

DRUG UTILISATION EVALUATION OF CEPHALOSPORINS, MACROLIDES, QUINOLONES ANTIBIOTICS IN KIMS HOSPITAL

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ABSTRACT

Drug Utilization Review (DUR), or Drug Use Evaluation (DUE), is recognized as an effective tool for detecting and improving drug use and patient care. Rational use of drugs is defined by the World Health Organization as “patients receive medicines appropriate to their clinical needs, in doses that meet their own requirements for an adequate period of time, and at the lowest cost to them and their community. The practice in clinical pharmacy also ensures that adverse drug reactions (ADRs) are minimized by avoiding drugs with potential side effects in susceptible patients. Thus, pharmacist has a major role to play in relation to prevention, detection, and reporting of ADRs.

Objective: To determine the prescribing pattern of cephalosporins, macrolides and quinolones antibiotics and to monitor and report the adverse drug reaction and drug interaction if any.

Methodology: The study was conducted in KIMS Hospital, Bangalore. It is a 1200 bedded tertiary care teaching, super specialty hospital, providing specialized health care services to all strata of people in and around Bangalore. It is a hospital based prospective and retrospective study conducted for a period of six months from January to June 2013, to study the utilization pattern of cephalosporins, macrolides and quinolones antibiotics. We have attempted to observe the utilization pattern of cephalosporins, macrolides and quinolones in our hospital. **Result:** Among 160 patients included during the study, we observed that 114(71.25%) patients were prescribed with cephalosporins, which was high compared with other class of antibiotics followed by 38(23.75%) patients were used with quinolones and the remaining eight (5%) patients were on macrolides antibiotics. **Conclusion:** We concluded from our observation that the utilization pattern of cephalosporins was seen more in patients compared with quinolones and macrolides antibiotics.

Keywords: Drug Utilization Review, drug Use Evaluation, rational use of drug.

INTRODUCTION

A DUR is “an authorized, structured process that reviews, analyses, and interprets the pattern of drug use in a given healthcare delivery system in relation to explicitly predetermined criteria, guidelines or standards.”¹⁻⁴ A DUE program includes the introduction of an educational or regulatory intervention to correct patterns of drug use that are not consistent with accepted standards, followed by a later audit to measure the effectiveness of the intervention on subsequent prescribing.^{1,5}

DUE programs emphasize improved quality of patient care. Linked with this aim are two other important goals: (i) Education of medical and pharmacy care providers with respect to rational use of

drugs; and (ii) Increased cost effectiveness of drug therapy selections.^{2,6} When problems are identified, interventions are designed and implemented to improve drug use. Intervention can include educational programs, provision of drug information, change in hospital policies and procedure, and changes in drug formulary.⁷

Types of DUE

Quantitative DUE

The quantitative study of drug utilization figures from which patterns of drug acquisition, prescribing, dispensing, distribution and consumption may be determined.

Qualitative DUE

The qualitative evaluation of drug therapy and the drug therapy outcomes by comparison of practice with predetermined criteria and standards.⁸

The DUE process is a continues process and will be most valuable if the cycle is completed rather than different steps being performed in isolation.⁹ Rational use of drugs is defined by the World Health Organization as “patients receive medicines appropriate to their clinical needs, in doses that meet their own requirements for an adequate period of time, and at the lowest cost to them and their community^{7,10-11}”.

Rational drug use implies an individual approach to patient’s treatment. Success of the treatment largely depends on the ability of a physician to diagnose the major health problem of a patient, select the correct drug, dosage form and route of administration, foresee probable adverse reactions and drug interactions, and prevent unnecessary or dangerous drug duplication therapy. Further rational drug use depends on the performance of the pharmacy and nursing departments in preparing and administering drugs.⁷

Programs that promote the rational prescribing of first- line antimicrobial agents are needed to address three major concerns: (1) Prevention of widespread bacterial resistance. (2) Prevention of adverse drug reactions, and (3) Control of health care costs.^{1, 12-13}

