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Original Research Article

Antibiotic utilization pattern in the department of surgery in a tertiary care centre in eastern India

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ABSTRACT

Background: The overuse and volume of antibiotic prescription has been found to correlate to the incidence of bacterial resistance. Clinical audit and education can favourably change antibiotic prescribing patterns among practitioners.
Methods: Prospective cross-sectional prevalence survey carried out in inpatient department (IPD) and outpatient department (OPD) of department of Surgery, Rajendra Institute of Medical Sciences, Ranchi. 200 prescriptions from OPD and 200 case sheets from IPD were randomly selected. Data was analyzed as per WHO outpatient prescribing indicators. ICU patients and patients on anti-tubercular treatment, antifungals etc. were excluded from this study. Data were computed and analyzed using MS Excel.
Results: In the OPD, the average no of drugs per patient was 3.445 of which 17% were injections. 33% of drugs prescribed were antibiotics. Beta-lactams followed by nitroimidazoles were the most common antibiotic class. In the IPD, an average of 2.26 antibiotics per patients was prescribed. 21% of antibiotics were prescribed by a generic name and 196 patients received antibiotic prophylaxis. β-lactams again were the most commonly prescribed antibiotic class with 42.7% (n=193) of total antibiotics prescriptions, Metronidazole (n=101, 22.37%) was the most prescribed antimicrobial agent.
Conclusions: The practice of polypharmacy and high antibiotic prescription rate is a concern in our part of the country. Prescriptions writing in generic name needs to be encouraged. There is an acute need for the development of antibiotics prescribing guidelines in India.

Keywords: Antibiotic policy, Antibiotic resistance, Antibiotics, Prescription pattern, World health organization indicators

INTRODUCTION

Administration of suitable antimicrobial therapy is indispensable to avoid infection-related morbidity and mortality.[1] Since their introduction in 1940s the role of antibiotics has expanded from treating serious infections to preventing infections in surgical patients, protecting patients with compromised immune systems, promoting growth and preventing disease in animals.[2] Surgical site infections (SSIs) is one of the most common indications of antibiotic prescription in the surgical ward. SSIs are defined as infections occurring up to 30 days after surgery and affecting either the incision or deep tissue at the operation site. Despite improvements in prevention, SSIs remain a significant clinical problem as they are associated with substantial mortality and morbidity and impose severe demands on healthcare resources. In many cases, the pathogens originate from the patient's endogenous flora. The causative pathogens depend on the type of surgery; the most commonly isolated organisms

are *Staphylococcus aureus*, coagulase-negative *Staphylococci*, *Enterococcus spp.* and *Escherichia coli*.[3]

Antibiotic-resistant bacteria are a major threat to the efficacy of antibiotics and pose a challenge for the clinicians. Infections caused by resistant organisms limit treatment options, and with the lack of availability and development of new antibiotics, there has been little improvement in the armamentarium.[4,5] Antibiotics can be marvel drugs but they also have risks. Centre for Disease Control and prevention finds that between a third and a half of all antibiotics used in the U.S. are either unnecessary or the antibiotic does not match the germ.[6] Antibiotics used in situations where these cannot be expected to improve the patient's condition, will increase the chance of resistance. Nevertheless, inappropriate use of antibiotics has been described worldwide in both community and hospital settings particularly in developing countries.[7] The overuse and volume of antibiotic prescribing in communities has been found to correlate to the incidence of bacterial resistance. Therefore, to reduce the number of infections caused by resistant bacteria, inappropriate antibiotic prescribing must decrease.[8] Clinical audit, in accordance with education, and prescribing guidelines can favorably change antibiotic prescribing patterns among practitioners. Thus, the present study was conducted to assess the prescribing pattern of the antibiotic in Department of Surgery at a tertiary care teaching hospital.

