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Original Research Article

Prescription Errors and Prescribing Faults of Antibiotic Prophylaxis and Combination Therapy- A Prospective Observational Study

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ABSTRACT

Introduction: Prescribing fault is a failure in the decision-making process that has the potential to harm the patient. Prescription error is an inability in the process of writing prescription that results in a wrong instruction. Blind prescribing, where antibiotics are prescribed without any culture or sensitivity testing, contributes to antibiotic resistance.
Methods: This is an observational prospective study done for 6 months (November 2018- April 2019) in a tertiary care hospital. Patients' details were analyzed by the assistance of ICMR Treatment Guidelines for Antimicrobial Use in Common Syndromes 2017 and chi-square tests, percentage analysis, ratio estimates, confidence intervals and probability values were performed.
Results: 303 patients were reviewed and categorized based on gender, age range, errors, faults, drug-drug interactions and types of therapy. In the study, males were predominant with 53%. The ratios of errors such as Poor legibility of hand writing, Abbreviations used and Inaccuracy in writing in pediatrics, adults and geriatrics were 1.13:1.03:1, 1.16:1.19:1 and 1.2:1.4:1 respectively. The 95% Confidence Intervals for Combinational and Prophylactic therapies were 0.142 and 0.937 with the probability value of 1.6054E-40.
Conclusion: Clinical interventions on prescribing faults, prescription errors and drug-drug interactions are frequently required with antibiotic therapy. Structured screening for these events by physicians in close collaborations with clinical pharmacologists should take place during and after the antibiotic treatment.
Scope: Similar studies can be conducted in various categories of drugs to improve quality of treatments and hospital standards. Establishment of Hospital Computerized Physician Order Entry Systems in preventing Medication Errors can be done.
Keywords: Prescription Error, Prescribing Fault, Antibiotics, Drug-Drug Interactions, Confidence Interval, Probability Value.

INTRODUCTION

Aim:

The aim of the study was to assess the Prescribing Faults and Prescription Errors of Antimicrobial Prophylaxis and Combination therapy in In-patients and Out-patients in a tertiary care hospital.

Objectives:

To assess Prescribing faults and Prescription errors of Antimicrobial Prophylaxis and Combination therapy In-patients and Out-patients in tertiary care hospital.

- To study the patients profiles and determine prescription errors and prescribing faults, if any.

- To determine the total number of Antibiotic Prescribing Faults and Prescription Errors
- To determine the severity of various Antibiotic Prescribing Faults and Prescription Errors.
- To evaluate Prescribing Faults and Prescription Errors.
- To study the patterns of Prescribing Faults and Prescription Errors caused by Antibiotics.
- To study the type and classify it whether it is a prescribing fault or prescription error.
- To encourage the safe and rational use of drugs.

Purpose and Significance:

Optimal pharmacotherapy is achieved when the right drug with correct dosage and quality reaches the right patient at the right time. However medication error is common and preventable cause of iatrogenic injuries and may result in hospitalization, unnecessary diagnostic evaluations, unnecessary treatments, and death. In 1999, an expert panel of the Institute of Medicine estimated that 44,000 to 98,000 people in the United States die each year as a result of medical errors, making medical error the sixth to ninth leading cause of death. [(1)] Prescribing faults and prescription errors are major problems among medication errors. They occur both in general practice and in hospital, and although they are rarely fatal they can affect patients' safety and quality of healthcare. [(2)]

Prescribing Fault:

A failure in the decision-making process that causes harm to the patient. [(3)]

Various types of faults can occur in the decision-making process:

- Irrational prescribing,
- Inappropriate prescribing,
- Under prescribing,
- Overprescribing, and
- Ineffective prescribing.

Prescription Error:

A failure in the prescription writing process that leads to a wrong instruction.

Blind Prescribing:

Among the antibiotic prescribing errors, the most commonly identified error by pharmacists is 'blind' prescribing. It occurs when antibiotics are prescribed without performing any culture or sensitivity testing. It not only contributes to antibiotic resistance but leads to further difficulties in diagnosing patients. [(4)]

Combining the data and comparing it from various sources, encourages the use of safe practice sources and increases the reliability of the system. [(5)]

Classification of Antibiotics: Any substance that inhibits the growth and replication of a bacterium is called an antibiotic. Antibiotics are a type of antimicrobial designed to target bacterial infections within (or on) the body. They help to treat an infection by making it difficult for disease-causing bacteria to grow and proliferate.

For example, few microbes produce specific substances to kill other nearby bacteria and gain the advantage when competing for food, water or other limited resources. However, some microbes only produce antibiotics in the laboratory.

There are 7 main classes of antibiotics: Penicillins, Cephalosporins, Macrolides, Tetracyclines, Fluoroquinolones, Aminoglycosides and Sulphonamides.

Antibiotic Resistance Mechanisms:

World Health Organization states that resistance of antibiotics occurs when the antibiotic used to treat an infection fails in doing so. Hence, it becomes difficult to treat infections caused by these bacteria. So it is bacteria (and not humans or animals as most people believe) which become antibiotic-resistant.

Wise use of antibiotics can help slow antibiotic resistance.

Antibiotics do not work against viral or fungal infections such as Common cold, Flu, Cough, Stomach flu, Ringworm.