Prescribing drug is an important skill, which needs to be continuously assessed and refined accordingly. It not only reflects the physician’s knowledge of pharmacology and pathophysiology but also his/her skill in diagnosis and attitude towards selecting the most appropriate, cost-effective treatment.¹⁴ Prescribing decisions are the result of a complex process that optimally considers a multiplicity of factors, including pharmacokinetics, antibacterial spectrum, patient tolerability, dosage regimen, recommended duration, palatability, and price. The risk of adverse effects, drug interactions, and generic substitution are also important considerations. Patients, colleagues, pharmaceutical companies, academic literature, and regulatory bodies may influence prescribing decisions. The quality of prescriptions may be described as ‘appropriate’ or ‘inappropriate’. Appropriateness can be assessed on 3 levels

Level 1- whether medication is warranted;

Level 2- which of several alternative drugs is the preferred choice; and

Level 3- appropriate prescription regimen, including dose, duration, type, and frequency of monitoring and drug interactions.

‘Appropriate use’ can have a variety of meanings. Some investigators use the term in a broad sense to imply that the antibiotic choice was suitable for the type, severity, and source of the infection. Other investigators apply additional criteria that narrow the precision of what is implied by the term ‘appropriate use’ to include any or all of the following: rational indication, correct dose regimen, adherence to step therapy compliance with restrictions, and documentation of specific information relevant to the individual patient case. The term ‘appropriate use’ applied by investigators was not defined for the purposes of constituting an inclusion criterion for this review.^{1, 15-16}

Quality of life can be improved by enhancing standards of medical treatment at all levels of the health care delivery system. Setting standards and assessing the quality of care through performance review should become part of everyday clinical practice.¹⁷ The study of prescribing patterns seeks to monitor, evaluate and suggest modifications in practitioner’s prescribing habits so as to make medical care rational and cost effective.^{14, 17} Concern about increasing rates of multi-drug-resistant (MDR) organisms and spiraling expenditure on broad-spectrum antimicrobials has induced most hospitals to implement a range of measures. These include supervision of their use by infectious disease consultants and/or clinical pharmacist’s provision of continuing education regarding appropriate antimicrobial drug use, and implementation of automatic stop orders. However, there is evidence that, in order to be effective, a multidisciplinary approach is warranted, with application of a range of measures, some of which should be individualized according to the hospital’s circumstances and means.¹⁸

Managed care pharmacists review drug utilization to determine which patients and prescribers are using particular medications. This allows the pharmacist to determine whether some drugs are inappropriately prescribed or used. With this knowledge in hand, the pharmacist and other care providers can then actively intervene in the patient's care process to assure better outcome.

Pharmacist can aid in the reduction or avoidance of poly pharmacy in the following way:

- Screening patient drug profiles.
- Assessing the effect of comorbid conditions.
- Reviewing potential drug-drug interactions.¹⁹

The pharmacist, along with the prescriber has a duty to ensure that patients are aware of the risk of side effects with drug therapy and a suitable course of action should they occur. With their detailed knowledge of medicine, pharmacists have the ability to relate unexpected symptoms experienced by patients to possible adverse effects of their drug therapy. The practice in clinical pharmacy also ensures that adverse drug reactions (ADRs) are minimized by avoiding drugs with potential side effects in susceptible patients. Thus, pharmacist has a major role to play in relation to prevention, detection, and reporting of ADRs.

Antibiotics are the most frequently prescribed and misused drugs and there are reported concerns about the continuous indiscriminate and excessive use of antibiotics leading to emergence of antibiotic-resistant organisms.^{11, 14, 17, 21} Resistant organisms may emerge as a result of many factors, including widespread usage while their spread is mainly caused by factors in the health care setting, including the health care provider's behavior.¹⁰

METHODOLOGY

Objectives

- To determine the Prescribing Pattern of Cephalosporins, Macrolides, Quinolones antibiotics.
- To monitor and reporting of Adverse Drug Reaction, if any.
- To monitor and report the drug-interactions, if any.

