

Drug Utilization Pattern of Antibiotics in Surgery Department in a Tertiary Care Hospital

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Abstract: Rational antibiotic usage reduces the incidence of post-surgical wound infection but its improper usage can further lead to excessive surgical wound infection and increased drug resistance which further complicates the problem. Proper treatment of post-operative and other hospital acquired infections is essential. Hence to investigate the current scenario in surgical post-operative patients, the present study was undertaken. **Objectives:** The goal of the study was to study the utilization pattern of antibiotics. **Materials and Methods:** A prospective observational study was carried out for a period of six months at Surgery and Orthopedic department of Basaveshwara Medical College & Hospital, Chitradurga. **Results:** A total of 147 patients were enrolled for this study, of which 101 were males and 46 were females. Cephalosporins were the most commonly prescribed class of antibiotics during the study period 77.5% pre-operatively and 47.4% post-operatively. The most commonly prescribed route of administration was found to be intravenous 47.6% and 64.7% pre and post-operative respectively. Drug related problems identified were minimal which included drug interactions (26.5%) and adverse drug reactions (6.9%). 88.4% patients showed positive outcomes and were discharged satisfactorily but only 11.6% showed negative outcomes. **Conclusion:** Cephalosporins were the predominant antibiotic prescribed and majority of the prescriptions were given through intravenous route. Antibiotic prescription in the patients were prescribed appropriately and beneficially.

Keywords: Drug utilization, preoperative, postoperative.

1. Introduction

World Health Organization (WHO) defines Drug Utilization as "The marketing, distribution, prescription and use of drug in a society with special emphasis on resulting medical, social and economic results [1]. Hence it has become inevitable for drug utilization studies as a pre-requisite for the formulation of drug policies [2].

DU studies are very important factor of almost all therapeutic drugs such as antibiotics or other constitutes which has a strong therapeutic outcome [3].

Infections are very common and responsible for a large number diseases adversely affecting human health. Most of the infectious diseases are caused by bacteria can be prevented, managed and treated through anti-bacterial group of compounds known as antibiotics. There are 130 million major operations performed in hospitals each year in the United

States. Antibiotics are frequently used in surgical patients as approximately 30% of patients undergoing surgery will develop post-operative surgical site infections (SSI) [5]. Antibiotics being the most commonly prescribed group of drugs, the problem of its over use is a global phenomenon. In India the prevalence of use of antimicrobial agents varies from 24 to 67% [6]. The widespread and prolonged use of broad spectrum antibiotics has contributed to increased healthcare costs and risks of antibiotic resistance, while inappropriate timing of antibiotics administration has shown to reduce antibiotic efficacy [7].

As per Kunin's criteria it was observed that 64% of total antibiotics prescribed were either not indicated or inappropriate in terms of drug or dosage [8]. The inevitable consequence of the widespread use of antimicrobial agents has been the emergence of antibiotic-resistant pathogens, fueling an ever increasing need for new drugs. Reducing inappropriate antibiotic use is thought to be the best way to control resistance [2]. A prescription order is an important document between the physician and the patient. Prescription writing is an important aspect, which needs to be continuously assessed and refined suitably and it reflects the physician's skill in the diagnosis and attitude towards selecting the most appropriate cost effective treatment [9].

The achievement of a rational choice and appropriate use of antibiotics and to recognize their potential problems are the main challenges in the prescription of antibiotics [10]. Monitoring of prescription and drug utilization patterns should be done periodically to increase the therapeutic efficacy, decrease the adverse effects and provide feedback to the prescribers to ensure rational use of medicines [11]. A clinical pharmacist is a member of the health care team who provides patient oriented pharmaceutical care and monitors the pharmacotherapy given to a patient [12]. Hence, this study was planned in order to examine the prevalent practices in our hospital regarding the use of antimicrobials for surgical prophylaxis, with respect to the choice of the antimicrobial agent, the timing of its administration, the intraoperative re-dosing and the total duration of the prophylaxis, in order to detect any inappropriateness, so that corrective measures could be suggested.

2. Materials and methods

Study Design: This was a prospective observational study.