Antibiotic-resistant mechanisms like hydrolyzing β lactam antibiotics using β lactamase, altered cell wall permeability, creation of bio film barrier etc.

One of the biggest threats to global health, the misuse and overuse of antibiotics are one of the major reasons for a sudden increase in the number of cases of antibiotic resistance.

Prevention of Antibiotic Resistance:

1) To doctors, nurses, veterinarians and other health workers:

- Do not prescribe or dispense antibiotics unless they are truly necessary and make all efforts to test and confirm the antibiotic which is going to be prescribed.
- Today, it is necessary estimated that in half of all cases, antibiotics are prescribed for conditions caused by viruses, where they are not effective.

2) To people using healthcare:

- Do not share antibiotics.
- Do not discontinue antibiotics without the doctor's recommendation.
- Do not skip doses of antibiotics.
- Do not take antibiotics with fruit juices, tea, coffee or any other drinks.
- Do not take antibiotics with birth control pills.

Future Scope:

Similar studies can be conducted in various categories of drugs used in hospital in multicenter in order to improve the quality of treatments and hospital standards. Specific training should be provided for healthcare professionals to identify and assess the Prescription Errors and Prescribing Faults. Allotment of clinical pharmacist in every department for the identification and assessment of the Prescription Errors and Prescribing Faults. Establishment of Hospital Computerized Physician Order Entry Systems (CPOE) in preventing Medication Errors.

MATERIALS AND METHODS

Study Site: Tertiary care hospital, Pharmacy practice department with a prime focus on variety of patient care processes including safe administration of medications which were located in convenient places with a basic objective of providing appropriate treatment to the disease.

Study Design: A prospective observational, chart review method.

It is an observational study often protensive in nature for which the tectonic outcomes of interest occur after study commencement (including study protocol, analysis plan and study initiation.

Study Period: 6 months (November 2018 to April 2019).

Sample Size: 303 patients.

Study Participants: All medication prescribing interventions to all paediatric, adult and geriatric patients who were admitted to the wards during the study period were included.

Study Criteria:

Inclusion Criteria:-

- Patients of either sex
- Patients using any one or more antibiotics
- Both inpatients and outpatients
- Patients undergoing prophylactic and combinational therapy
- Patients of all ages

Exclusion Criteria:-

- Pregnancy women
- Lactating women
- Adult and Geriatric outpatients
- Patients who are unable to comply with study criteria.

Materials: Research & Review articles, ICMR Treatment Guidelines for Antimicrobial Use in Common Syndromes 2017, National AMR Guidelines, WHO Model Prescribing Information, IAP Task Force Report, WHO Pocket book Ethiopia 2013, Standard Treatment guidelines for general hospitals Ethiopia 2014, Micromedex, drugs.com.

Study Procedure: The study topic is selected as "Prescription errors and Prescribing faults of antibiotic prophylaxis

and combination therapy at multicenter tertiary care hospitals. Literature review is done, study design, study criteria are determined. Data collection forms were designed. Data was collected from patients medication chart, clinical data, patient interview, patient's care taker. The collected data includes demographics like Name, Age, Gender, Pre-medical history, Drug Allergy, Diagnostic Laboratory reports, Date of prescription, Name of medication, Dosage regimen(dose, frequency, dosage form and route of administration), Duration of medication.This above data was systemically analyzed. Potential Prescribing errors and Prescribing faults were identified using ICMR Treatment Guidelines for Antimicrobial Use in Common Syndromes 2017, National AMR Guidelines, Micromedex, WHO Model Prescribing Information, IAP Task Force Report, National AMR Guidelines, drugs.com in our study.

Statistical Analysis:

Statistics (confidence interval, chi-square test, probability value, estimates of ratios, percentage analysis) were applied to characterize the whole study sample with regards to gender, age range, errors, faults, drug-drug interactions and types of therapy.

The number of errors and faults per patient was the dependent variable. Co variables were age, gender, types of prescription errors, types of prescribing faults, drug-drug interactions, types of therapy (combinational, prophylactic). For binary or nominal variables, the largest group was taken as the reference.

RESULTS

During the study period, a total of 303 antibiotic prescriptions were reviewed and categorized based on various factors like gender, age range, errors, faults, drug-drug interactions and types of therapy. The analysis for drug-drug interactions was carried out only in Pediatric sample population and incidence for faults was not recorded in pediatric out-patients.

Gender wise distribution of sample population:

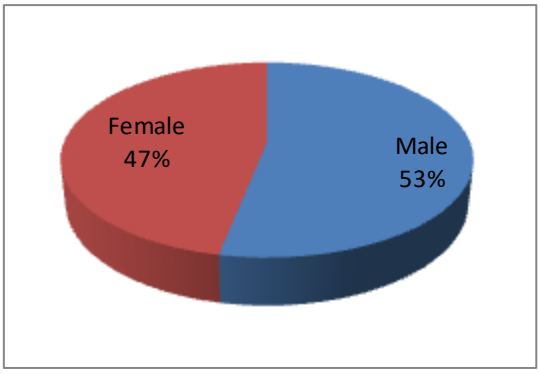

Figure 1: Gender wise distribution of sample population

In this study, among the 303 patients, males were predominant with 53% (n=161) and females were with 47% (n=142) (Fig. 1). The ratio of males-females (M/F) is 1.13:1. The 95% Confidence Interval for males is 0.531(lower bound: 0.473 and upper bound: 0.589) and for females, it is 0.469(lower bound: 0.411 and upper bound: 0.527). The Probability (p) value is 0.275043714.

