Research Article

APPRAISAL OF PRESCRIPTION CRITERIA OF ANTIMICROBIAL AGENTS IN A TERTIARY CARE HOSPITAL

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ARTICLE INFO

ABSTRACT

Aim & Objectives: To appraise the prescription criteria of antimicrobial agents in a tertiary care hospital. The objective was to evaluate the rationality of antimicrobial prescriptions in accordance with world health organization prescribing indicators, pattern of antimicrobial usage (based on frequency, route of administration) and determine the most commonly prescribed antimicrobials.

Methodology: A prospective observational study was carried out for 6 months and collected a total of 311 cases. The data was recorded in the specific designed standardized Performa, analyzed using MicrosoftExcel.

Results: In our study 311 prescriptions containing antimicrobials were analyzed out of which antibiotics were the most frequent class of prescribed among which cephalosporin's was prescribed about 170 times, Artesunate and Ceftriaxone accounts 115(15.13%), cefaperazone+salbuctam was the most frequent combination. Most prescriptions were made without bacteriological culture and sensitivity testing evidences, about 50% of the population stayed in hospitalfor3-4 days.

Conclusion: The study was aimed to assess the rationality of prescribing patterns of which highlights the need of rational drug use practices. Antimicrobial resistance and poly pharmacy of is increasing. Generics were hardly prescribed.

INTRODUCTION

Anti-microbial drugs are the greatest contribution of the 20th century to therapeutics. Their advent changed the outlook of physician about the power drugs can have on diseases. They are one of the few curative drugs. Their importance is magnified in the developing countries, where infective diseases predominate. As a class, they are one of the most frequently used as well as misused drugs. Antimicrobial agents are prescribed very often inappropriately and also inadequately and thus in medical practice, they have become one of the highly abused drugs.

This widespread and indiscriminate use of antimicrobial agents promoted the emergence of resistance to pathogens. Antimicrobial resistance is a global crisis and is one of the greatest challenges for public health [World Health Organisation].The practice of indiscriminate prescribing of antimicrobials leads to in effective, unsafe treatment, prolongation of illness, disease exacerbation, distress, harm/adverse drug events, treatment complexities and cost.

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The prevalence of antibiotic use is very high in India, and also leading to high prevalence of antimicrobial agents resistance [1] New resistance mechanisms are emerging and spreading globally, threatening our ability to treat common infectious diseases, resulting in prolonged illness, disability, and death.Without effective antimicrobials for prevention and treatment of infections, medical procedures such as organ transplantation, cancer chemotherapy, diabetes management and major surgery (for example, caesarean sections or hip replacements) become very high risk.[2]

Hence, it is extremely crucial to appraise and monitor the prescribing pattern of antimicrobials from time to time in order to provide a constructive approach to minimize problems related to irrational prescribing and inappropriate use of antimicrobial agents.

RESEARCH METHODOLOGY

Study Design: Prospective observational study
Study Site: Tertiary care hospital
Study Duration: 6 months
Sample Population: 311 patients of both the genders
Patient Enrolment: Patients are randomly enrolled in the study based on inclusion and exclusion criteria.

Inclusion Criteria

1. Patients from tertiary care hospital who receive antimicrobial medication orders for various illnesses.
2. Patients of all ages
3. Both the genders considered

Exclusion Criteria

1. Patients who left against medical advice (LAMA) from inpatient department.
2. Patients who are discharged within 24 hours of admission.
3. Patients who are unconscious (coma)
4. Outpatients medication orders
5. Patients who had a history of antimicrobial usage.
6. Patients who are not willing to give consent.

Study Material /Source of Data

A standardized proforma is designed to record the data from the case files of patients who were admitted in the tertiary care hospital,this proforma is used to record the necessary information in demographics (age, gender, occupation or educational status), date of admission, date of discharge, past medical history, food habits, known ADRS, vital signs (temperature, BP, RR , PR), number and types of antimicrobial agents and their brand or generic names , dose , route of administration and laboratory data was collected from the medication orders on daily basis.

Ethical Approval

An institutional research ethical clearance was obtained.

Study Procedure

The prescriptions were chosen based on inclusion criteria and details of patients were followed till discharge. During the study the inpatient case files were reviewed which includes patient demographics, specific issues related to antimicrobial use such as name of antimicrobials, dosage schedule, route of administration, date of discontinuation, generic name and bacteriological investigations. The information collected was documented in the patient proforma. The presumed diagnosis and the antimicrobial prescription along with duration, dose and dosing schedule were analysed using Micromedex 2.0 and CIMS.

