

Prospective assessment of antimicrobial prescribing pattern at a tertiary care hospital

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Abstract: *Background:* Antimicrobial agents (AMA) are the greatest contribution to 20th century, which are used for cure and prevention of infections. Widespread use of antimicrobials has facilitated the development of resistance. *Aim:* The present study was done to screen rational use of antimicrobials in the medicine outpatient department of a teaching hospital. *Methods:* A total of 650 prescriptions were collected from the medicine OPD. Prescriptions containing antimicrobial drugs were analyzed for appropriateness in dosage, duration of therapy and fixed dose drug combinations (FDCs). The antimicrobials were grouped using the anatomical therapeutic chemical (ATC) codes. *Statistical analysis:* Data was analyzed by percentage. *Results:* Out of 650 patients, 180 patients (27.65%) received antimicrobials. Among them 25.33% patients were prescribed one antimicrobial and 18.88% were prescribed antimicrobial FDCs. Out of the 180 prescriptions, 47% were irrational. The most commonly prescribed antimicrobial categories were β -lactam antimicrobials (35.09%), followed by fluoroquinolones (18.88%) and combinations of antimicrobials from different groups (13.85%). *Conclusion:* Higher frequency of irrational antimicrobial prescriptions suggests that antimicrobial restriction policies and a multidisciplinary effort to reduce usage are urgently required.

Keywords: Prescription pattern, Antimicrobials, ATC codes, FDCs, Rational pharmacotherapy

Introduction

Antimicrobials agents (AMA) have changed the outlook of physicians about the power of drugs on the diseases. Antimicrobials are the most common drugs, used for various life threatening and trivial infections. Their importance is magnified in the developing countries, where infective diseases are predominant [1]. But inappropriate and indiscriminate use of antimicrobials has led to the emergence of antimicrobial resistant strains, treatment failure and increase in mortality and morbidity [2]. The worldwide increase in antimicrobial resistant bacteria is of great concern but is not described adequately in the developing countries. It is the responsibility of the doctors to develop good prescribing habits which will help in reducing the intensity of the problem.

Some of the common causes that contribute to the development of antimicrobial resistance are unnecessary use of antimicrobial drugs, inappropriate dose, inadequate duration of therapy and use of irrational antimicrobial fixed dose drug combinations (FDCs). Because of the

high level of community antimicrobial drug resistance, use of expensive drugs becomes mandatory which may not be affordable by majority of patients in developing countries like India. Another problem is that many of the second and third line agents are becoming ineffective in clinical practice. And as it is reported earlier, 'the slow pace with which new molecules of antimicrobials are introduced into the market is inadequate to meet the needs of this global threat'.

To tackle with this problem, global initiatives are trying to promote rational use of antimicrobials [3] but, it requires continuous education of prescribers and patients, which ought to be supported by high quality evidence linking antimicrobial use to the emergence of resistance [4-5]. So, the present study was conducted to evaluate use of antimicrobial agents in a tertiary care hospital, just as one of the measures to analyze and promote rational use of drugs so that adequate measures can be taken to prevent problem of antimicrobial resistance in the region.

Material and Methods

Study design: This was a prospective cross sectional study conducted at the tertiary care hospital of Edappal, Malappuram District, Kerala. Prescription files from medicine OPD of this hospital were collected on all Saturday over a period of four months (March 2014-July 2014). Institutional ethics committee approval was obtained prior to start of this study. The number of drugs prescribed in each prescription was taken into account to calculate the incidence of polypharmacy.

Data collection: The data from the records were entered into a specially designed proforma. The following parameters were recorded for each prescription: patient's demographic profile, diagnosis, drug name, dose, route, frequency and duration of prescription. The patients were categorized by sex and then divided into four age groups. The frequency of prescription was calculated for each age group and for males and females separately. Prescribing frequency was expressed as a percentage of the prescription of the individual drug/drug class in a particular age/sex category to the total number of patients in the particular age/sex category.

Prescription pattern: WHO guidelines were taken into consideration for evaluating the rationality of prescriptions. The parameters for evaluation were: (1) Dose strength and dosage schedule (2) Duration of therapy (3) FDCs: rational/irrational. The antimicrobials were classified using the Anatomical Therapeutic Chemical (ATC) classification system. In the ATC classification system, the drugs are divided into different groups according to the organ or system on which they act and their chemical, pharmacological and therapeutic properties [6].