Gender wise distribution of Pediatric sample population:

Table 1:Gender wise distribution of Pediatric sample population

GENDER DISTRIBUTION OF PEDIATRICS	
Gender	**No. of Cases**
Male	107
Female	91
TOTAL	198

Among the 303 patients in the study, 198 were paediatrics. Here, males were predominant with 54% (n=107) and females were with 46% (n=91) (Table.1). The ratio of males-females (M/F) is 1.17:1. The 95% Confidence Interval for males is 0.353(lower bound: 0.299 and upper bound: 0.410) and for females, it is 0.300(lower bound: 0.249 and upper bound: 0.355). The Probability (p) value is 0.255508981.

Gender wise distribution of Adult sample population:

Among the 303 patients in the study, 84 were adults. Here, males were predominant with 54% (n=45) and females were with 46% (n=39) (Table.2). The ratio of males-females (M/F) is 1.15:1. The 95% Confidence Interval for males is 0.149(lower bound: 0.110 and upper bound: 0.194) and for females, it is 0.129(lower bound: 0.093 and upper bound: 0.172). The Probability (p) value is 0.512690761.

Table 2: Gender wise distribution of Adult sample population

GENDER DISTRIBUTION OF ADULTS	
Gender	**No. of Cases**
Male	45
Female	39
TOTAL	84

Gender wise distribution of Geriatric sample population:

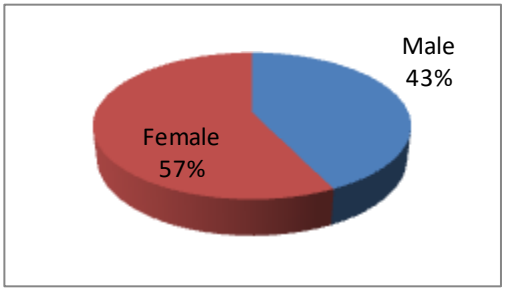

Figure 2: Gender wise distribution of Geriatric sample population

Among the 303 patients in the study, 21 were geriatrics. Here, females were predominant with 57% (n=12) and males were with 43% (n=9) (Fig. 2). The ratio of males-females (M/F) is 1:1.33. The 95% Confidence Interval for males is 0.030 (lower bound: 0.014 and upper bound: 0.056) and for females, it is 0.040 (lower bound: 0.021 and upper bound: 0.068). The Probability (p) value is 0.512690761.

Age wise distribution of sample population:

The prescriptions with antibiotics were categorised based on age wise distribution and were predominant among the children of age 0-10 years with 64% (n=193) and 95% Confidence Interval of 0.637(lower bound: 0.580 and upper bound: 0.691), followed by 31-40 years with 9% (n=29) and 95% Confidence Interval of 0.096 (lower bound: 0.065 and upper bound: 0.135), 41-50 years with 6% (n=19) and 95% Confidence Interval of 0.063 (lower bound: 0.038 and upper bound: 0.096), 21-30 years with 6 % (n=17) and 95% Confidence Interval of 0.056(lower bound: 0.033 and upper bound: 0.088), 71-80years with 4% (n=12) and 95% Confidence Interval of 0.040(lower bound: 0.021 and upper bound: 0.068), 51-60years with 4% (n=11) and 95% Confidence Interval of 0.036 (lower bound: 0.018 and upper bound: 0.064), 81-90 years with 3% (n=9) and 95% Confidence Interval of 0.030(lower bound: 0.014 and upper bound: 0.056), 61-70years with 2% (n=7) and 95% Confidence Interval of 0.023(lower bound: 0.009 and upper bound: 0.047), 11-20years with 2% (n=6) and 95% Confidence Interval of 0.020(lower bound: 0.007 and upper bound: 0.043) (Table.3). The ratio is 32.16:4.83:3.16:2.83:2:1.83:1.5:1.16:1. The Probability (p) value is 1.8687E-180.

Table 3: Age wise distribution of sample population

AGE DISTRIBUTION	
Age	**No. of Cases**
0-10 years	193
11-20 years	6
21-30 years	17
31-40 years	29
41-50 years	19
51-60 years	11
61-70 years	7
71-80 years	12
81-90 years	9
TOTAL	303

Age range of sample population:

Table 4: Age range of sample population

Age Range	No. of Cases
Pediatrics	198
Adults	84
Geriatrics	21
Total	303

Among the 303 patients enrolled in the study, pediatrics were predominant with 65% (n=198), followed by adults with 28% (n=84) and geriatrics with 7% (n=21) (Table.4). The ratio of pediatrics: adults: geriatrics is 9.42:4:1. The 95% Confidence Interval for pediatrics is 0.653(lower bound:

0.597 and upper bound: 0.707). For adults, it is 0.277 (lower bound: 0.228 and upper bound: 0.331) and for geriatrics, it is 0.069 (lower bound:0.043 and upper bound: 0.104) The Probability (p) value is 2.45324E-35.

