Original Article

Pharmacology Section

A Prospective Study on the Antimicrobial Usage in the Medicine Department of a Tertiary Care Teaching Hospital

FARHAN AHMAD KHAN, VINOD KUMAR SINGH, SANJEEV SHARMA, PREETI SINGH

ABSTRACT

Introduction: As we know, some of the species of animals are endangered, as there is an increase in their declining rate and a decrease in their survival rate. The same is true for the antibiotics also, as there is a rise in the antimicrobial resistance and a decline in the development of new antibiotics. Antimicrobial Resistance (AMR) has become a major obstacle in the way of the treatment of infectious diseases worldwide. Therefore, to fight against AMR, antibiotic utilisation studies are being carried out. Therefore, with the same perspective, this prospective study was done to evaluate the current usage of the anti-microbial agents in medicine department of a teaching hospital in northern India.

Methods: This was a prospective study which was done for a period of three months from Nov 2012 – Jan 2013. The prescriptions and the patient records are reviewed and analysed. The rationality of the drug usage was also evaluated by analysing the drug prescriptions.

Results: Out of the 494 drugs which were prescribed to 180 patients, 291 were antibiotics. The most commonly used AMAs were the β-lactams (penicillins and cephalosporins) –n = 102, followed by the quinolones –n = 93, Nitroimidazoles –n = 43, aminoglycosides –n = 35 and the macrolides –n = 18. The most common indication for the antimicrobial therapy was infection. According to the evaluation, the use of the antimicrobial therapy was found to be rational in 77.77 per cent patients. The average number of antibacterial agents which were prescribed per patient per course was found to be 1.61 and the average numbers of drugs which were prescribed per patient were 2.74. The average cost per prescription per day was Rs.115 and the average antibiotic cost per encounter was Rs. 85.

Conclusion: Antibiotic resistance is increasing at an alarming rate due to the irrational prescribing habits of physicians, leading to increasing morbidity, mortality and treatment costs. Therefore, the medical professionals as well as government personnel who are related to the health sector, need to understand that antibiotics are precious and finite resources. The remedy of this situation requires that regular educational awareness programmes should be conducted in hospitals at a regular basis.

Key words: Antimicrobial agents, Drug utilisation, Medicine, Infections

INTRODUCTION

Antibiotics are the most frequently prescribed drugs among hospitalised patients. The programs which are designed to encourage appropriate antibiotic prescriptions in health care institutions are an important element in the quality of care, infection control and cost control [1,2]. The studies on the prescribing patterns seek to monitor, evaluate and suggest modifications in the practitioners' prescribing habits, so as to make medical care rational and cost effective. The information on the antibiotic use patterns is necessary to make a constructive approach to the problems that arise from the multiple antibiotics which are available [3].

An inappropriate prescription increases the cost of the medical treatment and it also increases the morbidity and the mortality. The impact of the irrational prescription of drugs also leads to an increase in the incidence of adverse drug events and the emergence of drug resistance. The rational prescribing skills of clinicians can be assessed by conducting periodic prescription audits. There is an urgent need to ensure that the patients are always given evidence-based, cost-effective and rational treatments.

The rational use of antibacterial agents is being increasingly recognised as an important contribution to control the worldwide emergence of bacterial resistance, to minimize the side effects and to reduce the cost of the treatment [4,5]. A knowledge on how antibacterial agents are being prescribed and used, is fundamental, to obtain a rational drug use. The information on the past performance of the prescribers and consumers is the pillar in all the auditing systems [6]. The rational prescribing of antibiotics makes economic sense, but there is also a clear causal relationship between the antibiotic use and the antibiotic resistance [7]. Monitoring of the prescriptions and drug utilisation studies could identify the associated problems and provide feedback to the prescribers [3].

There are several reports on the high prevalence of self-medication with the use of antimicrobial agents, which are bought without a prescription from the private sector. However, an over and/or an inappropriate use of antimicrobial agents has the potential to lead to the development and the spread of resistant strains of pathogens [8]. With this state of affairs of the antimicrobials, we planned to study the antimicrobial agents which were prescribed and administered to the patients who were admitted in the Medicine Department of Teerthanker Mahaveer Medical College

Hospital and Research Centre, which is a tertiary care level and a 550 bed teaching hospital which is situated in Moradabad, UP, India.

MATERIAL AND METHODS

This prospective study was conducted by the Department of Pharmacology in collaboration with the Internal Medicine department of Teerthanker Mahaveer Medical College and Hospital, Moradabad, UP, India.