Results

During the study period, prescriptions of 650 patients were assessed. It consisted of 398 (61.25%) males and 252 (38.78%) females (Table 1). 33.20% of the patients attending the medical OPD were below the age of 45 years. The most common diagnosis which warranted antimicrobial prescription in the medicine OPD was upper respiratory tract infection (35%), followed by diarrhoea (18%) and urinary tract infection (19%). The number of drugs per prescription is

shown in Figure 1. A total of 234 (36.14%) patients received 2 drugs and 164 (25.30%) patients received only one drug. The average number of drugs per prescription was 2.52. The duration of antimicrobial drug prescription was less than 5 days in 29.73% of the patients and between 7-10 days in 53.66% of the patients.

Table-1: Distribution by age and sex of patients who visited medicine OPD

Age in years	Male (%)	Female (%)	Total (%)
16-30	97(24.37)	63(25.0)	160(24.61)
31-45	140(35.17)	83(32.93)	223(33.34)
46-60	99(24.87)	77(30.55)	176(27.07)
> 60	62(15.57)	29(11.50)	91(14.0)
Total	398(61.25)	252(38.76)	650

Fig-1: Frequency of drugs administered per prescription

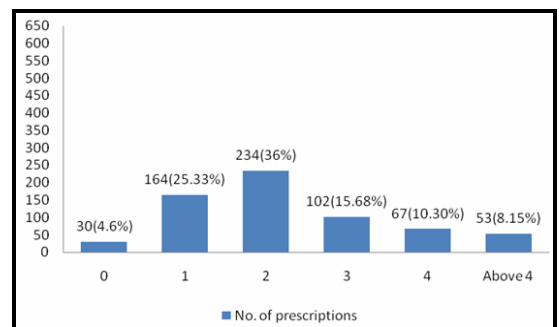


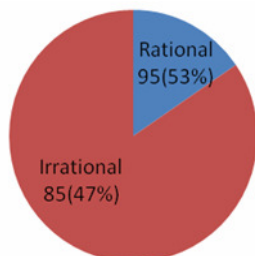
Table-2: Number of antibiotics prescribed per patient

Antimicrobials	No of patients	Percentage
Single antimicrobial	91	50.55%
Two antimicrobials	11	6.11%
>Three antimicrobials	14	7.77%
Antimicrobial FDCs	34	18.88%

The prescribing frequency of antimicrobials showed a decline with increasing age. Out of the total prescriptions drugs, it was observed that percentage of antimicrobials among the total drugs was 32.25%, analgesic/antipyretic/anti-inflammatory was 34.75%, acid lowering drugs were 19.14%. Out of 650 patients, 180 (25.37%) received antimicrobials. Out of that,

50.55% patients were prescribed one antimicrobial and 18.88% were prescribed antimicrobial FDCs (Table 2). 85 prescriptions (47%) were found to be irrational (Figure 2).

Fig-2: Evaluation of Antimicrobial Therapy (n=180)



The most commonly prescribed antimicrobial categories were β -lactam antimicrobials (35.09%) followed by fluoroquinolones (18.88%) (Table-3). Among the different classes of antimicrobial FDCs, fluoroquinolones and nitroimidazoles remained the most frequently prescribed combinations which were followed by aminopenicillin combinations.

No prescriptions with incorrect dosage, incorrect duration of therapy or use of banned drug formulations of antimicrobials were noted.

Table-3: Distribution of antimicrobials by groups, subgroups and ATC codes

Drug group	Subgroup	ATC code	No. of antimicrobial Prescriptions (%)
Tetracyclines (J01A)	Tetracyclines	J01A	6 (3.31)
Penicillins (J01C)	Extended spectrum penicillins	J01CA	12 (6.63)
	Combination of penicillins	J01CR	28 (15.55)
Cephalosporins (J01D)	1 st Generation	J01DB	7 (3.88)
	2 nd Generation	J01DC	1 (1)
	3 rd Generation	J01DD	15 (8.33)
Sulfonamide with Trimethoprim (J01E)	Combination of Sulfonamide with Trimethoprim	J01EE	4 (2.22)
Aminoglycosides (J01G)	Other Aminoglycosides	J01GB	5 (2.77)
Macrolides (J01F)	Macrolides	J01FA	11 (6.11)
Quinolones (J01M)	Fluoroquinolones	J01MA	34 (18.88)
Combination of antimicrobials (J01R)	Combination of antimicrobials	J01RA	25 (13.85)
Other antimicrobials (J01X)	Glycopeptide antibacterials	J01XA	3 (1.66)
	Imidazole derivatives	J01XD	8 (4.44)
Agents against amoebiasis and other protozoal diseases (P01A)	Nitroimidazole derivatives	P01AB	7 (3.88)
	Other agents against amoebiasis and other protozoal diseases	P01AX	9 (5.00)