Prescription distribution based on presence of errors in Pediatrics:

In this study, the ratio of presence and absence of Prescription Errors in pediatrics is 21:1, with presence of 95% (n=189) and absence of 5% (n=9) (Table. 5). The 95% Confidence Interval for presence is 0.624 (lower bound: 0.567 and upper bound: 0.679) and for absence, it is 0.030(lower bound: 0.014 and upper bound: 0.056). The Probability (p) value is 1.81635E-37.

Table 5: Prescription distribution based on presence of errors in Pediatrics

PRESCRIPTION ERRORS	
Error	**No. of Cases**
Presence	189
Absence	9
TOTAL	198

Prescription distribution based on presence of errors in Adults:

In this study, the ratio of presence and absence of Prescription Errors in adults is 9.5:1, with presence of 90% (n=76) and absence of 10% (n=8) (Fig.3). The 95% Confidence Interval for presence is 0.251 (lower bound: 0.203 and upper bound: 0.304) and for absence, it is 0.026(lower bound: 0.011 and upper bound: 0.051). The Probability (p) value is 1.17645E-13.

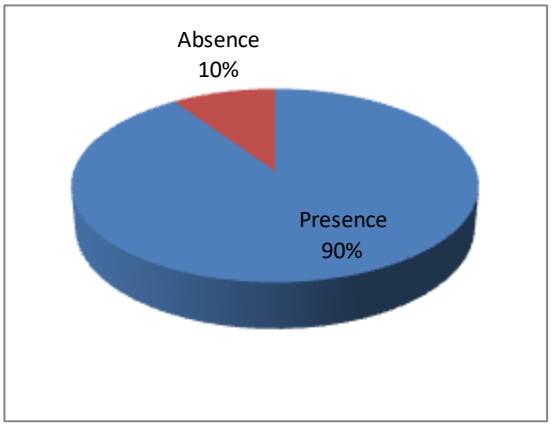

Figure 3: Prescription distribution based on presence of errors in Adults

Prescription distribution based on presence of errors in Geriatrics:

Table 6: Prescription distribution based on presence of errors in Geriatrics

PRESCRIPTION ERRORS	
Error	**No. of Cases**
Presence	17
Absence	4
TOTAL	21

In this study, the ratio of presence and absence of Prescription Errors in geriatrics is 4.25:1, with presence of 81% (n=17) and absence of 19% (n=4) (Table. 6). The 95% Confidence Interval for presence is 0.056 (lower bound: 0.033 and upper bound: 0.088) and for absence, it is 0.013(lower bound: 0.004 and upper bound: 0.033). The Probability (p) value is 0.00455635.

Types of patients in Paediatric sample population:

In this study, the ratio of in-patients and out-patients in pediatrics is 17:1, with in-patients of 6% (n=11) and out-patients of 94% (n=187) (Fig.4). The 95% Confidence Interval for in-patients is 0.036 (lower bound: 0.018 and upper bound: 0.064) and for out-patients, it is 0.617(lower bound: 0.560 and upper bound: 0.672). The Probability (p) value is 6.76936E-36.

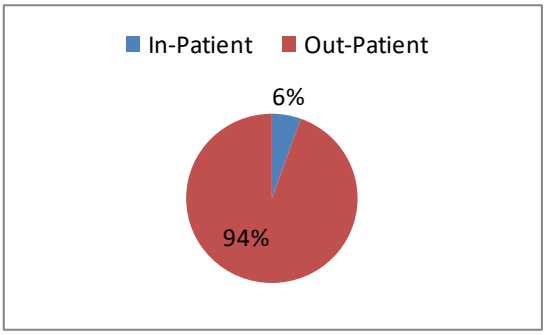

Figure 4: Types of patients in Paediatric sample population

Prescription distribution based on presence of faults in Pediatric In-Patients:

Table 7: Prescription distribution based on presence of faults in Pediatric In-Patients

PRESCRIBING FAULTS	
Fault	**No. of Cases**
Presence	8
Absence	3
TOTAL	11

In this study, the ratio of presence and absence of Prescribing Faults in pediatrics is 2.6:1, with presence of 73% (n=8) and absence of 27% (n=3) (Table. 7). The 95% Confidence Interval for presence is 0.026 (lower bound: 0.011 and upper bound: 0.051) and for absence, it is 0.010 (lower bound: 0.002 and upper bound: 0.029). The Probability (p) value is 0.131668066.

Prescription distribution based on presence of faults in Adults:

Table 8: Prescription distribution based on presence of faults in Adults

PRESCRIBING FAULTS	
Fault	**No. of Cases**
Presence	52
Absence	32
TOTAL	84

In this study, the ratio of presence and absence of Prescribing Faults in adults is 1.625:1, with presence of 62% (n=52) and absence of 38% (n=32) (Table.8). The 95% Confidence Interval for presence is 0.172 (lower bound: 0.131 and upper bound: 0.219) and for absence, it is 0.106(lower bound: 0.073 and upper bound: 0.146). The Probability (p) value is 0.029096334.

Prescription distribution based on presence of faults in Geriatrics:

In this study, the ratio of presence and absence of Prescribing Faults in geriatrics is 1.625:1, with presence of 62% (n=13) and absence of 38% (n=8) (Fig.5). The 95% Confidence Interval for presence is 0.043(lower bound: 0.023 and upper bound: 0.072) and for absence, it is 0.026(lower bound: 0.011 and upper bound: 0.051). The Probability (p) value is 0.275233755.

