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Research Article

PRESCRIBING PATTERN OF ANTIBIOTICS IN THE GENERAL MEDICINE AND PEDIATRICS DEPARTMENTS OF A TERTIARY CARE TEACHING HOSPITAL

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ABSTRACT

In modern medicine, antibiotics are one of the most frequently prescribed, but the excessive and inappropriate use of antibiotics causes significant adverse effects. This study is designed to determine inappropriate use and factors relating to this. A prospective observational study was carried out in a tertiary care teaching hospital for six months in general medicine and pediatrics department and screened 555 antibiotic medication orders from both inpatients (105) and outpatients (450). Mono therapy was observed in 519 (93%) medication orders and followed by dual therapy in 36 (7%). 40 (7.2%) medication orders contain Fixed Dose Combinations (FDC). Cephalosporins (72.72 %) were mostly prescribed to inpatients and penicillin's (57.29%) usage was found to be more in outpatients. In inpatients irrational changeover of antibiotics within 24 and 72 hours of admission was seen in 26 (24.76%) and 40 (38.09%) medication orders respectively. 82.01% of inpatients were prescribed parenteral antibiotics, but all the out patients were prescribed enteric formulations. Irrationality was mostly observed in dose and duration of therapy. There is no proper medication order monitoring and auditing program in place to rationalize antibiotic usage and this should be addressed immediately. The active participation of Clinical Pharmacist in therapeutic decisions is recommended.

Keywords: Antibiotics / Antimicrobial resistance / Fixed dose combination / Prescribing pattern / Rationality.

INTRODUCTION

According to WHO the rational use of drugs is the use of the right drug, right dosage at the right cost. "Rational use of drugs requires that patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements for an adequate period of time, at the lowest cost to them and their community[1]."

The first antibiotic was penicillin, accidentally discovered from a mold culture. Today, over 100 different antibiotics are available to cure minor to life-threatening infections[2].

Antibiotic administration should follow guidelines laid down under the heading 'rational use of antibiotics [3] for their safe and effective use.

It is observed in many studies that a substantial proportion of antibiotic prescribing is sub-optimal Prescribing inappropriate spectrum antibiotic, indication of an antibiotic for little/no sign of bacterial infection, prolonged courses for minor infections and overuse of parenteral preparations are the general errors observed in antibiotic usage, which results is an avoidable adverse effects, increase in health care costs and resistance to antibiotics for the community as a whole [4].

Antibiotic drug resistance can be intrinsic or acquired, develops due to irrational use of antibiotics. Developing new antibiotics is not a solution for this. It is the responsibility of the healthcare team to develop a good prescribing pattern which will help in reducing the intensity of the problem. And most of the alternatives, i.e. second and third line agents are becoming ineffective in clinical practice [5].

Health care providers must delineate and justify both medical and economic basis for their association in patient care. Rational use of antibiotics has become a most important among issues of different strategies to improve the use of medicines [6].

Antibiotic consumption in India has increased between six and seven per cent annually in the past 5 years [7]. A new study has revealed that 53 per cent Indians take antibiotics without a doctor's prescription and up to 48 percent want to change their physician, if not prescribed antibiotics for something as simple as a common cold. According to a preliminary study conducted by the World Health Organization (WHO), 16 per cent physicians prescribe. Antibiotics to patients with non-specific fever. The Global Antibiotic Resistance Partnership (GARP) -India research estimates 190, 000 neonatal deaths each year due to infections, of which over 30 percent are attributable to antibiotic resistance [8].

Excessive and inappropriate use of antibiotics causes significant adverse effects such as an increase of resistant microorganisms and associated infections, morbidity and mortality, drug toxicity, long hospitalization period, increase of costs. The inappropriate use of Antibiotics is the most important factor, consider in developing countries because of allowed marketing of antibiotics and higher frequency of specific infectious diseases. In this context, the present study was designed to determine inappropriate use and factors relating to this.

Information about Antibiotic use patterns is necessary for a constructive approach to problems that arise from the multiple antibiotics available.

MATERIALS AND METHODS

Study Site

Rajiv Gandhi Institute of Medical Sciences, a 750 bedded Tertiary Care Government Teaching Hospital.

Study Period

The study was carried out for a period of six months from August 2012-January 2013.

Study Design

Prospective-Observational study

Patient Selection

All patients from general medicine and pediatrics departments (I.P and O.P) who receive antibiotic medication orders were included in the study. Patients who are unwilling to participate in the study.

Ethical Approval

Institutional Ethical Committee, RIMS, Kadapa approved this study (Rc.No.413/Acad. /2012-13). The study was conducted in accordance with the Helsinki Declaration Established in 1964 (Sixth revision in 2000) and the International Conference on Harmonization Guidelines for Good Clinical Practice. All participants provided written informed consent.