An Institutional Ethical committee clearance is obtained to conduct the study. This study was conducted in Kempegowda Institute of Medical science (KIMS) Hospital, Bangalore, which is a 1200-bedded superspeciality tertiary care teaching, providing specialized health care services to all strata of people in and around Bangalore. We conducted a hospital based prospective and retrospective study, to study the drug utilization pattern of cephalosporin's, macrolides, and quinolones antibiotics for over a period of six month from January-June 2013.

Study criteria

1) Inclusion Criteria

Patient's age should be between 18 to 75 Years.
Patient admitted under medicine units.

2) Exclusion Criteria

Pediatric and pregnant patients.
Patients with co-morbid condition with or with complication.

Source of data

Patient data relevant to our study was obtained from the following sources and recorded in the well designed patient data collection form:

- Treatment chart/case sheet, lab report.
- Patient or patient's care giver interview.

Study procedure

1. Patient enrolment

A hospital based retrospective and prospective conducted in medicine units of Kempegowda Institute of Medical Sciences and Research Centre hospital (KIMS), Bangalore. The informations were collected from case note of patient prescribed with either Cephalosporins, Macrolides, Quinolones antibiotics or in combination during our six month study period. A total patient's case note were selected from inpatient medical record. The information obtained from each patient case note was entered into a well designed data collection form.

2. Determination of prescribing pattern

Well designed data collection form was prepared and required information was extracted from inpatient's information sheet which includes all the detail of patients like:

- Patient Demographic: Name, age, gender, weight, blood pressure, personal history, medication history.
- Presenting complain, past medical history, any drug allergy, family history of patients.
- Drug data which includes name of the drug, dosage regimen, dose and route of anti microbial agent (AMA), AMAs per patient, duration of therapy.

3. Determination of adverse drug reaction

Any adverse drug reactions with the selected antibiotics therapy were monitored and reported using the yellow card.

Statistical method

The obtained data, collection data was analyzed by simple percentage method to conclude the study results.

RESULTS

Table 1: Gender Distribution

| Age (in years) | Male | Female | Total number of patients | Percentage (%) |
|----------------|------|--------|--------------------------|----------------|
| 18-30 | 36 | 18 | 54 | 33.75 |
| 31-40 | 18 | 12 | 30 | 18.75 |
| 41-50 | 15 | 14 | 29 | 18.12 |
| 51-60 | 16 | 10 | 26 | 16.25 |
| >60 | 12 | 9 | 21 | 13.12 |

The study included total of 160 patients among which 97(60.62%) patients were male and 63(39.37%) patients were female.

Table 2: Age with Gender Distribution

| Gender | Number of patients | Percentage (%) |
|--------|--------------------|----------------|
| Male | 97 | 60.62 |
| Female | 63 | 39.37 |

Corresponding to table (2) represents age with gender distribution of the study population. It was found that 54 patients were between the age of 18 to 30 years out of which 36 patients were male and 18 were female. 30 patients were between the age of 31 to 40 years, of which 18 were male and 12 were female. 29 patients were between the age of 41 to 50 years, of which 15 of them were male and 14 were found to be female. 26 patients in the range of 51 to 60 years, out of which 16 were male and 10 were female. 21 patients were found to be more than 60 years old out of which 12 were male and nine were found to be female.

Table 3: Education Level with gender Distribution

| Education | Male | Female | Total number of patients | Percentage (%) |
|---|------|--------|--------------------------|----------------|
| Uneducated | 5 | 3 | 8 | 5 |
| Less than 7 th std | 21 | 11 | 32 | 20 |
| 8 th to 10 th std | 45 | 37 | 82 | 51.25 |
| PUC | 16 | 9 | 25 | 15.62 |
| Degree | 10 | 3 | 13 | 8.12 |

PUC: Pre University collage

STD: Standard

Corresponding to table (3) represent the educational level of patients included in the study. It was observed that 82(51.25%) patients were between the range of 8th -10th standard, of which 45 were male and 37 were female. 32(20%) patients completed less than 7th standard, of which 21 patient were male and 11 were female. 25(15.62%) patients completed PUC of which 16 were male and nine were female. 13(8.12%) patients completed degree of which 10 were male and three were female. Eight (5.26 %) patients were uneducated of which five were male and three were female.