Statistical Analysis

The collected data was analysed and the information was tabulated as per study objective using Microsoft excel.

Table 1 Prescribing pattern of antimicrobials

Category	Class	Drugs	Count
Antibiotic (n=538)(71.64%)	i. Cephalosporins(243)	i. Ceftriaxone	115
		ii. Cefoperazone+sulbactum	59
		iii. Cefotaxime	28
		iv. Cefixime	13
		v. Ceftriaxone+tazobactum	12
		vi. Cefpodoxime	6
		vii. Ceftriaxone+sulbactum	4
		viii. Cefixime clavulanic acid	2
		ix. Cefadroxil	1
		x. Cefuroxime+clavulanic acid	1
		xi. Cefpodoxime+clavulanic acid	1
	i. Aminoglycoside (61)	i. Amikacin	61
	ii. Fluoroquinolone (57)	i. Ofloxacin	37
		ii. Moxifloxacin	13
		iii. Levofloxacin	5
		iv. Ciprofloxacin	2
	iii. Penicillin (53)	i. Piperacillin+tazobactum	39
		ii. Amoxicillin+clavulanic acid	14
	iv. Tetracyclines(44)	i. Doxycycline	44
	v. Carbapenems(44)	i. Meropenem	44
	vi. Lincosamide(28)	i. Clindamycin	28
	vii. Oxalidazone(23)	i. Linezolid	23
	viii. Macrolide (17)	i. Azithromycin	14
		ii. Clarithromycin	3
	ii. Urinary antiseptics(7)	i. Nitrofurantoin	7
	iii. Glycopeptide (1)	i. Vancomycin	1
	Antibiotic combination(4)	i. Ofloxacin+ornidazole	3
		ii. Cefixime+linezolid	1
Antimalarial (n=122),(16.24%)	1. Sesquiterpene lactones (115)	i. Artesunate	115
	2. Aminoquinoles (4)	i. Primaquine	2
		ii. Hydroxychloroquine	2
	3. Cinchona alkaloid(3)	i. Quinine	3
Anti-amoeboid(n=31), (4.13%)	1. Nitroimidazoles(31)	i. Metronidazole	30
		ii. Ornidazole	1
Antiviral(n=6), (0.80%)	1. Antiherps virus(6)	i. Acyclovir	6
Antifungal(n=3), (0.4%)	1. Triazoles(3)	i. Fluconazole	2
		ii. Itraconazole	1
Anti-TB agents (n=2),(0.27%)	1. I line agents	i. Isoniazid+Pyrizinamide+ Ethambutol +Rifampicin	2
Antibiotic+Anti-Amoeboid (n=1),(0.13%)	1. Cephalosporin+ Nitroimidazole	i. Cefixime + Ornidazole	1

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RESULTS

In the current study, a total of 311 prescriptions were considered as per the inclusion and exclusion criteria for evaluation of anti-microbial prescribing pattern in tertiary care hospital.

Age categorization of the study population was done, patients in the age group of 0-12 years were 78 (25.08%), 13-30 years were 75(24.12%), 31-60 years were 100(32.15%), and above 60 years were 58(18.65%).

Maximum number of patients 100(32.15%) were found in the age group of 31-60 and minimum number of patients 58(18.65%) were geriatrics.

During gender distribution,male patients 189(61%) were more compared to females 122(39%) ,this may be because the female population was less exposed to environmental influences when compared to female so they are more prone to infectious diseases. Among all the classes of antimicrobials 582 were from the antibiotic followed by antimalarials 126.

In this study out of 751 antimicrobial agents prescribed highest utilization was with antibiotics(538,71.64%)followed by antimalarials(122,16.24%). Highest number of AMA s prescribed was cephalosporins followed by aminoglycosides. Cefodroxil, vancomycin , ornidazole was rarely prescribed. Cefoperazone+sulbactum was most commonly prescribed combination in this study (59).

In the current study the highest percentage for antimicrobials were parenteral route (82.02%) followed by oral route. This is because the study was done in in-patient department. Artesunate and ceftriaxone were most commonly prescribed drug in IV route which seen in 112 times respectively followed by amikacin in 61 times. In oral route doxycycline was prescribed 44 times.

In the current study twice daily dosing was prescribed highest(87.37%), followed by once daily dosing(9.05%) and thrice daily dosing(3.59%).