The study was conducted for a period of three months from Nov 2012 – Jan 2013. The data of the patients who received antimicrobials were recorded on the basis of the inclusion and exclusion criteria and they were analysed further for the drug utilisation studies.

Out of the 210 patients who visited the IPD departments of Medicine, only 180 patients were analysed on the basis of the inclusion and exclusion criteria.

The study protocol, pro-forma, and all the other documents which were related to the study were approved by the Institutional Ethics Committee.

Rationality

A. The therapy was considered as rational if the antimicrobial use, its route of administration, dose, frequency and its duration of use were considered as appropriate for the infection.

B. The therapy was considered as irrational if the antimicrobial was used without indication, if its prophylaxis under circumstances of unproven efficacy or by clearly inappropriate route, dose or preparation for that indication.

THE SELECTION CRITERIA OF THE PATIENTS

Inclusion Criteria: All the patients who were admitted in the Medicine Department of Teerthanker Mahaveer Medical College Hospital and Research Centre, of either gender, who included pregnant/lactating mothers.

Exclusion Criteria

1. The patients who absconded/were discharged against medical advice were excluded from the study.

2. The patients who were referred to higher centres were excluded from the study.

3. All the paediatric patients were excluded from the study.

RESULTS

A total of around 210 patients visited the IPD departments of Medicine over a period of three months. On the basis of the inclusion and exclusion criteria, 180 patients were selected for the present study. The total number of drugs which were prescribed to the patients was 494. Each patient, on an average, was prescribed 2.74 drugs per prescription. It was observed that out of the 494 drugs which were prescribed to the patients, only 9 (1.80 per cent) were of the generic form [Table/Fig- 1].

Among the 180 patients, male patients (n = 110) were more in number than female patients (n = 70) [Table/Fig- 2a]. The top clinical conditions for which antibiotics were prescribed in the Medicine Department included Chronic Obstructive Pulmonary disease COPD (20 per cent), Typhoid fever (15 per cent), Hepatic encephalopathy (13.88 per cent), Pneumonitis (11 per cent), Cerebrovascular accident (10.55 per cent), acute gastroenteritis

(10 per cent), Meningitis (8.88 per cent), Urinary Tract infection (5.55 per cent), and Cellulitis (5 per cent) [Table/Fig- 2b].

Out of the 494 drugs which were prescribed to the patients, 291 were antibiotics. During the study, it was observed that the most commonly prescribed antibacterials were the β-lactams (penicillins and cephalosporins) –n = 102, followed by, the quinolones –n = 93, Nitroimidazoles –n = 43, aminoglycosides –n = 35 and the macrolides –n = 18, [Table/Fig- 3]. The most commonly used agents among these classes, i.e., the β-lactams were the penicillins (amoxicillin with clavulanic acid –n = 45) and the Cephalosporins (Ceftriaxone –n = 37), followed by the quinolones (levofloxacin –n = 75), nitroimidazoles (metronidazole –n = 43), aminoglycosides (amikacin –n = 29), and the macrolides (clindamycin –n = 9), [Table/Fig- 3], [Table/Fig- 4].

Indicators	No. of Patients
1. Average number of drugs per prescription (encounter)	2.74
2. Percentage of drugs prescribed by generic name	1.80
3. Number of encounters resulting in prescription of an injection	(75.55%)
4. Average drug cost per encounter	101
5. Average antibiotic cost per encounter	85
Prevalence of use	
1. Total no. of prescription	180
2. Total no. of AMAs prescribed	291
3. Mean no. of AMAs	1.61
Routes of drug administration antibiotics (291)	
1. Oral	155
2. Parenteral (i.v)	136
Purpose of use of AMAs	
1. OPD patients	45
2. IPD patients (Post–operated and conservatively managed)	135
3. Total no. of patients	180
Evaluation of antimicrobial therapy	
1. Rational	140
2. Irrational	40

[Table/Fig- 1]: Prevalence and indication of antimicrobials

Age	Male	Female	Total
0–20	11	9	20
21–40	22	26	48
41–60	57	17	74
61–80	20	18	38
Total	**110 (61.1%)**	**70 (38.8%)**	**180**

[Table/Fig- 2a]: Age wise distribution of patient (medicine)

