



PRESCRIBING PATTERN OF ANTIMICROBIALS IN INTENSIVE CARE UNIT OF A TERTIARY CARE HOSPITAL

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ABSTRACT

Prescription pattern monitoring studies (PPMS) are drug utilization studies with the main focus on prescribing, dispensing and administering of drugs. They promote appropriate use of monitored drugs and reduction of abuse or misuse of monitored drugs. PPMS also guide and support prescribers, dispensers and the general public on the appropriate use of drugs, collaborate and develop a working relationship with other key organizations to achieve a rational use of drugs. This prospective observational study was conducted to assess the prescribing pattern of antimicrobials in the ICU of Vinayaka Missions Kirupananda Variyar Medical College & Hospital (VMKVMCH), Salem. This form of monitoring and evaluation of drug

prescribing pattern can suggest necessary modification in prescribing practices. 100 consecutive patients who were admitted to different department ICU during the study period of six months from November 2016 to April 2017 were selected. From 100 consecutive prescription, 60% was reported from MICU, 1-3 days was the highest duration of ICU stay and male gender had high preponderance. Most frequently used AMA's was ceftriaxone and cefotaxime from cephalosporin class. Injections were most preferred dosage form and were

frequently administered through IV route. Most AMA prescription was made with bacteriological culture and sensitivity evidence. Prescriptions had AMA's prescribed in combination and DI was frequently reported. There is a need for motivating the physicians to prescribe less number of antimicrobial agents in order to minimize the drug interaction. This can be achieved by periodic evaluation and framing a better prescribing strategy.

KEYWORDS: Antimicrobial Agent, ICU, Prescribing Patterns, Cephalosporin.

INTRODUCTION

Prescription pattern monitoring studies (PPMS) are drug utilization studies with the main focus on prescribing, dispensing and administering of drugs. They promote appropriate use of monitored drugs and reduction of abuse or misuse of monitored drugs. PPMS also guide and support prescribers, dispensers and the general public on appropriate use of drugs, collaborate and develop a working relationship with other key organizations to achieve a rational use of drugs.^[1] Prescription Patterns explain the extent and profile of drug use, trends, quality of drugs, and compliance with regional, state or national guidelines like standard treatment guidelines, usage of drugs from essential medicine list and use of generic drugs. The aim of PPMS is to facilitate the rational use of drugs in a population. The overuse, underuse or misuse of medicines results in wastage of scarce resources and widespread health hazards. The rational use of medicines (RUM) is defined as "Patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time."^[2] Prescribing habits which are inappropriate can lead to ineffective and unsafe treatment and exacerbation or prolongation of illness, distress, harm to the patient and higher costs. 'They also make prescriber vulnerable to influences which can cause irrational prescribing. Irrational prescription of drugs is a common occurrence in clinical practice. Important reasons are lack of knowledge about drugs, unethical drug promotions and irrational prescribing habits of clinician.^[3] The intensive care unit (ICU) is a setting where a large number of drugs are administered to patients and the costs of hospitalization and drug treatment are high. In many countries, antibiotic resistance in the ICU setting has emerged as an important problem influencing patient outcomes. Widespread use of broad-spectrum antibiotics, crowding of patients into geographically confined areas, the presence of invasive medical devices and a greater number of critically ill patients may be factors favoring the emergence and spread of resistant organisms. Monitoring of prescriptions and drug utilization studies can identify the problems and provide feedback to prescribers so as to create

awareness about the irrational use of the drug. Measurement of drug use in health facilities not only describes drug use patterns and the behavior of prescribers but also helps in the identification of polypharmacy and the problems associated with it⁴. Hence we designed our study with the following objective.

- Analysis of prescribing patterns of antimicrobial in intensive care unit of Vinayaka Missions Kirupananda Variyar Medical College & Hospital (VMKVMCH), Salem.
- To find out most frequently prescribed class of antimicrobial agent and number of antimicrobial drugs per prescription.
- To find out the drug interactions of antimicrobials and with another drug.
- To find out the role of microscopic, culture and sensitivity test for antimicrobial in implementing the effective prescribing pattern.