Table 4: Income with gender distribution

| Income (INR) | Male | Female | Total number of patients | Percentage (%) |
|------------------|------|--------|--------------------------|----------------|
| Unknown | 12 | 7 | 19 | 11.87 |
| Less than 5,000 | 24 | 19 | 43 | 26.87 |
| 5000-10,000 | 48 | 29 | 77 | 48.12 |
| More than 10,000 | 13 | 8 | 21 | 13.12 |

Corresponding to table (4) depicts the income with gender distribution of patients. 77 (48.12%) earned within the range of INR.5000-10,000 per month, of which 48 were male and 29 were female. 43(26.87%) earned less than INR.5000, of which 24 were male and 19 were female. 21 (13.12%) earned more than INR.10,000 per month, of which 13 were male and eight were female. Out of 19(11.87%) patients income was unknown, of which 12 were male and seven were female.

Table 5: Age and gender distribution in patients on cephalosporins antibiotics

| Age (in years) | Male | Female | Total number of patients | Percentage (%) |
|-----------------|------|--------|--------------------------|----------------|
| 18-30 | 26 | 13 | 39 | 34.21 |
| 31-40 | 11 | 11 | 22 | 19.29 |
| 41-50 | 9 | 10 | 19 | 16.66 |
| 51-60 | 9 | 9 | 18 | 15.78 |
| >60 | 9 | 7 | 16 | 14.03 |

Corresponding to table (5) represents the age and gender distribution of patients who were prescribed with cephalosporin class of antibiotics. About 114 patients (71.25%) were included in the study of which, ceftriaxone 90(78.94%) was the most commonly prescribed drug. we found that ceftriaxone was used in combination with sulbactam to have maximum antibiotic effect and also to reduce the microbial resistant.

Table 6: Age and gender distribution in patients on quinolones antibiotics

| Age (in years) | Male | Female | Total number of patients | Percentage (%) |
|-----------------|------|--------|--------------------------|----------------|
| 18-30 | 5 | 6 | 11 | 32.38 |
| 31-40 | 1 | 5 | 6 | 17.64 |
| 41-50 | 3 | 3 | 6 | 17.64 |
| 51-60 | 5 | 4 | 9 | 23.68 |
| >60 | 4 | 2 | 6 | 15.78 |

Corresponding to table (6) represent age and gender distribution of 38 patients (23.75%) who were prescribed with quinolone class of antibiotics, Out of which 22(57.89%) patients were on ofloxacin, which was the most commonly prescribed drug.

Table 7: Age and Gender distribution in patients on Macrolides Antibiotics

| Age (in years) | Male | Female | Total number of patients | Percentage (%) |
|-----------------|------|--------|--------------------------|----------------|
| 18-30 | 1 | 0 | 1 | 12.5 |
| 31-40 | 2 | 1 | 3 | 37.5 |
| 41-50 | 3 | 0 | 3 | 37.5 |
| 51-60 | 1 | 0 | 1 | 12.5 |
| >60 | 0 | 0 | 0 | 0 |

Corresponding table (7) represents age and gender distribution of patients who were prescribed with macrolide class of antibiotics. About 8(5%) were included in study, of which clarithromycin 5(62%) was the most commonly prescribed drug.