Departments	Disease/diagnosis	No. of patients	%
Medicine	Typhoid fever	27	15
	Chronic obstructive pulmonary disease COPD	36	20
	Pneumonitis	20	11
	Urinary tract infection	10	5.55
	Cellulitis	9	5
	Acute gastroenteritis	18	10
	Cerebrovascular accident	19	10.55
	Hepatic encephalopathy	25	13.88
	Meningitis	16	8.88
	Total	**180**	**100**

[Table/Fig- 2b]: Disease wise distribution of patient (medicine)

Class	Antibacterial agents	No. of agents prescribed	Consumption %
Beta Lactams	Amoxicillin + Clavulanic acid	45	15.46
	Ceftriaxone	37	12.71
	Ceftriaxone+ Salbactum	20	6.87
	Total	102	35.05
Quinolones	Ciprofloxacin	18	6.18
	Levofloxacin	75	25.77
	Total	93	31.45
Aminogly cosides	Amikacin	29	9.96
	Gentamicin	6	2.01
	Total	35	11.97
Macrolide	Clindamycin	9	3.09
	Linezolid	9	3.09
	Total	18	6.18
Nitroimidazoles	Metronidazole	43	14.77
	Grand Total	291	100

[Table/Fig- 3]: Antimicrobials prescribed in Medicine department (n=180)
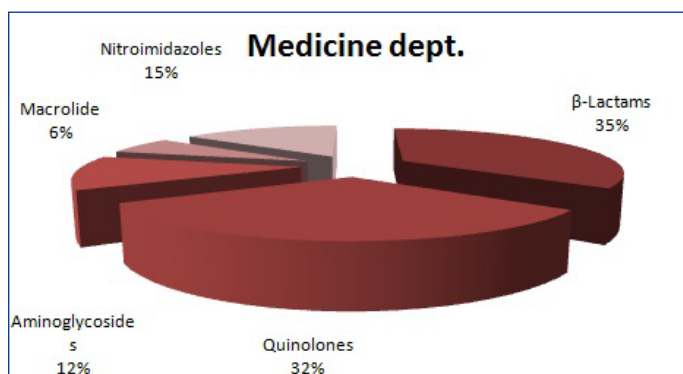
[Table/Fig- 4]: Antimicrobials prescribed in Medicine department

Class	Generic Name	No. of agents prescribed	Consumption %
Proton Pump Inhibitors	Pantoprazole	65	32.01
	Ranitidine	26	12.80
	Total	91	44.81
Antihistaminics	Levocetrizine	17	8.37
	Chlorpheniramine maleate	8	3.94
	Fexofenadine	21	10.34
	Total	46	22.66
Nsaids	Paracetamol+ Nimesulide	46	22.66
Benzodiazepines	Alprazolam	10	4.92
Corticosteroids	Dexamethasone	10	4.92
		203	100

[Table/Fig- 5]: Concomitant drugs used

Their routes of administration were oral (*n* = 155) and intravenous (*n* = 136) [Table/Fig- 1]. The average number of antibacterial agents which were prescribed per patient per course was found to be 1.61 [Table/Fig- 1]. The average cost per prescription per day was Rs.115 and the average antibiotic cost per encounter was Rs. 85.

77.77 per cent of the prescriptions were found to be rational according to the use of the AMAs and in 22.22 per cent of the patients, the antimicrobial therapy was considered as irrational [Table/Fig- 4].

Among the concomitant medications, the Proton Pump Inhibitors were prescribed in 44.81 per cent of the cases, followed by the antihistaminics and the NSAIDs in 22.66 per cent of the cases [Table/Fig- 5].

DISCUSSION

In the developing countries like in India, the influence of the drug companies on the prescribing patterns of doctors has become so high, that a number of "me too" drugs are available. This is mainly because of the fact that doctors are often influenced by the drug companies for prescribing drugs and the patient who is at the receiving end of the spectrum bears the cost of the expensive and the inappropriate medical treatment most of the time. Therefore, with the help of drug utilisation research, we can facilitate the rational use of drugs in populations. The rational use of a drug implies the prescription of a well-documented drug at an optimal dose, together with the correct information, at an affordable price. Krivoy N. et al., (2007), has expressed concern about the continuous, indiscriminate, and the excessive use of antimicrobial agents that promote the emergence of antibiotic-resistant organisms [9].