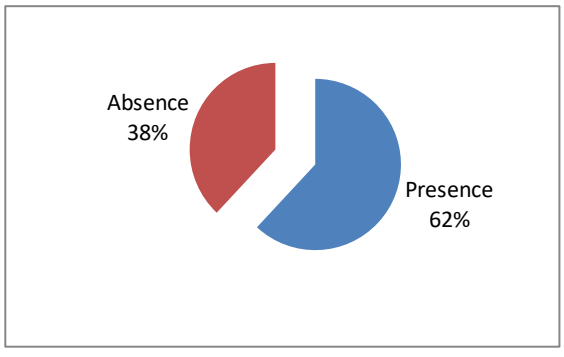

Figure 5: Prescription distribution based on faults in Geriatrics

Prescription distribution based on Drug-Drug Interactions in Pediatrics:

Table 9: Prescription distribution based on Drug-Drug Interactions in Pediatrics

DRUG-DRUG INTERACTIONS	
Interaction	**No. of Cases**
Presence	59
Absence	139
TOTAL	198

In this study, the ratio of presence and absence of Drug-Drug Interactions in pediatrics is 1:2.35, with presence of 30% (n=59) and absence of 70% (n=139) (Table.9). The 95% Confidence Interval for presence is 0.195(lower bound: 0.152 and upper bound: 0.244) and for absence, it is 0.459(lower bound: 0.402 and upper bound: 0.517). The Probability (p) value is 1.30543E-08.

Incidence of different types of Prescription Errors in the study:

Table 10: Incidence of different types of Prescription Errors in the study

TYPES OF PRESCRIPTION ERRORS	
Type	**No. of Cases**
Poor legibility of hand writing	229
Abbreviations used	215
Inaccuracy in writing	201

The different types of prescription errors found in the study were Poor legibility of hand writing with 36% (n=229), Abbreviations used with 33% (n=215) and Inaccuracy in writing with 31% (n=201) (Table. 10). The ratio is 1.13:1.06:1. The 95% Confidence Interval for poor legibility of hand writing is 0.756 (lower bound: 0.703 and upper bound: 0.803), for abbreviations used is 0.710 (lower bound: 0.655 and upper bound: 0.760) and for inaccuracy in writing, it is 0.663 (lower bound: 0.607 and upper bound: 0.716) The Probability (p) value is 0.401869489.

Incidence of different types of prescribing Faults in the study:

The different types of prescription faults in the study were categorized as Inappropriate with 24% (n=18), Under dosage with 3%

(n=2), Over dosage with 1% (n=1), Irrational with 67% (n=51) and In-Effective with 5% (n=4) (Table. 11). The 95% Confidence Interval for Inappropriate fault is 0.059 (lower bound: 0.036 and upper bound: 0.092), for Under dosage is 0.007 (lower bound: 0.001 and upper bound: 0.024), for Over dosage, it is 0.003 (lower bound: 0.000 and upper bound: 0.018), for is Irrational fault is 0.168 (lower bound: 0.128 and upper bound: 0.215) and for In-Effective fault is 0.013 (lower bound: 0.004 and upper bound: 0.033). The ratio is 18:2:1:51:4. The Probability (p) value is 1.56355E-24.

Table 11: Incidence of different types of Prescribing Faults in the study

TYPES OF PRESCRIBING FAULTS	
Type	**No. of Faults**
Inappropriate	18
Under dosage	2
Over dosage	1
Irrational	51
In-Effective	4

Incidence of different types of Prescription Errors in Pediatrics:

The different types of prescription errors in the pediatrics were categorized as Poor legibility of hand writing with 36% (n=187), Abbreviations used with 33% (n=171) and Inaccuracy in writing with 31% (n=165) (Fig.6). The ratio is 1.13:1.03:1. The 95% Confidence Interval for poor legibility of hand writing is 0.617 (lower bound: 0.560 and upper bound: 0.672), for abbreviations used is 0.564 (lower bound: 0.506 and upper bound: 0.621) and for inaccuracy in writing, it is 0.545 (lower bound: 0.487 and upper bound: 0.602) The Probability (p) value is 0.476220674.

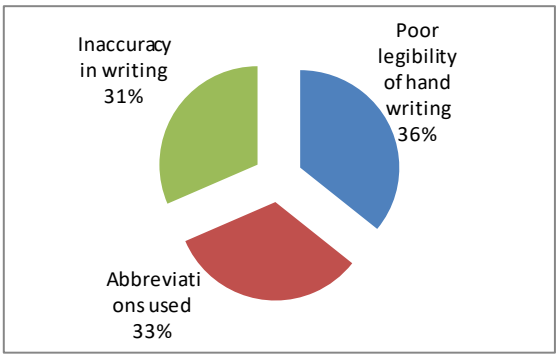

Figure 6: Incidence of different types of Prescription errors in Pediatrics

Incidence of different types of Prescription Errors in Adults:

The different types of prescription errors in the adults were categorized as Poor legibility of hand writing with 35% (n=36), Abbreviations used with 35% (n=37) and Inaccuracy in writing with 30% (n=31) (Table. 12). The ratio is 1.16:1.19:1. The 95% Confidence Interval for poor legibility of hand writing is 0.119 (lower bound: 0.085 and upper bound: 0.161), for abbreviations used is 0.122 (lower bound: 0.087 and upper bound: 0.164) and for inaccuracy in writing, it is 0.102 (lower bound: 0.071 and upper bound: 0.142) The Probability (p) value is 0.742243817.