MATERIALS AND METHODS

A Prospective - observational study was carried out in Intensive Care Unit of Vinayaka Missions Kirupananda Variyar Medical College & Hospitals (VMKVMCH), Salem for a study period of six months from November 2016 to April 2017. Data of the 100 eligible consecutive case records of inpatients admitted to different departments of ICU during the study period were taken for the study. Patients of both genders were included in the study from intensive care units excluding NICU & PICU, since children fewer than eighteen were our exclusion criteria. Patients who got transferred to ward or discharged from the hospital within 24 hours of admission were also excluded from the study population. An appropriate study protocol and Pro-forma were developed and the following parameters were recorded for each prescription: patient's demographic profile, diagnosis, drug name (both brand and generic name), dose, route, frequency, and duration of prescription, microscopic culture and sensitivity report and drug interaction.

RESULTS

The parameters that support prescribing pattern were determined accordingly. Out of 100 prescriptions, 60% cases were reported from MICU. The duration of stay of patients who stayed in ICU for 1-3 days 32(32%) was highest. Out of 100 ICU cases, it was found that male patients had higher preponderance i.e., 64% and the patients were commonly from the age group of 51-60(39%). The poly pharmacy was noticed in all case records, 66 drug to drug

interactions were found and out of which 28(42.42%) cases had the synergistic effect and were found to be highest.

Table No: 1.

S. No	Approach of treatment	No. of prescription	% of cases
1	Single therapy	59	59%
2	Combinational therapy	41	41%
	Total	100	100

Table 1: Shows the analysis of prescription based on fixed drug combinations. Single therapy was having high preponderance than FDC of AMA's such as Cefoperazone + Sulbactam, Ampicillin + Cloxacillin, Piperacillin + Tazobactam, Amoxicillin + clavulanic acid.

The antimicrobials prescribed in intensive care unit were analyzed according to their prescribed dosage forms. It was found that out of 32 antimicrobial 16(50.00%) were prescribed as injections, followed by 12(37.5%) antimicrobial as a tablet and 4(12.5%) were prescribed as capsules (figure no: 1).

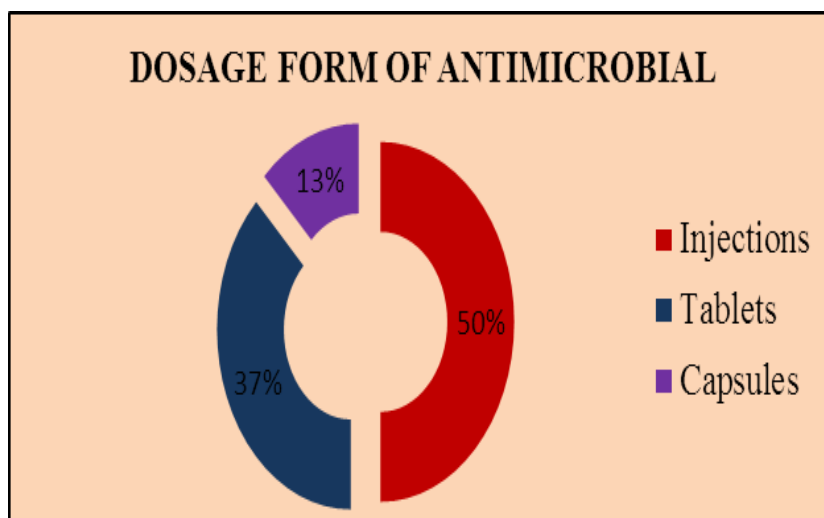


Figure No: 1.

Out of 100 prescriptions collected during the study period, the drugs were administered in different routes, of which intravenous route was mostly preferred that is 15(46.87%), followed by oral route 16(50%) and intramuscular 1(3.13%). Among 100 prescriptions 64 (64%) of cases were having bacteriological reports and 36% of cases were not having the bacteriological report.