In our study, the β-lactam antibiotics were the most commonly prescribed antibiotics, as has been shown in other studies also, which were conducted by Das et al. Also, we found Amoxicillin with clavulanic acid –(n = 45) was mostly prescribed, followed by Ceftriaxone –n = 37 in the β-lactam group [Table/Fig- 3 & 4]. In a similar study which was conducted by Das et al. it was also reported that the β-lactams were preferred over other drugs i.e ciprofloxacin (23.85 per cent) was preferred, followed by Amoxycillin (20.06 per cent), a combination of Ampicillin + Cloxacillin (9.17 per cent), Doxycycline (5.96 per cent), erythromycin (4.58 per cent) and co-trimoxazole (4.58 per cent) [10]. Among those who were on concomitant drug combinations, 44.1 per cent (n = 91) received Proton pump inhibitors, followed by the Antihistaminics and the NSAIDs [Table/Fig- 5]. The average number of drugs which were used in each prescription was 2.70 [Table/Fig- 1].

Most of the drugs were prescribed with their brand names, and only for 1.8 per cent patients, the prescriptions were written by their generic names [Table/Fig- 1].

From the data which was obtained, only six patients were found to have undergone microbial culture investigations, which showed the negligence on the part of the doctors.

In this study, 77.77 per cent of the AMAs were found to be rational and 22.23 per cent were found to be irrational. This contradicted the results of the study which was conducted by Badar VA and Navale SB in 2012, that showed that 30 per cent of the AMAs were rational, that 60 per cent were irrational and that 11 per cent were questionable [11]. In this study, it was observed that the average number of drugs which were prescribed per prescription was in accordance with that in similar studies which were done in India and in other developing countries and that the final figure was acceptable and within the limit as per the WHO guidelines.

The reason for the higher percentage of the patients who received injectables may be that most of the patients were enrolled from

the IPD department and in severe conditions, who required emergency interventions. This increased the treatment cost, as was shown in our study; the average cost of the antibiotics per prescription was found to be Rs. 115.

Rational prescribing habits should be encouraged in the doctors, which can be achieved by conducting awareness programmes and time to time drug utilisation studies in the hospital, which provide a proper feedback to the prescribers, which will reflect the success rates of the awareness programme. There should be awareness programmes for the patients also, that will educate the consumers about the drugs which are prescribed to them. This is necessary because the overuse, underuse or the misuse of medicines harms people and wastes resources.

CONCLUSION

The present work is the maiden drug utilisation study which was conducted in the IPD Department of Medicine at our university hospital. It highlighted some rational prescription patterns which included the less utilisation of antibiotics. The average number of drugs per prescription was found to be low. But there was an overuse of injections that had increased the cost of the treatment; also, the culture sensitivity was not done before prescribing antibiotics. This would lead to antibiotic resistance. The drugs were prescribed with their brand names; therefore, the habit of prescribing drugs with their generic names should be promoted. The data which have been presented here were analysed and they were discussed with the physicians who were concerned and this will help immensely in the promotion of the rational prescribing and the drug use in hospitals. The list of essential medicines was given to the physicians in the hospital.

Drug and therapeutics committees should be established in hospitals to monitor and implement interventions to improve the use of medicines.

So, measures should be taken to avoid the inappropriate use of antibiotics. Physicians must have a clear understanding on the therapeutic use of antibiotics; they must be aware of the prevalence of various pathogens and the resistance patterns in their hospital. Drug utilisation studies will be done again in the same department after a six month period, in order to see the effect of the awareness programmes.

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Author(s):
1. Dr Farhan Ahmad Khan
2. Dr Vinod Kumar Singh
3. Dr Sanjeev Sharma
4. Dr Preeti Singh

Particulars of Contributors:
1. Associate Professor, Department of Pharmacology, Teerthanker Mahaveer Medical College & Research Centre, TMU, Moradabad, India.
2. Associate Professor, Department of Medicine, Teerthanker Mahaveer Medical College & Research Centre, TMU, Moradabad, India.
3. Professor, Department of Pharmacology, Teerthanker Mahaveer Medical College & Research Centre, TMU, Moradabad, India.
4. Tutor, Department of Pharmacology, Teerthanker Mahaveer Medical College & Research Centre, TMU, Moradabad, India.

Name, Address, E-Mail Id of The Corresponding Author:
Dr Farhan Ahmad Khan,
Associate Professor, Department of Pharmacology,
Teerthanker Mahaveer Medical College & Research
Centre, TMU, Moradabad, India.
Phone: +919759468300
E-mail: dr.farhan.k@gmail.com

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