Study Site: The study was conducted at Basaveshwara Medical College Hospital and research centre, Chitradurga.

Study Period: The study was conducted over a period of six months from November 2017 to 2018.

Study Subjects: All in-patients who were presented to the General Surgery and Orthopedics department of the hospital during the study period were enrolled into study. Patient who met the following criteria were enrolled.

Inclusion Criteria:

- Subjects who are undergoing for surgery.
- Subjects of both genders admitted in General Surgery and Orthopedic department.
- Subjects of age group between 20-90 years.

Exclusion Criteria:

- Patients who are diagnosed with cancer.
- Pregnant and lactating patients.

Ethical approval:

The study was approved by the Institutional Ethical Committee of Basaveshwara Medical College Hospital & Research Centre, Chitradurga.

Vide number: SJMCP/IEC/PHARM D/16/17-18 (ANNEXURE -1).

Sources of data:

- Medical records of in-patients.
- Operation records.
- Interview with patients and/or care takers.

Study procedure:

- The study was started after obtaining the approval from institutional ethical committee (IEC) of SJM college of Pharmacy.
- Patients who satisfied the above study criteria were included in the study after taking the informed consent.
- Patient's demographic details, complaints, history, diagnosis and prescribed drugs will be collected from the medical records of the patient and will be documented in a suitably designed data collection form.
- Details of prescription includes: Brand/generic name, class, dosage, route, frequency and duration.

Statistical analysis:

- The data were entered in Microsoft excel and data were analyzed by SPSS software version 19.
- Categorical data were presented as frequency, percentage and quantitative data were analyzed by descriptive method.

3. Results

A. Distribution of patients according to gender

A total of 147 patient's data was collected from in-patient of surgery and orthopedic department from the hospital. Among

the whole 147, 68.7% were males and 31.3% were females. The results are given below in Fig. 1.

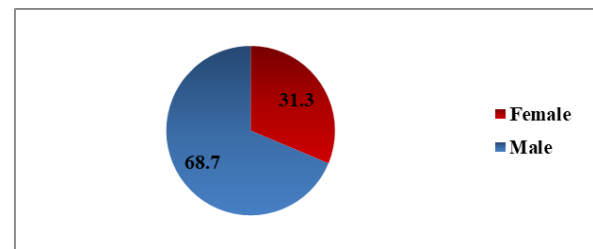


Fig. 1. Distribution of patients according to gender

B. Distribution of patients according to department

In the study population, 57.8% were from orthopaedic department and 42.2% were from surgery department. The results are given below in Fig. 2.

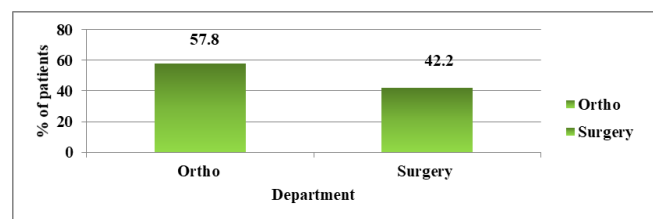


Fig. 2. Distribution of patients according to department

C. Distribution of patients according to diagnosis

In the study population, 51.8% had fracture, followed by 11.6% for hernia, 8.1% for ulcer, 6.1% for arthritis. Ano rectal fistula and gangrene holds 5.4%. Cellulitis and abscess were found in 3.4%. 2.8% had diabetic foot. Only 2% had spondylitis. The results are given below in Table 1.

Table 1
Distribution of patients according to diagnosis

Diagnosis	Frequency	Percentage (%)
Anorectal fistula	8	5.4
Abscess	5	3.4
Gangrene	8	5.4
Diabetic foot	4	2.8
Hernia	17	11.6
Cellulitis	5	3.4
Arthritis	9	6.1
Fracture	76	51.8
Spondylitis	3	2
Ulcer	12	8.1
Total	147	100

D. Pre-operative data

1) Prescription Pattern of Antibiotics (n=169)

Table 2
Prescription pattern of antibiotics based on class

Drugs	Frequency	Percentage (%)
Cephalosporins	131	77.5
Penicillins	9	5.3
Aminoglycosides	16	9.5
Others	13	7.7
Total	169	100

For the pre-operative data, mostly prescribed classes of

antibiotics were Cephalosporins (77.5%) followed by, Aminoglycosides (9.5%), Penicillins (5.3%), other antibiotics (7.7%).