Table 12: Incidence of different types of Prescription Errors in Adults

TYPES OF PRESCRIPTION ERRORS	
Type	**No. of Cases**
Poor legibility of hand writing	36
Abbreviations used	37
Inaccuracy in writing	31

Incidence of different types of Prescription Errors in Geriatrics:

Table 13: Incidence of different types of Prescription Errors in Geriatrics

TYPES OF PRESCRIPTION ERRORS	
Type	**No. of Cases**
Poor legibility of hand writing	6
Abbreviations used	7
Inaccuracy in writing	5

The different types of prescription errors in the geriatrics were categorized as Poor legibility of hand writing with 33% (n=6), Abbreviations used with 39% (n=7) and Inaccuracy in writing with 18% (n=5) (Table. 13). The ratio is 1.2:1.4:1. The 95%

Confidence Interval for poor legibility of hand writing is 0.020 (lower bound: 0.007 and upper bound: 0.043), for abbreviations used is 0.023 (lower bound: 0.009 and upper bound: 0.047) and for inaccuracy in writing, it is 0.017 (lower bound: 0.005 and upper bound: 0.038) The Probability (p) value is 0.846481725.

Incidence of different types of prescribing Faults in Pediatrics:

Table 14: Incidence of different types of prescribing Faults in Pediatrics

TYPES OF PRESCRIBING FAULTS	
Type	**No. of Cases**
Inappropriate	11
Under dosage	1
Over dosage	1

The different types of prescription faults in the pediatrics were categorized as Inappropriate with 84% (n=11), Under dosage with 8% (n=1), Over dosage with 8% (n=1) (Table. 14). The 95% Confidence Interval for Inappropriate fault is 0.036 (lower bound: 0.018 and upper bound: 0.064), for Under dosage is 0.003 (lower bound: 0.000 and upper bound: 0.018), for Over dosage, it is 0.003 (lower bound: 0.000 and upper bound: 0.018). The ratio is 11:1:1. The Probability (p) value is 0.000456297.

Incidence of different types of Prescribing Faults in Adults:

The different types of prescription faults in the adults were categorized as Under dosage with 2% (n=1), Irrational with 90% (n=45) and In-Effective with 8% (n=4) (Fig.7). The 95% Confidence Interval for Under dosage fault is 0.003 (lower bound: 0.000 and upper bound: 0.018), for Irrational is 0.149 (lower bound: 0.110 and upper bound: 0.194), for In-Effective, it is 0.013 (lower bound: 0.004 and upper bound: 0.033). The ratio is 1:45:4. The Probability (p) value is 1.78821E-16.

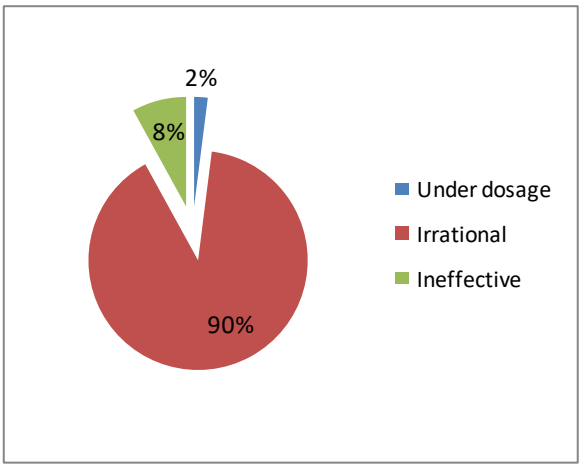

Figure 7: Incidence of different types of Prescribing Faults in Adults

Incidence of different types of Prescribing Faults in Geriatrics:

Table 15: Incidence of different types of Prescribing Faults in Geriatrics

TYPES OF PRESCRIBING FAULTS	
Type	**No. of Cases**
Inappropriate	7
Irrational	6

The different types of prescription faults in the geriatrics were categorized as Irrational with 46% (n=6) and Inappropriate with 54% (n=7). The 95% Confidence Interval for Irrational fault is 0.020 (lower bound: 0.007 and upper bound: 0.043), for Inappropriate is 0.023 (lower bound: 0.009 and upper bound: 0.047 (Table. 15). The ratio is 1.17:1. The Probability (p) value is 0.781511295.

Prescription based on type of Therapy:

Table 16: Prescription based on type of Therapy

TYPES OF THERAPY	
Type	**No. of Cases**
Combinational therapy	43
Prophylactic therapy	284

Prescriptions were categorised based on the type of therapy given. They were, Combinational therapy with 13% (n=43) and Prophylactic therapy with 87% (n=284)(Table. 16). The 95% Confidence Interval for Combinational therapy is 0.142 (lower bound: 0.105 and upper bound: 0.186), for Prophylactic therapy is 0.937 (lower bound: 0.904 and upper bound: 0.962. The ratio is 1:6.6. The Probability (p) value is 1.6054E-40.