METHODS

Study design was prospective cross-sectional prevalence survey carried out, from January 2019 to June 2019, in the inpatient departments (IPD) and out-patient departments (OPD) of department of Surgery, Rajendra Institute of Medical Sciences, Ranchi.

Data collection

Out-patient

Patients were randomly selected on five days (Monday to Friday) per week with a maximum of two patients per day. This was done till a total of 200 prescriptions were selected.

In-patient

Patients were randomly selected on five days (Monday to Friday) per week with a maximum of two patients per day. The patients who were discharged on the particular day and who were admitted for more than five days were randomly included. Care was taken that all the working units were adequate represented. Only the general wards were selected. A total of 200 prescriptions were collected. Data was obtained from the case record form of the patients.

Inclusion criteria

The patients attending surgery OPD or admitted in general ward of the department of surgery at RIMS Ranchi were randomly included in this study.

Exclusion criteria

Patients admitted in ICU or those receiving antifungals, antivirals, antimalarial, antimycobacterial drugs were excluded.

Data analysis

The relevant data was recorded in customized data collection form. Information recorded included patient particulars, diagnosis, investigations, drug details and the indication for prescribing antimicrobial agent, suspecting organism underlying infection, whether the treatment was for prophylaxis or was empirical, and duration of therapy and details of any concomitant medications.

Out-patient

Data was analyzed as per WHO outpatient prescribing indicators.[9] These include, Indicator 1: Average number of drugs prescribed per encounter, Indicator 2: Percentage of encounters when injection was prescribed, Indicator 3: Percentage of encounters when antibiotic was prescribed, Indicator 4: Percentage of antibiotics prescribed from essential list.

In-patient

Appropriate prescribing indicators for inpatient antibiotic use were Indicator 1: Percentage of hospitalizations with one or more antibiotics prescribed, Indicator 2: Average number of antibiotics drugs prescribed per hospitalization with antibiotics prescribed, Indicator 3: Percentage of surgical in-patients who received antibiotics prophylaxis, Indicator 4: Percentage of antibiotics prescribed by generic name.[10]

Statistical analysis

Data was computed and analyzed using MS Excel.

RESULTS

Total numbers of prescriptions collected were 200 from the surgery OPD. Out of these 107 were male and 93 were female, with a male female ratio of 1.15. Total no of medicine prescribed in the OPD were 689 with an average of 3.445 medicines per patient. 34 patients (17%) were prescribed injections. 131(66%) patients' received a total of 228 (33%) prescriptions of antibiotics (Table1).

β-lactams were the most common antibiotic class which was prescribed (n=112, 49.12%). Of the β-lactams most commonly prescribed were the penicillins (n=72,

64.29%), followed by cephalosporins (n=29, 25.89%) and carbapenems (n=11, 9.82%).

Table 1: Description of WHO prescribing indicators for surgery OPD.

Indicators	N	%
Total no. of medicines prescribed	689	NA
Average no. of medicine per patient	3.445	NA
Encounters when injections were prescribed	34	17
Encounters when antibiotics were prescribed	131	66
Total no. of antibiotics prescribed	228	33
Antibiotics prescribed from essential list	122	54
Antibiotics prescribed by generic name	65	29

Nitroimidazoles were the next most commonly prescribed antibiotic class in the OPDs with a total of 60 (26.32%) prescriptions. Metronidazole (n=47, 78.33%) was the most popular nitroimidazole, followed by tinidazole (n=13, 21.67%). Fluoroquinolones were prescribed 51 (22.37%) times, of which ofloxacin 24 (47.06%), ciprofloxacin 18 (35.29%) and norfloxacin were prescribed 9 (17.65%) times. Macrolides and aminoglycosides were prescribed 3 and 2 times respectively (Table 2).

Analysis of randomly selected case sheets of surgery ward showed that a total of 1526 medicines were prescribed to 200 patients, out of these 452 (32%) were antibiotics. A total of 184 patients (92%) were prescribed antibiotics with an average of 2.26 antibiotics per patients. 21% (96) of antibiotics were prescribed by a generic name and 196 patients received antibiotic prophylaxis (Table 3).