Study Material

A specially designed data entry form was used to enter all patient data like name, age, sex, weight, inpatient number, date of admission, date of discharge, reason for admission, past medical history, food habits, known allergies, previous ADRs, vital signs like temperature, BP and pulse. Provision was given in the format to enter laboratory diagnosis made, drugs prescribed along with their formulation, dose and duration.

Study Procedure

Medication orders containing antibiotics of any category were selected randomly irrespective of ailments, age or sex of the patients or the route of administration of the drug from department of general medicine, pediatrics department and reviewed on a daily basis. The necessary information, i.e. number of antibiotics and their name, dose, route, duration of administration, diagnosis, laboratory data and other information was collected from the medication orders on a daily basis. The collected data were analyzed and the information was tabulated as per study objectives. Appropriateness was evaluated according to the indications, the choice of antibiotic agent. The rationality of antibiotic usage was assessed by interpreting the collected data (name, dose, route, duration of administration, diagnosis and laboratory data) with standard references. The medication order problems like possible DDI's, Dose and Duration errors were also evaluated.

RESULTS AND DISCUSSION

Demographic Details

A total of 555 medication orders was analyzed among them 105 from in-patient (I.P) department and 450 from out-patient (O.P). Medication orders were grouped with respect to the patient's age and gender and it is expressed in Table No.1 and 2. Majority of antibiotic medication orders were of adult patients (313) among >40years age group were found to be more and same was observed in Vijay Kumar T M et al [9] study. Female medication orders were found to be more; this indicates the female group is susceptible to more infections than males. Contradictory to this, Ramanth K. V et al [10] study revealed males were more in their study.

Antibiotic prescribing Process

A total of 592 antibiotics was prescribed. In 105 inpatient medication charts 139 antibiotics were prescribed for different conditions on an average of 1.31 (± 0.46) antibiotics per medication chart. 53 (38.12 %) antibiotics were prescribed in 34 medication charts of a pediatric ward on an average of 1.51 (±0. 56) antibiotics per medication chart. In 450 outpatient antibiotic prescriptions 453 antibiotics were prescribed in different disease conditions on an average 1.006 (± 0.21) per prescription.

Antibiotic monotherapy was observed in 93.5% of all patients, 6.5% of patients were prescribed with two antibiotics and none of the patient received 3 or more antibiotics, it is expressed in Table No. 3. Most of the infections are responding to single antibiotic and few required two antibiotics. We observed 40 (7.2 %) medication orders include FDC preparations, of which 36 were outpatient's medication orders and the most common FDC is amoxicillin(500mg) + clavulanic acid(125mg), this less usage may be due to the less availability, nature of practice, and economic status and hospital formulary limitations in this hospital setup. InVijay Kumar T M et alstudy, 16.8%. Of FDC's were prescribed. A very good number of antibiotics (75%) were prescribed from the National List of Essential Medicine (NLEM-2011).

Class of Antibiotics

It is observed that, cephalosporin antibiotic usage was found to be more in inpatients and most of the outpatients were prescribed with penicillin antibiotics in that amoxicillin (500mg) + clavulanic acid (125mg) combination was prescribed often. Ceftriaxone usage was found to be more (72.72 %) than other cephalosporins. It indicates that the cephalosporins were most effective in controlling broad-spectrum infections. Usage of aminoglycoside antibiotic (Amikacin) is more (39.62 %) in a pediatric department when compared to the adult medicine department. It is expressed in Table No. 4.

Conditions treated with Antibiotics

In this study, we found the prescribing of antibiotics for non-bacterial infections and in little/no evidence of infections, such as cold, abdominal pain, headache and fever etc. prescribing of the wrong spectrum of antibiotics is also observed.

In outpatient department antibiotics were prescribed for 63 (14%)outpatients with Cough and Cold; 51 (11.3%)with Fever alone and 154 (34.2%)with Fever with Cough and Cold; 91 (20.2%)with respiratory tract infections (RTI); Urinary tract infections 3 (0.6%), abdominal infections 21 (4.6%), soft tissue infection15 (3.3%) and 54 (12%)with other conditions (Eye and Ear discharge, Acid Peptic Disease, Chest Pain, Body Pains and Headache, etc.,)

In inpatient department antibiotics were prescribed for 57 (54.2%) patients with fever alone, 2 (1.9%) Typhoid Fever, 23 (21.9%) with respiratory tract infections (RTI); Urinary tract infections 1 (0.9%), abdominal infections 14 (13.3%), 10 (9.5%) with other conditions (Gross anemia with SOB, OP poisoning, weakness of limbs, epigastric pain with SOB, Chest Pain) Table No.5.