Prescription based on type of Therapy in Pediatrics:

Table 17: Prescription based on type of Therapy in Pediatrics

TYPES OF THERAPY	
Type	**No. of Cases**
Combinational therapy	9
Prophylactic therapy	189

Prescriptions of pediatrics were categorised based on the type of therapy given. They were, Combinational therapy with 5% (n=9) and Prophylactic therapy with 95% (n=189)(Table. 17). The 95% Confidence Interval for Combinational therapy is 0.030 (lower bound: 0.014 and upper bound: 0.056), for Prophylactic therapy is 0.624 (lower bound: 0.567 and upper bound: 0.679. The ratio is 1:21. The Probability (p) value is 1.81635E-37.

Prescription based on type of Therapy in Adults:

Table 18: Prescription based on type of Therapy in Adults

TYPES OF THERAPY	
Type	**No. of Cases**
Combinational therapy	23
Prophylactic therapy	77

Prescriptions of adults were categorised based on the type of therapy given. They were, Combinational therapy with 23% (n=23) and Prophylactic therapy with 77% (n=77) (Table. 18). The 95% Confidence Interval for Combinational therapy is 0.076 (lower bound: 0.049 and upper bound: 0.112), for Prophylactic therapy is 0.254 (lower bound: 0.206 and upper bound: 0.307. The ratio is 1:3.34. The Probability (p) value is 6.66409E-08.

Prescription based on type of Therapy in Geriatrics:

Prescriptions of geriatrics were categorised based on the type of therapy given. They were, Combinational therapy with 38% (n=11) and Prophylactic therapy with 62% (n=18) (Fig.8). The 95% Confidence Interval for Combinational therapy is 0.036 (lower bound: 0.018 and upper bound: 0.064), for Prophylactic therapy is 0.059 (lower bound: 0.036 and upper bound: 0.092. The ratio is 1:1.63. The Probability (p) value is 0.193646535.

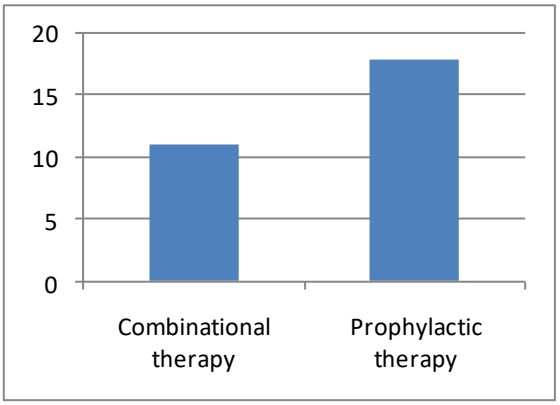

Figure 8: Prescription based on type of Therapy in Geriatrics

DISCUSSION

A total of 303 prescriptions were reviewed in a teritiary care hospital and a pediatric clinic during a study period of 6months for Prescription Errors, Prescribing Faults and Drug-Drug Interactions.

According to Marimuthu Karthikeyan, Devi Lalitha; in a study conducted in 311 patients in a 350-bed multispecialty tertiary care referral hospital located in South India, 168 were males (54%) and 143 were females (46%). [(6)] Dilnasheen Sheikh, Uday Venkat Mateti stated that in a prospective observational study carried out for a period of 8 months from June 2015 to February 2016 at a tertiary care hospital, males were 70% (140) and females were 30% (60). [(7)] According to A.M. Kadam, M. S. Ganachari, in a prospective study carried out in a tertiary care hospital in south India, the data was obtained from 294 patients comprising of 192 males and 102 females. Out of which 44 (14.9 %.) were identified as medication errors which were comprised of 32 (73%) male and 12 (27%) female cases. Showing that incidence of medication errors in males (16.6%) was significantly higher than in females (11.7%). [(8)]

Almost the same, in this study, among the 303 patients, males were predominant with 53% (n=161) and females were with 47% (n=142).

According to Rainu Kaushal, in a Prospective cohort study of 1120 pediatric patients admitted to 2 academic institutions

during 6 weeks in April and May of 1999, 525 (36%) were female and 949 (64%) were male. [9] Abebe Zeleke and Tesfahun Chanie stated that in a cross-sectional study carried out in the pediatric wards of Dessie Referral Hospital from February 17 to March 17, 2012; majority were males (61.8%). [1]

Among the 303 patients in this study, 198 were pediatrics. Here, males were predominant with 54% (n=107) and females were with 46% (n=91).

DelleminChe Abdullah, stated that, in a retrospective study conducted in geriatrics, there involved screening of prescription for a one-month period (March 2001) and found that males and females were almost equal with 820 and 781 respectively. [10]

Among the 303 patients in this study, 21 were geriatrics. Here, females were predominant with 57% (n=12) and males were with 43% (n=9)

According to Dilnasheen Sheikh, Uday Venkat Mateti, in a prospective observational study carried out for a period of 8 months from June 2015 to February 2016 at a tertiary care hospital, most of the patients were in the age group above 61 years (n=58) (29%)followed by 46-60 years. And the remaining were, in the age group 18-30years (n=39) (19.5%), 31-45years (n=45) (22.5%), 46-60years (n=58) (29%). [7] According to A.M. Kadam, M. S. Ganachari, in a prospective study carried out in a tertiary care hospital in south India, majority of medication errors related to antibiotics occurred between the age group of 20-40 (41%) years. [8]

In this study, the prescriptions with antibiotics were categorised based on age wise distribution and were predominant among the children of age 0-10 years with 64% (n=193) followed by 31-40 years with 9% (n=29), 41-50 years with 6% (n=19), 21-30 years with 6 % (n=17), 71-80years with 4% (n=12) and 51-60years with 4% (n=11) 81-90 years with 3% (n=9), 61-70years with 2% (n=7), 11-20years with 2% (n=6)

Menyfah Q Alanazi stated that in a cross-sectional study conducted by reviewing charts of patients complaining of infections, adults were (≥15 years) =61% and pediatrics (<15 years) =39%. [11]

Among the 303 patients enrolled in this study, pediatrics were predominant with 65% (n=198), followed by adults with 28% (n=84) and geriatrics with 7% (n=21).