Out of 311 prescriptions an average of 4.5 drugs were prescribed per patient where 2 drugs were prescribed to 105 patients, followed by 3 drugs in 90 patients.
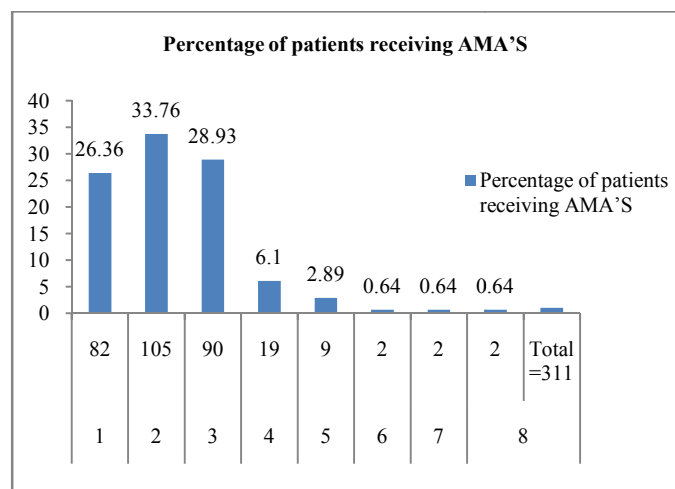

Figure 1 Percentage of patients receiving antimicrobial agents

Out of 311 prescriptions in the study 10 prescriptions were sent to culture and sensitivity testing on which 9 were urine samples and one sample was sputum. E.coli was detected in seven urine samples followed by streptococcus and staphylococcus epidermidis and sputum culture revealed Klebsillia Pneumonia. The urine microbes like E.coli, streptococcus, staphylococcus epidermidis were resistant to norfloxacin in common, specifically E.coli and Streptococcus were resistant to Azithromycin, Ampicillin/Sulbactam and Norfloxacin. Sputum for Klebsillia was resistant to Ampicillin, Cefotaxime, cefotaxime Axetil , ceftriaxone , co- trimoxazole , cefepime.

Majority of antimicrobials was used to treat infections(46.6.%) followed by prophylaxis(34%) and symptomatic(19.84%).

In the present study irrational prescribing of Antimicrobial agents was noticed in 165 patients, rationality was observed in 121 patients and the questionable prescriptions in 25 patients.
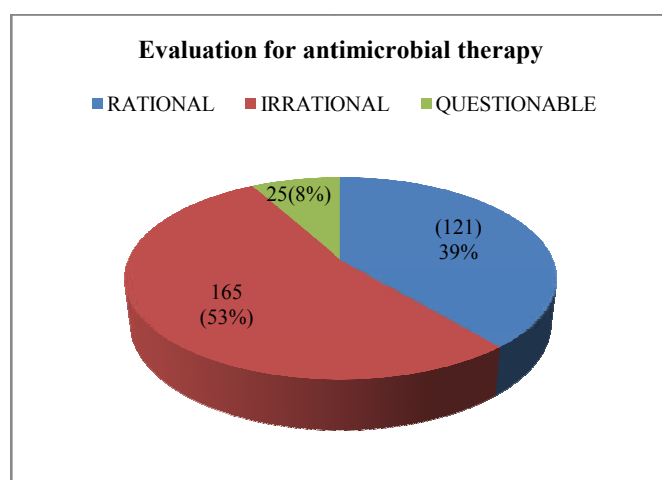

Figure 2

And when comes to the patients who received antimicrobial agents, 78 patients stayed for 3 days,77 patients stayed for 4 days.

DISCUSSION

The current study was conducted in tertiary care hospital to appraise the prescription criterion of antimicrobial agents in the management of various illnesses. The present study includes the sample size of 311 patients who were admitted in the hospital.

All the demographics and medication details were collected from the patients and their medication files.In the current study it was observed that Maximum number of patients 100(32.15%) were found in the age group of 31-60 and minimum number of patients 58(18.65%) were geriatrics. Similar results were found in the studies conducted by Akram Ahmed *et al* (2014) [3] and Bhimavarapu Ramya Reddy *et al* (2012)[4].

In our study male patients 189(61%) were more, compared to females 122(39%) which was in accordance to Akram Ahmad *et al* (2014)[3], V.Kavitha *et al* (2016)[5] and Azizullah *et al*(2011)[6],this may be because the female population was less exposed to environmental influences when compared to female so they are more prone to infectious diseases.