Type of Formulation

Parenteral antibiotic formulations were often used in inpatients, 114 (82.01%) antibiotics were prescribed in the form of injections, followed by tablets 14 (10.07%), capsules 10 (7.19%) and suspensions 1 (0.71%), but, all the outpatients in this study were prescribed with non-parenteral antibiotic formulations. As much as possible parenteral usage should be avoided as it can lead to early development of resistance in a short period. Injectable forms should be used in severe conditions for quick control of infections. Most of the other studies reveal that injection usage is very less when compared to oral forms.

Duration of Hospitalization

Most of the patients (55%) have discharged within 3 days, 12.38 % within 5 days, 4.76 % within 7 days of hospitalization and the average duration of hospitalization is 3.8 (± 2.37) days. This indicates most of the infections were controlled with 3-day antibiotic therapy. In Ravi Pathiyil Shankar et.al, [11] study, the median hospitalization was found to be 5 days.

In an out-patients the average duration of antibiotic therapy was found to be 5.44 (± 1.49) days. The majority of the outpatients 305 (67.7 %) had been prescribed antibiotics for 5 days. 118 (26.2 %) outpatients with 7 days antibiotic therapy. 20 (4.4 %) outpatients were prescribed 3 day antibiotic therapy.4 outpatients received 4 day antibiotic prescription. Only one patient each received 2, 6, 10 and 15 days antibiotic therapy.

For complete eradication of uncomplicated infections need to treat for a minimum of 5-7 days

Prescribing Problems

We have also observed prescribing problems in 322 medication orders. Many of the prescribers were prescribed antibiotics at the time of admission without proper evidence of the condition (lab values/signs).More than the half of the study population had received antibiotics for general fever, cough and cold, where the antibiotic therapy is not necessary. Prescribing of appropriate dose was being observed in the general medicine department, but in pediatric department more than half of the medication charts have found to contain either low or high dose of antibiotics. This indicates proper dose calculation methods were not in practice to this population. We have observed 12.07% of possible DDI's. The reason for this may be improper knowledge about interactions, hospital formulary restrictions, and individual clinical experiences. DDI's may lead to decreased efficacy and increased toxicity in patients, but clinically we didn't find any interaction consequences. Improper duration of therapy with the antibiotic was observed in 14.41% of patients. These were expressed in Table No. 6.

Changeover of Antibiotics

We have observed the irrational changeover of antibiotics within 48 hours of admission in 26 (24.76%) cases and within 72 hours was seen in 40 (38.09%) cases. This changeover is mainly due to the change of duty attending physician, shifting of patients from one department to another department (O.P. To I.P. And Causality to General Medicine) and change of drugs after laboratory results. As per general prescribing guidelines antibiotic should be used for a minimum of 72 hours for knowing its efficacy in a particular condition. Improper changeover of antibiotics leads to the development of antibiotic resistance; this will make the patient too unresponsive to that particular antibiotic next time

Type of Therapy

We observed 27.61 % of patients had received specific antibiotic therapy and 72.39 % received empirical therapy.

CONCLUSION

The irrational use of antibiotics is the use of an agent with an inappropriate spectrum, poly-pharmacy, and administration of an antibiotic when there is little evidence of bacterial infection, for non-bacterial infections, unnecessarily prolonged courses and over use of intravenous agents. WHO recommends lesser use of injection as it's helpful in reducing the cost of treatment and eliminate the pain to the patient. There is an urgent need for establishing a proper infection control committee to address all such problems. Clinical pharmacists and Clinicians need to play vital role in minimizing the antibiotic problems by conducting continual awareness programs regarding up-to-date prescribing guidelines in the hospital and also minimizing the antibiotic resistance. The active participation of clinical Pharmacists in the clinical ward rounds and documentation of Pharmacist observation on prescription in patient folder is highly recommended for safety and drug monitoring.

Table 1: Distribution of Medication Orders Based on Patient Age

S. No.	Age	Number of medication orders in IP (%)	Number of medication orders in OP (%)
1	Neonates (0-28 days)	1 (0.95%)	4 (0.8%)
2	Infants (28 days- 2 years)	8 (7.61%)	54 (12%)
3	Children (3- 11 years)	21 (20%)	154 (34.2%)
4	Adolescents (12- 18 years)	8 (7.61%)	29 (6.4%)
5	Adults (19- 40 years)	28 (26.6%)	111 (24.6%)
6	Older patients (> 40 years)	39 (37.14%)	98 (21.7%)
Total *(n=555)*		105 (18.9%)	450 (81.1%)

Total amount of medication orders (*n*=555) IP-inpatient, OP-outpatient

Abbreviations

FDC: Fixed Dose Combinations.