Among antibiotics, the most commonly prescribed were the combination Cephalosporins and Beta lactamase inhibitors (Cefaperazone+Salbactam) 47 (27.8%).

Table 3
 Prescription pattern of antibiotics based on subclass (n=169)

ANTIBIOTICS			
Class of Drugs	Drugs	Frequency	Percentage (%)
Cephalosporins	Cefotaxime	16	9.5
	Ceftiaxone	29	17.2
	Cefixime	7	4.1
Penicillins	Amoxicillin	1	0.6
	Piperacillin	1	0.6
Aminoglycosides	Amikacin	7	4.1
	Gentamycin	9	5.3
Others Antibiotics	Meropenem	4	2.4
	Metronidazole	9	5.3
Combination Therapy	Cefoperazone+Salbactam	47	27.8
	Cefoperazone+Tazobactam	1	0.6
	Ceftriaxone+Tazobactam	14	8.3
	Cefotaxime +Salbactam	15	8.9
	Ceftazidime +Salbactam	2	1.2
	Amoxicillin+Clavulanic Acid	1	0.6
	Piperacillin+Tazobactam	6	3.6
Total		169	100.0

2) *Distribution of drugs based on route of administrations*

Among 147 patients, 47.6% had received antibiotics through intravenous route 37.4% received through oral route of administration in the preoperative data. 15% of patients were on both oral and intravenous route. The results are given below in Fig. 3.

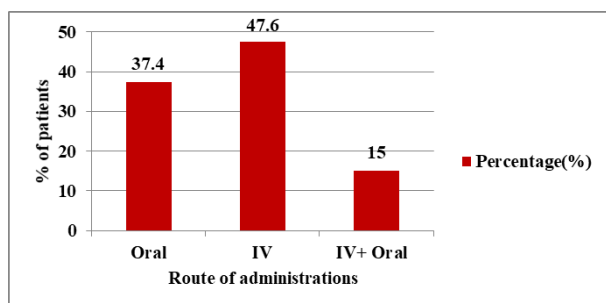


Fig. 3. Distribution of drugs based on route of administrations

3) *Distribution of patients based on mono therapy and combination therapy (n=147)*

Among 147 patients, 88 (59.9%) received mono therapy and 57 (38.8%) received combination therapy. Only 2 (1.3%) received more than two antibiotics. The results are given in Table 4.

Table 4
 Distribution of patients based on mono therapy and combination therapy

Types of therapy	Frequency	Percentage (%)
Mono therapy	88	59.9
Combination therapy	57	38.8
More than two drugs	2	1.3
Total	147	100.0

E. *Post-operative data*

1) *Prescription pattern of antibiotics based on class (n=291)*

For the post-operative data, mostly prescribed antibiotics were Cephalosporins (47.4%) followed by Aminoglycosides (17.2%) and Fluoroquinolones (7.9%), Penicilins (10.3%), other antibiotics (17.2%).

Table 5
 Prescription pattern of antibiotics based on class

Drugs	Frequency	Percentage (%)
Cephalosporins	138	47.4
Penicillins	30	10.3
Aminoglycosides	50	17.2
Fluoroquinolones	23	7.9
others	50	17.2
Total	291	100.0

Table 6
 Prescription pattern of antibiotics based on their subclass (n=291)

