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Dr. Imtiaz Ahmed
Assistant Professor, Department of General Surgery, Shadan Institute of Medical Sciences, Hyderabad, Telangana, India

Correspondence
Dr. Imtiaz Ahmed
Assistant Professor, Department of General Surgery, Shadan Institute of Medical Sciences, Hyderabad, Telangana, India

Prospective assessment of the pattern of antimicrobial use in an indoor ward of surgery department in a tertiary care centre

Dr. Imtiaz Ahmed

Abstract
Aim: To evaluate the pattern of antimicrobial utilization in indoor ward of surgery department.
Methods: This prospective cross sectional study which was carried in the Department of General Surgery, Shadan Institute of Medical Sciences, Hyderabad, Telngana, India India, for the period of 9 months. 100 patients admitted in male and female indoor fulfilling inclusion criteria were included in the study. Antimicrobial utilization pattern among male and female patients was evaluated using quality indicators of drug use, recommended by WHO. Average number of antimicrobials per prescription, Percentage of antimicrobials prescribed by generic name, percentage of antimicrobials prescribed from essential drug list, and average dose of antimicrobial per prescription were calculated.
Results: Out of 100 patients included, 55 (55%) were male and 45 (45%) were female patients. Most of the patients 40-50 years age group. Clinical diagnosis for which antimicrobials were prescribed among surgical indoor patients were GIT disorder 33(33%), Genito-urinary disorders 15 (15%), trauma 10 (10), Carcinoma 9 (9%), Lump 8 (8%), Plastic surgery 7 (7%), Hernia 6 (6%), Gangrene 5 (5%), Liver disease 3(3%), Cellulites 2 (2%), Cyst 1 (1%), Sarcoma 1 (1%). Total number of antimicrobials used was 13. Ceftriaxone was the maximally utilized antimicrobial, given to 120 patients. Mean number of antimicrobials prescribed per patient was 3.81±1.18. Total number of antimicrobials administered by IV route was 325 (81.25%), and by oral route 75 (18.75%). No severe ADR was reported during the study ADRs reported were headache (30%), nausea (25%), vomiting (10%) and rashes (3%).
Conclusion: Prescribing indicators provide useful information in understanding general medicines prescribing patterns. 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.

Keywords: Antimicrobial therapy, prescriptions, side effects

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 organismsare *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 pattern of antimicrobial use in an indoor ward of surgery department at a tertiary care hospital.

Material and methods

This prospective cross sectional study which was carried in the Department of General Surgery, Shadan Institute of Medical Sciences, Hyderabad, Telangana, India, for the period of 9 months, after taking the approval of the protocol review committee and institutional ethics committee. 100 patients admitted in male and female indoor fulfilling inclusion criteria were included in the study.

Inclusion criteria

- Patients admitted in male and female surgery ward.

Exclusion criteria

- Patients with severe ailments, shifted to ICU from indoor
- Pregnant women
- Patients who deny to participate

Methodology

A standard subject socio demographic and clinical features data collection proforma was prepared and information regarding age, gender, occupation, income group, subject IP/OP number, diagnosis, subject present/past medical history, number of days of hospitalization, treatment, any ADR, investigations, outcome, Patients knowledge about drug treatment, self- medication was collected from indoor ticket and patient's interview.

Antimicrobial utilization pattern among male and female patients was evaluated using quality indicators of drug use, recommended by WHO. Ailments for which antimicrobials were prescribed, Number of antimicrobials prescribed, route of administration, any adverse drug reaction occurred during treatment were recorded. Average number of antimicrobials per prescription, Percentage of antimicrobials prescribed by generic name, percentage of antimicrobials prescribed from essential drug list, average dose of antimicrobial per prescription, PDD/DDD ratio, cost of antimicrobials prescribed, average cost per prescription, total burden on government were calculated. Data was statistically analyzed by entering it into a Microsoft excel sheet

Results

Out of 100 patients included, 55 (55%) were male and 45 (45%) were female patients. Most of the patients 40-50 years age group.

Clinical diagnosis for which antimicrobials were prescribed among surgical indoor patients were GITdisorder 33(33%), Genito-urinary disorders 15 (15%), trauma 10 (10), Carcinoma 9 (9%), Lump 8 (8%), Plastic surgery 7 (7%), Hernia 6 (6%), Gangrene 5 (5%), Liver disease 3(3%), Cellulites 2 (2%), Cyst 1 (1%), Sarcoma 1 (1%) (table 2.)

Table 1: Demographic profile of the patients

Gender	Number of patients	Percentage
Male	55	55
Female	45	44
Age		
Below 20	7	7
20-30	12	12
30-40	22	22
40-50	42	42
Above 50	17	17

Table 2: Clinical diagnosis of patients admitted in surgical indoor

Clinical diagnosis	Number of patients	Percentage
GITdisorder	33	33
Genito-urinary disorders	15	15
trauma	10	10
Carcinoma	9	9
Lump	8	8
Plastic surgery	7	7
Hernia	6	6
Gangrene	5	5
Liver disease	3	3
Cellulites	2	2
Cyst	1	1
Sarcoma	1	1

Total number of antimicrobials used was 13. Ceftriaxone was the maximally utilized antimicrobial, given to 120 patients. Mean number of antimicrobials prescribed per patient was 3.81±1.18.

Total number of antimicrobials administered by IV route was 325 (81.25%), and by oral route 75 (18.75%). costliest antimicrobial prescribed was meropenam, prescribed to 12 patients. Total cost per patient for meropenam was Rs.4600. In terms of cost, cheapest antimicrobial was clarithromycin oral, given to 4 patients. Cost per patient was Rs.9. Cost of all the antimicrobials utilized was of Rs.172500. Cost per patient was Rs.1725.