Table 8: Utilization pattern of Cephalosporins Antibiotics

| SL NO | Condition | Number of patient | Percentage % |
|-------|--|-------------------|--------------|
| 1 | Dengue fever | 31 | 27.19 |
| 2 | Viral fever | 16 | 14.03 |
| 3 | Acute exacerbation of bronchial asthma | 7 | 6.14 |
| 4 | Chronic obstructive pulmonary disease | 7 | 6.14 |
| 5 | Hepatitis | 7 | 6.14 |
| 6 | Enteric fever | 5 | 4.38 |
| 7 | Acute bronchitis | 4 | 3.50 |
| 8 | Urinary Tract infection | 4 | 3.50 |
| 9 | Other | 43 | 37.71 |
| | Total | 114 | 100 |

The study on the utilization pattern of cephalosporin antibiotics for various infections table (8) revealed that it was used commonly to treat 31(27.19%) patients with dengue fever, followed by 16(14.03%) patients for viral fever, 7(6.14%) patient for having COPD, hepatitis and bronchial asthma. Other conditions like 5(4.38%) patients for enteric fever, 4(3.50%) patients for bronchitis and UTI, and etc were also prescribed.

Table 9: utilization pattern of quinolones antibiotics

| SL NO | Condition | Number of patients | Percentage (%) |
|-------|-----------------------|--------------------|----------------|
| 1 | Dengue fever | 15 | 39.47 |
| 2 | Acute gastroenteritis | 5 | 13.15 |
| 3 | Viral fever | 4 | 10.52 |
| 4 | Other | 14 | 36.84 |
| | | 38 | 100 |

The study on the utilization pattern of quinolone antibiotics for various infections table (9) revealed that, it was used commonly to treat 15(39.47%) patients with dengue fever, followed by 5(13.15%) patients for acute gastroenteritis, 4(10.52 %) patients for viral fever and etc.

Table 10: Utilization Pattern of Macrolides Antibiotics

| SL NO | Condition | Number of patients | Percentage (%) |
|-------|-----------------------------------|--------------------|----------------|
| 1 | Upper respiratory tract infection | 3 | 37.5 |
| 2 | Lower respiratory tract infection | 5 | 62.5 |
| | Total | 8 | 100 |

The study on the utilization pattern of macrolide antibiotics for various infections table (10) revealed that, it was used commonly to treat 5(62.5%) patients for lower respiratory tract infection, followed by 3(37.5%) patients for upper respiratory tract infection.

DISCUSSION

Among the 160 included patients, out of which 97(60.62 %) patients were male, which was found to be more in number compared to female 63(39.37%) patient, which correlated with the study conducted by Shankar R et al, in Western Nepal reported that, sensitivity pattern of common organisms were determined in 203 patients, who were prescribed with antibiotics; Out of which 112 were male and 91 were female.¹⁷ In other studies conducted by Ramanath KV et al in Mandya and Tsega B et al in North West Ethiopia had reported female patients (69%) were more likely to receive antibiotics than male patients (62.9%) respectively.²²⁻²³

Considering the age with gender distribution of the study population, it was found that 54(33.75%) patients were between the age of 18 to 30 years, out of which 36 patients were male and 18 were female. 30(18.75%) patients were between the age of 31 to 40 years, of which 18 were male and 13 were female. 29(18.12%) patients were between the age of 41 to 50 years, of which 15 of them were male and 14 were found to be female. 26(16.25%) patients in the range of 51 to 60 years, out of which 16 were male and 10 were female. 21(13.12) patients were found to be more than 60 years old

out of which 12 were male and Nine were found to be female, which correlated with study conducted by Ramanath KV in Mandya had reported majority of patients 31(31.9%) belongs to age group of 21 to 30 years and least observed in age group of 71-80 years (1%).¹⁷

Considering the educational level of patients included in the study, it was observed that only 82(51.25%) patients were between the range of 8th -10th standard, of which 45 were male and 37 were female. 32(20%) patients completed less than 7th standard, of which 21 patient were male and 11 were female. 25(15.62%) patients completed PUC, of which 16 were male and nine were female and 13(8.12%) patients completed degree, of which 10 were male and three were female. Eight (5%) patients were uneducated, of which five were male and three were female.