Total of 64 specimens was collected from ICU patients who had done with microscopic culture and sensitivity test. Out of that urine accounted for 29(45.31%), followed by sputum 20(31.25%), pus 7(10.93%), suction catheter tip 3(4.68%), wound swab 2(3.13%), blood 2(3.13%), throat swab 1(1.56%) has shown in (figure no: 2).

Table No: 2.

S. No	Specimen	No of prescription	% of prescription
1	Urine	29	45.31%
2	Sputum	20	31.25%
3	Pus cell	7	10.93%
4	Suction catheter tip	3	4.68%
5	Wound swab	2	3.13%
6	Blood	2	3.13%
7	Throat swab	1	1.56%
	Total	64	100

Out of total 41 specimens collected during the study period, the sensitivity to different antimicrobials is studied and each of the sensitivity patterns was reported (figure no: 3).

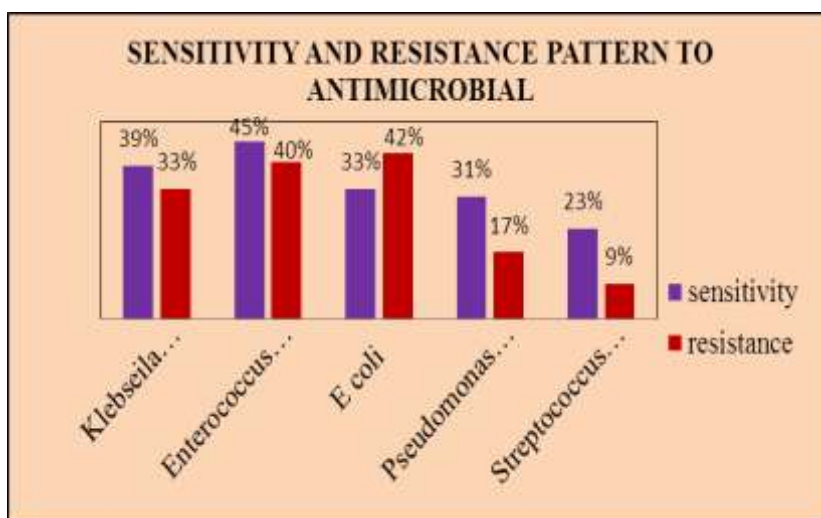


Figure No: 2.

The most commonly prescribed antimicrobials were categorized and the results were presented in (Figure no: 3). Thirty Two antimicrobials were prescribed for 278 times in 100 cases. Among that Ceftriaxone 47(16.90%) was most commonly prescribed drug in the study population followed by Cefotaxime 32(11.50%), Metronidazole 28(10.10%), Levofloxacin 24 (8.63%), Cefoperazone/sulbactam 18 (6.50%), Ciprofloxacin 16(5.80%), Azithromycin 13(4.70%), Linezolid 12(4.31%), piperacillin 12(4.34%), Amoxicillin 9(3.26%), Meropenem 9(3.26%), Fluconazole 6 (2.15%), Amikacin 6 (2.15%), Mebendazole 5 (1.79%), Other 5(1.79%),

Doxycycline 4(1.43%), Ampicillin 4(1.43%), Norfloxacin 3(1.07%), Streptomycin 3(1.07%), Amoxicillin+Clavulanic acid 3(1.07%), Faropenem 2(0.71%), Imipenem 2(0.71%), Gentamycin 2(0.71%), Cefixime 2(0.71%), Piperacillin+Tazobactam 2 (0.71%), Clotrimazole 2 (0.71%), Rifampicin 2(0.71%), Cefpodoxime 1(0.35%), Clarythromycin 1(0.35%), Cefixime 2(0.71%), Carbimazole 1(0.35), Itraconazole 1(0.35%), Clindamycin 1(0.35%).