Table 2: Description of the antibiotics used in surgery OPD.

Class of Antibiotics	Subclass/ antibiotic	No of prescription		% of Class used	% of subclass/ antibiotic (in class)	% of subclass/ antibiotic (in total)
β-lactam	Penicillin	67	112	49.12	59.82	29.39
	Cephalosporin	26			23.21	11.40
	Carbapenem	7			6.25	3.07
Fluoroquinolone	Ofloxacin	24	51	22.37	47.06	10.53
	Norfloxacin	8			15.69	3.51
	Ciprofloxacin	18			35.29	7.89
Nitroimidazole	Metronidazole	47	60	26.32	78.33	20.61
	Tinidazole	13			21.67	5.70
Macrolide	Azithromycin	2	3	1.32	66.67	0.88
	Clarithromycin	1			33.33	0.44
Aminoglycoside	Amikacin	2	2	0.88	100.00	0.88

Although β-lactams again were the most commonly prescribed antibiotic class with 42.7% (n=193) of total antibiotics prescriptions, Metronidazole (n=101, 22.37%) was the most prescribed antimicrobial agent. Most commonly prescribed subgroup among β-lactam were cephalosporins (n=92, 47.67%). Nitroimidazoles were the second most commonly prescribed class. Fluoroquinolones were not far behind with 21.02% (n=95) of prescriptions. Aminoglycosides (n=36, 7.96%), macrolides (n=12, 2.65%) and glycopeptides (n=2, 0.44%) too had their share of prescriptions (Table 4).

Antibiotics were prescribed for a total of 8 indications in the IPD. Acute cholecystitis (n=57, 28.50%) was observed to be the most common indication for antibiotic use in our study followed by acute appendicitis (n=32, 16%). Other indications include cellulitis/ necrotizing fasciitis (n=30, 15%), gastrointestinal perforation (n=23, 11.50%), acute pancreatitis (n=21, 10.50%), intestinal obstruction (n=18, 9%), complicated hernia (n=17, 8.50%) and severe gastritis (n=2, 1%) (Table 5).

Table 3: Description of antibiotic prescribing indicators for surgery IPD.

Indicators		N	%
Total no. of medicines prescribed		1526	
Total no. of antibiotics prescribed	1526	452	30
Hospitalisation with one or more antibiotics	200	184	92
Average number of antibiotics drugs prescribed per hospitalization with antibiotics prescribed		2.26	
Antibiotics prescribed by generic name	452	96	21
Surgical in-patients who received antibiotics Prophylaxis	200	196	98

Table 4: Description of antibiotics use in surgery IPD.

Class of antibiotics	Subclass/ antibiotic	No of prescriptions		% of class used	% of subclass/ antibiotic (in class)	% of subclass/ antibiotic (in total)
β-Lactam	Penicillin	76	193	42.70	39.38	16.81
	Cephalosporin	92			47.67	20.35
	Carbapenem	25			12.95	5.53
Fluoroquinolone	Ofloxacin	45	95	21.02	47.37	9.96
	Norfloxacin	13			13.68	2.88
	Ciprofloxacin	37			38.95	8.19
Nitroimidazole	Metronidazole	101	114	25.22	88.60	22.35
	Tinidazole	13			11.40	2.88
Macrolide	Azithromycin	10	12	2.65	83.33	2.21
	Clarithromycin	2			16.67	0.44
Aminoglycoside	Gentamycin	14	36	7.96	38.89	3.10
	Amikacin	22			61.11	4.87
Glycopeptide	Vancomycin	2	2	0.44	100.00	0.44

Table 5: Description of indications for antibiotic use in surgery IPD.