Antibiotics were the most used class of antimicrobials when compared to other classes of antimicrobials Similar to that of the previous study done by the KousalyaPrabahar *et al* (2017)[8]. Highest utilization of cephalosporins 170 (22.63%) was noticed similar to Lisha Jenny john *et al* (2011) [9] study, LayaVahdati Rad *et al* (2015)[10]. Ceftriaxone 115 (15.31%) was the most commonly used cephalosporin antibiotic which was same in accordance with that of the studies done by Akram Ahmad *et al* (2014)[3], V. Kavitha *et al* (2016)[5]. Where cephalosporins are generally widely prescribed due to their high potent action, available in various formulations in the market, their extended indications and the activity against gram negative to gram positive bacteria that means broad spectrum activity from first generation to third generation cephalosporins.

Cefoperazone+sulbactam combination 59 (7.85%) was the most preferred fixed drug combination similar to that of Lisha Jenny John *et al* (2011)[9] study.

The most preferred dosage form was injectables 616(82.02%) because of the inpatient history. Injectables are given more for immediate control of infections and to minimise morbidity as compared to oral route. LayaVahadati Rad *et al* (2015)[10], Dr.Devarsi Choudhury *et al* (2015)[11] on analysis of antimicrobial prescriptions had proven that injection were the commonest route of administration followed by oral route. Out of 751 antimicrobials prescribed 656(87.35%) were given as BD similar frequency of antimicrobial usage was found in LayaVahadati Rad *et al* (2015)[10].

In our study dual therapy was maximally used in the management of various illness in accordance with Azizullah S G *et al* (2011)[6] . The percentage and average number of patients receiving antimicrobial agents were 2-3 and the percentage use of AMA'S was 62.69%which is similar to that of study done by Vandana A Badar *et al* (2012)[12].

Out of 311 prescriptions in the study 10 prescriptions were sent to culture and sensitivity testing on which 9 were urine samples and one sample was sputum. E.coli was detected in seven urine samples followed by streptococcus and staphylococcus epidermidis and sputum culture revealed Klebsillia Pneumonia. The urine microbes like E.coli, streptococcus, staphylococcus epidermidis were resistant to norfloxacin in common, specifically E.coli and Streptococcus were resistant to Azithromycin, Ampicillin/Sulbactam and Norfloxacin. Sputum for Klebsillia was resistant to Ampicillin, Cefotaxime, cefotaxime Axetil , ceftriaxone , co- trimoxazole , cefipime. In all other instances AMAS were prescribed based on the clinical features and with the evidence of other relative indicators of infection like total and differential WBC counts urine microscopy , chest X-ray , platelet count and ESR Pandiamunian J *et al* (2014)[13] shows the similar results as ours , were E.coli was found more in the cultures done.

The common indication for use of antimicrobials in our study was Infections 46.60% followed by Prophylactic 34% and Symptomatic 19.84%.This is comparable to the results given by Pandiamunian J *et al* (2014)[13] and Vandana A Badar *et al* (2012)[12]. Drug therapies were categorized according to indication for the antimicrobial use.

Three usage groups were essentially defined by the physician according the way they treated the patients

1. Infection was considered as the indication if clinical and/or laboratory data gave evidence of infection
2. The therapy is considered as prophylactic if there was no evidence of infection and the agent was employed to prevent infection (e.g. Catheterization)
3. Indication considered as symptomatic if no evidence of prophylaxis could be found and records shows the same symptoms being treated e.g. treatment of fever in absence of specifically suspected infection.

In this study 39% of AMA'S were rational, 53% irrational and 8% questionable, this results were similar to that of Vandana A Badar *et al* 2012[12].

The Rationality was done based on the following criteria

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

Therapy was considered irrational if the antimicrobial was used without
Indication, prophylaxis under circumstances of unproven efficacy or by clearly inappropriate route, dose or preparation for that indication, by not performing the culture sensitivity testing.

Therapy was considered questionable when insufficient clinical or laboratory data was present to enable the therapy to be classified as clearly rational or irrational E.g. Patient of CHF having cough is due to CHF or infection then treatment with antimicrobial agent considered questionable.[14]

Results reveal that duration of hospital stay was 3-4 days in 155 patients and the highestduration was 28 days in 1 patient.in accordance to the study by V. Kavitha *et al* (2016)[5].

CONCLUSION

The present study was aimed to assess the rationality of prescribing patterns of AMA's , we found that majority of the people belong to the age group of 31-60 years were most commonly prescribed AMA's and irrationality was found in 165 prescriptions(53.05%).