Considering the income with gender distribution of patients 77(48.12%) earned within the range of INR.5,000-10,000 per month, of which 48 were male and 29 were female. 43(26.87%) patients earned less than INR.5,000 per month, of which 24 were male and 19 were female. 21 (13.12%) patients earned more than INR.10, 000 per month, of which 13 were male and eight were female. 19(11.87%) patients income were unknown, of which 12 were male and seven were female.

Considering the age and gender distribution of patients who were prescribed with cephalosporin class of antibiotics. About 114(71.25%) patients were included in the study of which, 90(78.94%) patient were prescribed with ceftriaxone which was most commonly prescribed drug. Also, we found that ceftriaxone was used in combination with sulbactam to have maximum antibiotic effect and also to reduce microbial resistant, which was correlated with a study conducted by Ramanath KV et al in Mandya had also reported most of the inpatient were prescribed with empirical therapy with ceftriaxone 28(68.3%).¹⁷

Considering age and gender distribution of patients who were prescribed with quinolone class of antibiotics, About 38(23.75%) patients were included in the study of which, 22(57.89%) patients were on ofloxacin which was the most commonly prescribed drug. Considering the age and gender distribution of patients who were prescribed with macrolide class of antibiotics. About eight (5%) patients were included in the study of which, five (62.5%) patients were on clarithromycin which was the most commonly prescribed drug. The study on the utilization pattern of cephalosporin antibiotics for various infections revealed that it was used commonly to treat 31(27.19%) patient with dengue fever, followed by 16(14.03%) patients for viral fever, 7(6.14%) patient for having COPD, hepatitis and bronchial asthma and other condition like 5(4.38%) patients for enteric fever, 4(3.50%) patients for bronchitis and UTI, 3(2.62%) patients for chronic alcoholic disease and etc, which was correlated with a study conducted by Omole et al in south west Nigeria had also reported that 279(45.3%) patients were on cephalosporin and penicillin who were prescribed mostly for upper respiratory tract infection (URTI).

The study on the utilization pattern of quinolone antibiotics for various infections revealed that it was used commonly to treat 15(39.47%) patients for dengue fever, followed by 5(13.15%) patients for acute gastroenteritis, 4(10.52 %) patients for viral fever and other condition like 3(7.89 %) patients for cholera, 2(5.26 %) patients for UTI and etc. The study on the utilization pattern of macrolide antibiotics for various infections revealed that it was used commonly to treat 5(62.5%) patients for lower respiratory tract infection, followed by 3(37.5%) patients for upper respiratory tract infection. In this study the mean duration of therapy with cephalosporin was 5.15 days and 4.76 days for quinolone, 4.25 days for macrolide which was correlated with a study conducted by Omole et al in south west Nigeria had reported the mean duration of prescription for cephalosporin found to 5.1 days.¹¹

LIMITATION

- It is a short duration of DUE study conducted for evaluation of prescribing pattern of drugs.
- There was no standard treatment guidelines prepared and implemented to check the utilization pattern of cephalosporins, macrolides and quinolones antibiotics.
- The study population size was less for a drug utilization evaluation studies to conclude the rationality of prescribing, these cephalosporins, macrolides and quinolones class of antibiotics.

CONCLUSION

It is necessary to take action to improve prescribing habit in order to reduce the unnecessary usage of antibiotic thus enhance rational antibiotic use. The Drug and Therapeutic Committee can play an important role in this regard and also perform drug utilization studies and prescription reviews to improve drug use in general and management. Medical profession trend to use newer, more expensive agents, as opposed to cost effective, proven, and well established antimicrobial agents.

Prescriber must be encouraged to make more use of laboratory investigations and must not depend solely on clinical diagnosis. The frequently prescribed antibiotics were cephalosporins followed by quinolones and macrolides. In cephalosporin class, ceftriaxone usage was more common and also in combination with salbutamol. Periodic study on the usage of antibiotics and sensitivity pattern in the study hospital set up should be conducted to enable the health care professionals to select the appropriate antibiotic regimen to promote rational usage of antibiotics.

CONFLICTS OF INTEREST

NIL

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