According to Rainu Kaushal, in a Prospective cohort study of 1120 patients admitted to 2 academic institutions during 6 weeks in April and May of 1999, 10 778 medication orders were reviewed and found 616 medication errors. [9] Abebe Zeleke and Tesfahun Chanie stated that in a cross-sectional study carried out in the pediatric wards of Dessie Referral Hospital from February 17 to March 17, 2012; among the 384 medication orders a total of 223 prescribing errors were identified. This corresponds to an overall medication prescribing error rate of 58.07% and 34.70 medication prescribing errors in 100 patient days. [1]

In this study, the ratio of presence and absence of Prescription Errors in pediatrics is 21:1, with presence of 95% (n=189) and absence of 5% (n=9).

According to Dilnasheen Sheikh, Uday VenkatMateti, in a prospective observational study carried out for a period of 8 months from June 2015 to February 2016 at a tertiary care hospital, 147 (73.5%) were adult patients and the number of errors reported were 8 (20%). [7]

In this study, the ratio of presence and absence of Prescription Errors in adults is 9.5:1, with presence of 90% (n=76) and absence of 10% (n=8).

Dellemin Che Abdullah, stated that, in a retrospective study conducted in geriatrics, there involved screening of prescription for a one-month period (March 2001) and found that in a total of 10,429 prescriptions; the prescriptions that were found to have medication errors were 403. [10]

In this study, the ratio of presence and absence of Prescription Errors in

geriatrics is 4.25:1, with presence of 81% (n=17) and absence of 19% (n=4).

According to James Feinstein, out of 498 956 hospitalizations in 2011, 49% were associated with ≥1 PDDI, with a "contraindicated" PDDI occurring in 5% of all hospitalizations, a "major" PDDI present in 41%, a "moderate" PDDI in 28%, and a "minor" PDDI in 11%. [(12)]

In this study, the ratio of presence and absence of Drug-Drug Interactions in pediatrics is 1:2.35, with presence of 30% (n=59) and absence of 70% (n=139).

According to Giampaolo P. Velo, Pietro Minuz: Prescription errors accounted for 70% of medication errors that could potentially result in adverse effects. A mean value of prescribing errors with the potential for adverse effects in patients of about 4 in 1000 prescriptions was recorded in a teaching hospital with inaccuracy in writing and poor legibility of handwriting, the use of abbreviations or incomplete writing of a prescription. [(2)] Abebe Zeleke and Tesfahun Chanie stated that in a cross-sectional study carried out in the pediatric wards of Dessie Referral Hospital from February 17 to March 17, 2012; incomplete prescriptions and dosing errors were the most prevalent error types which accounted for 54.26% and 31.39%, respectively. [(1)]

Being the same, the different types of prescription errors found in the study were Poor legibility of hand writing with 36% (n=229), Abbreviations used with 33% (n=215) and Inaccuracy in writing with 31% (n=201).

According to Sergey Zyryanov, in a retrospective analysis of spontaneous reports about adverse drug reactions related to the beta-lactam antibiotics, 14.6% occurred due to inappropriate schedule of drug administration; 11.3% because of overdosage and 3.8% occurred because of underdosage. [(13)]

In this study, the different types of prescription faults in the adults were categorized as Under dosage with 2% (n=1), Irrational with 90% (n=45) and In-Effective with 8% (n=4).

CONCLUSION

In this study, we discussed about the prescription errors, prescribing faults and drug-drug interactions of antibiotic combinational and prophylactic therapies including both males and females of pediatrics, adults and geriatrics.

Among the 303 patients, males were predominant than females. Based on age wise distribution, pediatrics were predominant, followed by adults and geriatrics.

According to the study, the different types of prescription errors found in the study were Poor legibility of hand writing, Abbreviations used and Inaccuracy in writing with the ratio of 1.13:1.06:1. The different types of prescription faults in the study were categorized as Inappropriate, Under dosage, Over dosage, Irrational and In-Effective with a ratio of 18:2:1:51:4. With subject to Drug-Drug Interactions in pediatrics, it is 1:2.35.

Prescriptions were categorised based on the type of therapy given. They were, Combinational therapy and Prophylactic therapy.

Prescriptional errors, Prescribing Faults and Drug-drug interactions were common. Overall, they did not cause any serious problem to the patients. However, close monitoring of the medical chart is necessary to identify them which may lead to serious clinical problems in patients. Statistical analytic methods showed their best performances. Clinical Pharmacist plays an important role in identifying these sort of interactions. Hence this study is conducted to increase the Health related quality of life of patients.

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