Prescribed daily dose of antimicrobials were compared with defined daily dose. PDD/DDD ratio of amoxicilline+clavulanic acid oral was maximum 1.84 and amoxicilline+clavulanic IV was minimum 0.43.

In surgical indoor 25 (25%) patients were receiving CAM (complementary and alternative medicines) other than antimicrobials.

No severe ADR was reported during the study ADRs reported were headache (30%), nausea (25%), vomiting (10%) and rashes (3%).

Table 3: Cost analysis of prescribed antimicrobials

Antimicrobial	No. of patients	%
Meropenam	8	2
Amikacin	96	24
Ceftriaxone	120	30
Ceftazidime	12	3
Metronidazole	68	17
Pipracillin+ Tazobactum	8	2
Linezolid	4	1
Amoxicilline+ Clavulanic acid oral	28	7
Cefixime	32	8
Amoxicilline+ Clavulanic acid IV	4	1
Ciprofloxacine	8	2
Ofloxacin	4	1
Levofloxacin	4	1
Clarithromycin	4	1

Discussion

A prescription by a doctor may be taken as a reflection of physicians' attitude to the disease and the role of drug in its treatment. It also provides an insight into the nature of health care delivery system [9]. Antimicrobials are the mainstay of treatment for majority of the infections. There is an urgent need to promote rational antimicrobials use as resistance to the existing ones may pose a serious threat to the treatment of infections warranting discovery of newer ones. Early disease recognition and early start of corrective treatments for infections have proved to have significant outcomes in terms of treatment effectiveness [10].

Aim of drug utilization studies is to analyze and evaluate prescribing pattern by using standard drug use indicators, and suggest modifications if needed to the prescribers for making the treatment more rational and cost effective [11].

Irrational use of antimicrobials may increase cost of treatment, cause more ADRs and higher rate of antimicrobial resistance in community pathogens.

The study was planned to analyze and evaluate prescribing pattern of antimicrobials in a tertiary care teaching hospital, to compare it with other studies and to provide feedback to the prescribers.

Our study has covered population from rural as well as urban areas, different socio economic and age groups. There were very few studies available to compare the results. Mean duration of hospital stay was 11.06 days. In study by Rasheeduddin *et al*. it was 9.2, which was very near to our study while in study by Teferra Abula and Mohammed Kedir, it was 14.2, for which selection of serious patients in their study might be the reason [12].

Total number of antimicrobials administered by IV route was 325 (81.25%), and by oral route 75 (18.75%). Nearly similar results were reported in study by Rasheeduddin *et al*. Generally IV routes are preferred in surgical patients, as drugs by IV route attain required blood concentration which is usually required in surgical procedures.

Ceftriaxone was the maximally utilized antimicrobial, given to 120 patients. The pattern reported in study by Rasheeduddin was very near to our study but in comparison to them flouroquinolol was less utilized in our study, while in study by Taferra Abdulla, Mohammed Kedir, ampicillin, gentamycin and chloramphenicol were used. In study by Mondal *et al*. gentamycin was used in place of amikacin in our study [12, 13].

Mean number of antimicrobials prescribed per patient was 3.81±1.18. In study by Taferra Abdulla, Mohammed Kedir, it was 2.17 indicating overutilization of antimicrobials in our study. Though their study was done in 2004, and the difference may be due to changing sensitivity and resistance among pathogens. In other studies, average number of antimicrobials per patient was not reported.

In surgical indoor patients, costliest antimicrobial prescribed was meropenam, prescribed to 12 patients. Total cost per patient for meropenam was Rs.4600. In terms of cost, cheapest antimicrobial was clarithromycin oral, given to 4 patients. Cost per patient was Rs.9. Cost of all the antimicrobials utilized was of Rs.172500. Cost per patient was Rs.1725. Study by Shelat *et al*. was conducted in private hospitals and the cost per patient was very high due to use of branded drugs while in our institution, drugs are prescribed by generic names and purchased by government which are provided to every patient free of cost.[14] In developing countries like India it helps in providing health facilities to maximum number of patients in limited cost. This information strongly indicates the need for comparative evaluation of cost in private and government sectors, comparison of pharmacokinetic parameters and accordingly establishment of policy to prescribe antimicrobials.

Appropriate dose and duration is one of the major determinants to control development of bacterial resistance. Most of the drugs were prescribed in appropriate dose. For amoxicillin-clavulanic acid oral, PDD/DDD ratio was 1.84 and for IV it was 0.43. As DDD is the dose calculated for maintenance therapy and in indoor most of the admitted patients need aggressive treatment. This may be the reason for increased PDD/DDD ratio. Few antimicrobials were started empirically and stopped after one or two doses, because the therapy was changed after final diagnosis. This was the probable cause for low PDD/DDD ratio.

In surgical indoor 25 (25%) patients were receiving CAM (complementary and alternative medicines) other than antimicrobial. CAM may affect the course of disease or effect of antimicrobials, may interact with antimicrobials and increase occurrence of ADRs. This finding indicates role of household remedies, self-medication and role of quacks in our country. People in village, illiterate patients and patients from low socioeconomic status try to treat the disease at home first and then they come to hospital.

Culture sensitivity test was not done for selection of antimicrobials in most of the cases and antimicrobials were prescribed empirically.

Conclusion

Prescribing metrics are helpful in determining general trends of medication prescribing. In our part of the world, polypharmacy and a high rate of antibiotic prescriptions are a source of concern. In our institute, prescribing injectables was not normal, but it is a good practise. The use of common names in prescriptions should be promoted and encouraged. In India, there appears to be a pressing need for the development of antibiotic prescribing guidelines.

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