Discussion

Antimicrobial resistance is one of the major global preventable problems. The causes of antimicrobial resistance are unnecessary use, inappropriate doses, inadequate duration of therapy and irrational fixed dose drug combinations. Hence this study was undertaken to improve the quality of medication and to promote the prescription of drugs. Average number of drugs per person is an important index of

prescription audit. Mean number of drugs per prescription should be kept as low as possible. Higher figures (polypharmacy) always lead to increased risk of drug interaction, adverse effects, development of bacterial resistance, increased hospital cost [7-10].

This study was undertaken to evaluate rational use of antimicrobial FDCs in the outpatient Medicine department of a tertiary level teaching hospital.

In this study out of the total 650 prescriptions, 27.65% prescriptions contained antimicrobial agents. It was also found that there was a trend towards prescribing antimicrobial FDCs for common ailments like infections of upper and lower respiratory tract, urinary tract and gastrointestinal tract. The prescribing frequency of antimicrobials is similar to the results of previous studies from other developing countries [6, 11-13].

The findings suggested that the prescriptions were suitable in terms of the duration and dosage of the antimicrobials. This is in agreement with the study conducted by Ranjeeta Kumari et al.[14] β lactam antimicrobials (35.09%) and fluoroquinolones (18.88%) were the preferred drugs. β lactam antimicrobials were commonly prescribed drugs corresponding with the previous studies [15-16]. This might be due to their round the year availability. All antimicrobials were ATC codes which is helpful in adverse drug monitoring. Also, it has a role in drug utilization studies.

As far as FDCs are concerned, out of the total 34 antimicrobial FDCs, 23 prescriptions contained irrational FDCs. The irrational prescriptions of the present study were found to be similar to those observed with the earlier studies [11, 17]. The encounters of irrational FDCs and polypharmacy of antimicrobials seen in the prescriptions may be due to the empirical use of antimicrobials without waiting for culture and sensitivity test for positive diagnosis [18].

Moreover according to the previous studies, it has been observed that many reasons for antimicrobial overuse or mistreat could be defensive prescribing, pressure from patients and relatives and inadequate knowledge of the proper indications [19-21]. With reference to earlier studies, there is a scope to progress rational and appropriate use of antimicrobials. A utilization evaluation programme is an effective way of determining rationality of antimicrobial usage. To prevent us from going back to the pre-antimicrobial era, it is crucial that the doctors should be made aware of the common irrational antimicrobial FDCs and their effects on the community as well as the patient. However, the

results indicate a substantial scope for improving the prescribing pattern of antimicrobials in the medical OPD. The improvement would be facilitated by providing comments, prescriber teaching and creation of a hospital formulary.

Study Limitations: The limitation of the present study is the limited sample size, and short duration of study (4 months). Moreover, the depth and quality of data available at health facilities influenced the variables that could be studied. Variables such as diagnostic tests performed and outcomes, signs of infection, prescriber type and characteristics, patient load and previous treatment may influence antimicrobial prescribing behavior, but were not studied because of limitations of data.

The usefulness of rational drug use studies as a quality of care monitoring mechanism may therefore be limited unless the scope and depth of information that clinicians document as part of consultations is examined and standards introduced. Multicentric prospective studies with a large sample size in various prescribing setup will give us better insight regarding prescription writing practices. However, this study has dealt basic concept and identified key areas which require modification and recommendation.

Conclusion

The present study has reported that most commonly prescribed antimicrobials were β -lactam antimicrobials (35.09%) followed by fluoroquinolones (18.88%). A combination of antimicrobials from different groups was 13.85%. This study also revealed that the antimicrobial prescription in terms of irrationality of antimicrobial FDCs was 47%. This irrational polypharmacy could be reduced by the use of proper strategy, proper clinical titration aided by guidelines and protocols, educational initiatives and surveillance at all levels of health care system. Hence, this could control worldwide emergence of antibacterial resistance, side effects and reduced cost of the treatment.

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