GARP: Global Antibiotic Resistance Partnership

BP: Blood Pressure

ADRs: Adverse drug reactions

FDC's: Fixed dose combinations

NLEM: National list of essential medicines

OP poisoning: Ortho-phosphorus poisoning

RTI: Respiratory tract infections

SOB: Shortness of breath

DDI's: Drug-Drug interactions

I.P: In-Patient

O.P: Out-Patient

WHO: World Health Organization

Table 2: Distribution of Medication Orders Based on Gender

Unit	General medicine		Paediatrics	
	Male	Female	Male	Female
IP	20	51	21	13
OP	125	113	119	93
Total *n=555*	145 (26.1%)	164 (29.5%)	140 (25.2%)	106 (19.0%)

Total number of medication orders (*n*=555)

Table 3: Number of Antibiotics per Prescription

	Number of medication orders (%) *n=555*	
	IP	OP
Mono therapy	72 (12.97%)	447 (80.5%)
Dual therapy	33 (5.94%)	3 (0.54%)

Total amount of medication orders (*n*=555)

Table 4: Class of Antibiotics

S. No.	Antibiotic CLASS	Percentage (%) *n=592*
1.	Pencillins	53.71
2.	Cephalosporins	26.50
3.	Quinolones	9.12
4.	Aminoglycosides	4.39
5.	Tetracyclines	2.53
6.	Sulphonamides	0.84
7.	Macrolides	2.36

n=592 number of antibiotics prescribed in 555 medication orders

Table 5: Conditions Treated with Antibiotics

S. No.	Condition	Percentage (%) *n*=555
1.	Fever	19.45
2.	Typhoid Fever	0.36
3.	Cough and Cold	11.35
4.	Fever with Cough and Cold	27.74
5.	Respiratory tract infections (RTI)	20.54
6.	Abdominal infections	6.30
7.	Urinary tract infections (UTI)	0.72
8.	Soft tissue infection	2.70
9.	Other conditions	11.53

Total amount of medication orders (*n*=555)

Table 6: Antibiotics Prescribing Problems Identified

S. No.	Prescribing problems	Percentage (%) *n*=555
1.	Improper Indication	58.55
2.	Dosage Errors	23.96
3.	Improper Duration	14.41
4.	Possible Drug-Drug Interactions	12.07

Total amount of medication orders (*n*=555)

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DISCLOSURE POLICY

The authors declare that they have no conflict of interests.

REFERENCES

1. Kop. Hanmant Amane and Priyadarshini. Prescription analysis to evaluate the rational use of Antibiotics. *Intern. Jour. of Phar and Bio Scien.* Apr-June 2011; Vol 2: Issue 2.
2. Everett Stephens. Antibiotic introduction. [cited 2012 SEPT 14] Available from: http://www.emedicinehealth.com/antibiotics/page3_em.htm# Side Effects.
3. zlem Tu¨nger et.al, Evaluation of rational antibiotic use. *Intern. Jour of Anti. Agents 15 (2000); 131–135:*
4. T. M. A. Weller and C. E. Jamieson The expanding role of the antibiotic pharmacist, *Jour. of Antimicr. Chemo.* (2004); 54: 295–298.
5. Hanmant Amane and Priyadarshini Kop. Prescription analysis to evaluate the rational use of Antibiotics. *Intern. Jour. of Phar and Bio Scien.,* Apr-June 2011;Vol 2: Issue 2:
6. T.G.M Bauters et.al, clinical pharmacy and pediatrics: why focus on antibiotics *Pharm world SCI.* (2006) 28:3-5.
7. 53% Indians take antibiotics without prescription: WHO. Express news service: New Delhi, Thu Apr 07 2011, 00:30 hrs. [Cited 2012 OCT 14] Available From: http://www.indianexpress.com/news/53--Indians-take-antibiotics-without-prescription-who/772826.
8. Global Antibiotic Resistance Partnership (GARP) - India Working Group. Rationalizing antibiotic use to limit antibiotic resistance in India. *Ind J Med Res.* September 2011; 134: 281-294.
9. T.M Vijayakumar, D. Sathyavati, T. Subhashini, G. Sonika and M.D.Dhanaraju assessment of prescribing trends and rationality of drug prescribing. *Int J of pharmaco,* 2011;7 (1): ISSN 1811-777:140-143.
10. Ramanath KV, Shafiya SB. prescription pattern of antibiotic usage for urinary tract infection treated in a rural tertiary care hospital *Ind J of pharm prac.*apr - jun, 2011;vol 4:issue 2:
11. Ravi P S, Praveen P, Nagesh K S, Joshy M E and Kottallur N B. Prescribing Patterns of Antibiotics and Sensitivity Patterns of Common Microorganisms In the Internal Medicine ward of a Teaching Hospital In Western Nepal: A prospective study *Ann of Clin Micr And Antimicr.*2003; 2:7.