ceftriaxone. The most commonly observed ADR in the study population

were nausea & vomiting, dizziness & constipation. ADRs can be prevented by proper monitoring of drug administration and by instructing the health care professional regarding mostly occurring ADR.

The intervention to rectify the hassles or inappropriate use of antimicrobial agents are wished to make therapy more rational and cost effective. There is a crucial need for microbiological investigation before remedy of infections.

From our study results, we recommend that health practitioners need to abide by means of a standard treatment guideline to comply with a rational antibiotic prescription. The prescriber have to decrease empirical therapy and promote proper diagnosis based on definitive therapy as much as possible to decrease the hazards of antimicrobial resistance (AMR). Drug utilization review program have to be carried out to find out about the rational use of antimicrobials.

STRENGTHS AND LIMITATIONS
STRENGTHS:
•The study mainly focuses on the antibiotic prescribing pattern in medicine department and provide the information on the commonly prescribed antibiotics for various infectious diseases.
•The study finds out the most commonly affecting disease conditions in the medicine department.
•Additionally the study provides information on common organisms isolated during culture and sensitivity testing which helps in reducing antibiotic resistance.
•This study may serve an educational purpose to modify future prescribing.

LIMITATIONS:
•As the study was done for a short period of time with a small sample size, it may not accurately state the real clinical situation.
•The analysis of antibiotic prescription was not based on diagnosis pattern.
•Antibiotic prescriptions from specific groups like pregnant women, children's were not analysed and the cost of the antibiotics were not calculated.
•The prescription practices may have changed as a result of seasonal variations.

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