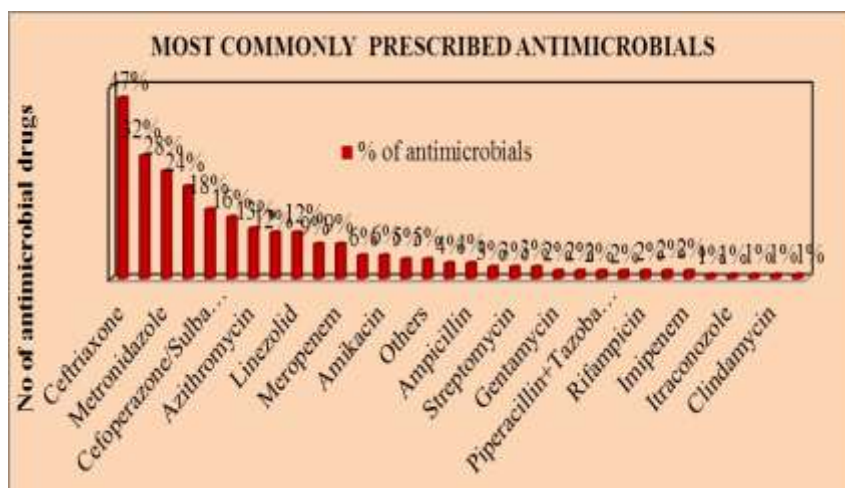


Figure No: 3.

There was a different pattern of antimicrobial prescribing reported during the study period in intensive care unit. Out of 100 patients, 30 patients (30%) received one antimicrobial while two antimicrobial were received by 26 patients (26%), three antimicrobial were received by 24 patients (24%), four and more than four antimicrobial were received by 20 patients (20%).

DISCUSSION

A prescription by a physician may be taken as a reflection of his attitude towards the disease condition and the role of drugs in its treatment.^[5] Early disease recognition and early start of corrective treatments for infections have proved to have significant outcomes in terms of treatment effectiveness.^[6] When the prescriptions were analyzed based on different departments on intensive care unit, the results exhibit that majority of cases was obtained from MICU which was similar to the results of a study done by Mujtaba *et al*^[7], where medical cases dominated (77%) when compared to other departments of ICU.

The duration of stay of a patient is counted from the date of admission to the date of discharge. Patients who stayed in ICU for 1-3 days was found to be highest in our study which showed deviation from the study done by Ahmed *et al*^[8], where length of stay ranges from 1-36 days.

A study done by Selvaraj *et al*, showed that male patients had high preponderance (61.25%) than female patients (38.78%) which supported our results and was in accordance with their study.

Age wise distribution of cases has enabled us in analyzing nature of prescribing among various age groups. Our study results indicated that most common age group of patients were 51-60(39%) which was in accordance with the study conducted by Rajendra Gupta *et al*^[10], were patients from old age group (39.72) was highest.

The likelihood of occurrence of Drug-Drug interactions among critically ill patients is common since most of the ICU patients have multiple diseases and due to poly pharmacy practice in association with treatment of these diseases. Among 100 cases, there were 66 Drug-Drug interactions. Out of 66 interactions, 42.42% interactions accounted for the synergistic effect, 36.36% interactions had an antagonistic effect and 21.22% interactions were another type.

Physicians preferred to prescribe antimicrobials in combination for pharmacotherapy of the patients than single therapies. This may be due to the fact that hospitals' physicians try to expand the possible spectrum of action for multiorganisms infection commonly happen in this state and also base on the latest antibiotic treatment guideline. Our results showed that majority of patients received combinational antimicrobial therapy; this finding was in accordance with the study of Sheikh Farid *et al*^[11], was majority of patients (51.6%) received antimicrobial drugs in combinations.