Diagnosis		N	%
Acute cholecystitis	200	57	28.50
Acute appendicitis	200	32	16.00
Complicated hernia	200	17	8.50
Cellulitis or ulcer	200	30	15.00
Gastritis	200	2	1.00
G.I. perforation	200	23	11.50
Intestinal obstruction	200	18	9.00
Acute pancreatitis	200	21	10.50

DISCUSSION

The present study was conducted to assess the prescribing pattern of the antibiotic in Department of Surgery at a tertiary care teaching hospital. Clinical audit and drug utilization studies can favorably change antibiotic prescribing patterns among practitioners. The International Network for the Rational Use of Drugs (INRUD) which was established in 1989 to promote the rational use of medicines in developing countries, in association with WHO, has developed various indicators that provided objective indices to assess drug use in clinical practice.[9]

In the present study average number of medicines per patient in OPD was 3.445, 33% of these were antibiotics.

17% patients were prescribed injections. In the IPD the average number of antibiotics drugs prescribed per hospitalization was 2.26.

The international network for the rational use of drugs in collaboration with the WHO action program on essential Drugs undertook a project to develop and field-test a set of basic drug-use indicators in 1993. In this study they observed that the average numbers of drugs per encounter were high in Indonesia and Nigeria (3.3 and 3.8). 46% and 67% of them antibiotics and 22% and 45% of them injections.[10] Shrestha et al, in their study in Nepal observed that the average number of drugs per prescription was 5.85, 64.1% of patients received antibiotics, and 71% of patients received injectable form of drugs.[11]

Lambert et al, observed that the two most common reasons why doctors prescribed antibiotics were to find a cure of the underlying disease and to control and lessen symptoms.[12]

Average number of drugs per medical prescription is an important indicator which helps in investigating poly-medication, which is a major factor contributing to adverse drug reactions and drug-drug interactions. The educational quality informational level of the prescriber may also be observed.[13] The WHO proposes that optimally, this should be <2.[14,15] In this study and in studies from other developing countries we observed that the average number of drugs per prescription was more than that proposed by WHO.

Percentage of drugs prescribed by generic name is an indicator which enables the investigator to calculate the number of prescriptions in which the drugs are prescribed by the generic name. This helps in controlling drug costs in the health service.[13] In this study 21% antibiotics were prescribed by generic name. This may be due to lack of confidence of doctors on generic drugs. Proper and regular quality check of generic drugs will help in boosting use of generic drugs in India.

Percentage of encounters with an antibiotic prescribed is an indicator that evaluates the use of antibiotics in excess which contributes to bacterial dissemination and

resistance.[13] This was 66% in this study, which is very high compared to the standard (20.0%-26.8%) derived to be ideal.[16]

Percentage of prescribed injectable drugs is an indicator that aims to evaluate the injectables in excess because their administration may have serious consequences when prescribed or applied wrongly, such as difficulty for case reversion in the event of anaphylactic reactions, adverse reactions, fiber necrosis, etc.[13] The indicator was observed at 17%, which is at par with the standard (13.4%-24.1%) derived to serve as ideal.[16]

Holani et al, in their study observed that beta-lactams and Fluoroquinolones were the most commonly used antibiotic class in surgery OPD. Nitroimidazoles were second most common class after beta-lactams in IPD. In our study beta-lactams followed by fluoroquinolones were observed to be most commonly used antibiotic class in both OPD and IPD.[17]

These core prescribing indicators are useful for investigating drug prescription pattern in OPD but they are less helpful for inpatient settings, as drug use pattern there may be more complex.[9] The prescribing indicators are also susceptible to the data collection methods, i.e., either data are collected retrospectively or prospectively.

CONCLUSION

Prescribing indicators provide useful information in understanding general medicines prescribing patterns. The practice of polypharmacy and high antibiotic prescription rate is a concern in our part of the country. Prescribing injectables was not common in surgery OPD in our institute and is a good practice. Prescriptions writing in generic name needs to be promoted and encouraged. There appears to be an acute need for the development of antibiotics prescribing guidelines in India.

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