Our study highlights the need of rational drug use practices. A high proportion of patients received antimicrobial treatment empirically prior to availability of culture results, while admitted in the medical wards. Microbiological cultures were collected in only one quarter of patients before the initiation of AMA's.

Antimicrobial resistance and polypharmacy of AMA's is increasing at alarming rates leading to increasing morbidity , mortality and treatment cost. The medical fraternity need to understand that AMA's are precious and finite resources. Generics were hardly prescribed. Government of India might be able to ensure both rational and restricted use of antibiotics with implementation of schedule H_1 (from march 1st 2014).

Our study suggest need of clinical pharmacist is clearly proven to promote the rational prescribing, update the drug information and guidelines to health care providers. Thus a clinical pharmacist is requisite tool and insight necessary to predict or supress microbial virulence at hand.

Reference

1. Joshi Me, Tariq K .restricted antibiotic policy's rational approach towards antibiotic resistance -policy-express healthcare management, Indian express, Business publications division, issue dtd.1-15 june 2015.
2. World Health Organization. Antimicrobial resistance.[document on the internet]. 2018.Available from:
   http://www.who.int/mediacentre/factsheets/fs194/en/
3. Akram Ahmad, MeghaRevanker, Irfanul Haque, A.Pravina, Rahul Ivan, Ram Dasari, Sheetal Kuriakose, Isha Patel. Study the prescription pattern of antibiotics in the medicine department in a teaching hospital of vydehi institute of medical sciences and research. South India banglore. IJTPR. 2014;6(3):43-46.
4. Bhimavarapu Ramya Reddy, Bhavna Priyasri S, Murali Krishna Maddukuri, Balanagu Madhavi, Thota Swathi, Satya Lakshmi Balla. A prospective study on antibiotic prescribing pattern among hospitalized patients in tertiary care hospital of PSG hospital. Coimbatore. IJRPNS. 2012;1(2):147-158.
5. V.Kavitha, Y.Mrudula, M.SwarnaLatha, R.Dinesh, G.ArunB.Srinivas. Study of prescribing pattern of antibiotics in the management of various infectious diseases in Warangal region. *Indian journal of medical research and pharmaceutical sciences*. 2016;3(1):13-35.
6. Azizullah SG, Jabeen G, Shobna J, Kaleemuddin S, Mohiuddin. Study of prescribing patterns of antibiotics used in the management of various infectious diseases. IJOPP. 2011;4(1):36-40.
7. Yuan-Yuan Wang, Ping Du, Fang Huang, Dong-Jie Li, Jun Gu, Fu-Ming Shen. Antimicrobial prescribing patterns in a large tertiary hospital in shanghai. China. *International journal of antimicrobial agents*. 2016;48:666-673.
8. KousalyaPrabahar, Sikharam Dinesh, Swetha Barla, L.N. Padmasani. Antibiotics utilization pattern in paediatrics in a tertiary care teaching hospital. *Asian journal of pharmaceutics*. 2017;11(1):S230.
9. Lisha Jenny john, Padmini Devi, Jenny John, Shoba Guido. Drug utilization study of antimicrobial agents in medical intensive care unit of tertiary care hospital. *Asian J Pharm Clin Res*. 2011;4(2):81-84.
10. LayaVahdati Rad, ModupalliAlekhya. Prescribing pattern of antibiotics in paediatrics inpatient department of a tertiary care teaching hospital in banglore. IOSR-JPBS. 2015;10(4):26-32.
11. Dr.Devarsi Choudhury, Dr.Anupama Deka, Dr. Dolly Roy. Pattern of antibiotics used in the paediatrics indoor departments at silchar medical college and hospital. Assam. *Sch. J. App. Med. Sci*. 2015;3(4C):1810-1814.
12. Vandana A Badar, Sanjay Kumar B Navale. Study of prescribing pattern of antimicrobial agents in medicine intensive care unit of a teaching hospital in central india. JAPI. 2012;60:20-23.
13. Pandiamunian J, Somasundaram G. A study on prescribing pattern of antimicrobial agents in the medical intensive care unit of tertiary care teaching hospital in puducherry union territory. South India. *Int J Pharm Pharm Sci*. 2014;6(3):235-238.
14. Roberts AW, Visconti JA. The rational and irrational use of systemic antimicrobial drugs. *Am J Hosp Phar*. 1972;29:828-834.

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