Our result shows that Injections were most frequently administered to patients admitted to ICU which coincides with the study of Pandiamunian *et al*.^[12] Parenteral route (IV) of administration was mostly preferred by our hospital ICU setting followed by oral route (tablets and capsules) which was in accordance with the study of Ravika kanish *et al*.^[13]

Antimicrobials prescribed empirically and prophylactically without performing culture sensitivity pattern may increase the chances of antimicrobial resistance. Our hospital setting is highly focused on performing microscopic culture and sensitivity tests. When prescriptions were analyzed for microscopic culture and sensitivity reports, 64% of cases were having bacteriological reports and 36% of cases were not having a bacteriological report. This result was in contestation with the results of the study by Chandran *et al*^[14], were sensitivity reports

were chosen only in 41.1% of cases. This comparison was found to be advantageous to our hospital setting.

Karen *et al*^[15] have outlined in their study that the most frequently collected specimens were Urine, Tracheal secretion, Pus, Sputum, Blood, Throat swab, Wound swab, Suction catheter tip, and others. Urine was the choice of a specimen and common microorganism present in the isolated specimen of ICU patients were *Escherichia coli* which had a close resemblance with our study result, were same specimens was collected during the study period and choice of the specimen was urine with highly sensitive organism *Escherichia coli*.

Generic drugs are cheaper than brand-name drugs. Moreover, ours is a tertiary care hospital where prescription of generic drugs is always emphasized. Out of 32 antimicrobial drug majority were purely prescribed in their Generic names which was found to be in conformity to study of Babalola *et al*^[16], were the overall percentage of drugs prescribed as generic was (69.81%) while it was contrary to study of Wahed *et al*^[17], in which none of the drugs were prescribed by generic name rather by proprietary (brand) name.

The antimicrobials were grouped according to their particular classes, out of 13 classes of antimicrobials, Cephalosporin was the most common class of antimicrobial prescribed, this result was similar to study of Shah *et al*^[18], where cephalosporin exhibited for about (44.34%).

Divya Kancherla *et al*^[19], reported in their study that among cephalosporin class of antimicrobial agents most commonly prescribed drugs are Ceftriaxone (80.35%) followed by cefotaxime, which was similar to our study results.

Polypharmacy among various classes of antimicrobial drugs was observed. Polypharmacy is defined as the concomitant use of four or more drugs and it could enhance drug interactions and drug-related problems. In our study, 30% of prescription had one antimicrobial followed by 26% prescription had two antimicrobials, 24% prescription had three antimicrobials, four and more than four antimicrobials was present in 20% prescription which was contrary to the results reported in the study of Lisha Jenny *et al*^[20], were most their patients were prescribed two antimicrobials (31.3%), followed by three and four antimicrobials (25.7%).

CONCLUSION

Our present study on antimicrobial drugs prescribing patterns in ICU, thus provide a framework for continuous prescription audit in the ICU. In our ICU setting prescribing of antimicrobial are supported by microscopic culture and sensitivity reports, while few are based on clinical judgment. Even though there was drug interaction reported in ICU most of them was synergistic and was beneficial to patients. They are highly focused in prescribing newer and broad spectrum antimicrobials from classes like cephalosporin's, fluoroquinolones to overcome the resistance of microorganisms.

Longitudinal surveillance of antimicrobial drug use in ICU can be carried out to create a database to compare the future trends in prescribing and utilization of antimicrobial agent. The study also provides a strong proof that our hospital setting is following an appropriate prescribing trends for antimicrobial relevant for the treatment of a clinical condition.

From the above study, it may be concluded that due to multiple diseases and polypharmacy a multiple number of antimicrobials are prescribed among ICU patients. So it will be safer to patients if Physicians provide their care to minimize these multiple drug prescribing pattern by periodic evaluation to improve prescribing standards. Educational interventions among the doctors as well as students should be carried out in order to promote rational drug use. Various intervention strategies like an introduction of hospital formulary, establishment of Drug and Therapeutic Committee, Drug Information centers and drug use evaluation can be useful and effective in rationalizing the drug use.

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