Antibiotics			
Class of drugs	Drugs	Frequency	Percentage (%)
Cephalosporins	Cefixime	13	4.5
	Cefotaxime	21	7.2
	Ceftriaxone	18	6.2
Aminoglycosides	Amikacin	40	13.7
	Gentamycin	10	3.4
Fluoroquinolones	Ciprofloxacin	7	2.4
	Levofloxacin	10	3.4
	Norfloxacin	2	0.7
	Ofloxacin	4	1.4
Other Antibiotics	Albendazole	1	0.3
	Linezolid	7	2.4
	Metronidazole	32	11.0
	Ornidazole	3	1.0
	Meropenem	7	2.4
Combination Therapy	Cefoperazone+Salbactam	51	17.5
	Cefotaxime+Salbactam	9	3.1
	Ceftazidime+Salbactam	2	0.7
	Ceftazidime+Tazobactam	9	3.1
	Ceftriaxone+Tazobactam	14	4.8
	Ceftriaxone+Salbactam	1	0.3
	Amoxicillin+Clavulanic acid	6	2.1
	Piperacillin+Tazobactam	24	8.2
TOTAL		291	100.0

Among postoperatively, the most commonly prescribed antibiotics were the combination Cephalosporins and Beta lactamase inhibitors (Cefaperazone + Salbactam) 51 (17.5%).

2) Distribution of patients according to route of administrations (n=147)

Among 147 patients, 64.7% had received antibiotics through intravenous route 23.9% received through oral route of administration in the preoperative data. 11.5% of patients were on both oral and intravenous route. The results are given below in Fig. 4.

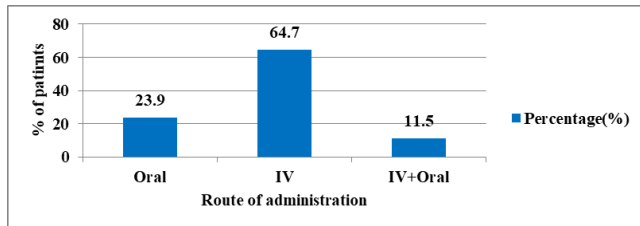


Fig. 4. Distribution of patients according to route of administrations

3) Distribution of patients based on mono and combo therapy (n=147)

Among 147 patients, 28 (19%) received monotherapy and 69 (47%) received combination therapy. 50 (34%) patients received more than two antibiotics. The results are given below in Table 7.

Table 7
 Distribution of patients based on mono and combo therapy

Types of therapy	Frequency	Percentage (%)
Monotherapy	28	19
Combination therapy	69	47
More than two drug	50	34
Total	147	100.0

F. Distribution of patients according to duration of therapy (n=147)

Among 147 patients, 76 (51.8%) patients stayed hospital for 10 days and 71 (48.2%) patients stayed for more than 10 days. The results are given below in Table 8.

Table 8
 Distribution of patients according to duration of therapy

Duration (days)	No of patients	Percentage (%)
1-10	76	51.8
11-20	71	48.2

G. Drug related problems (n=147)

Among 147 prescriptions, the majorly found drug related problems found were drug interactions and adverse drug reactions. Out of which 39 (26.5%) drug interactions and 10 (6.9%) adverse drug reactions were found. The results are given below in Fig. 5.

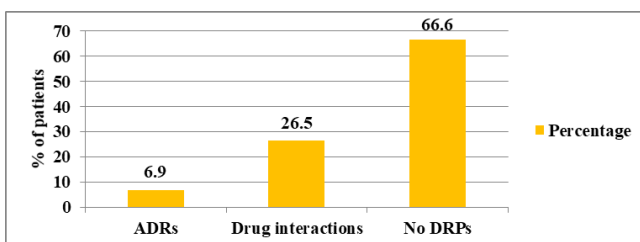


Fig. 5. Drug related problems

H. Distribution of patients based on outcomes of therapy (n=147)

Among 147 patients, 130 (88.4%) patients were discharged satisfactorily and 17 (11.6%) patients had negative outcomes including referral to higher centres. The results are given below.

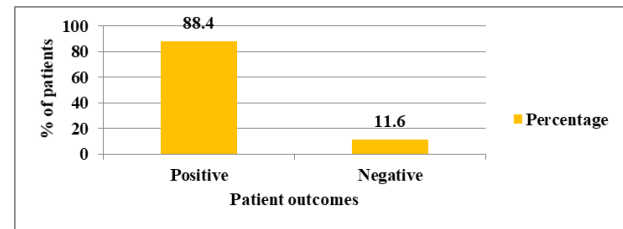


Fig. 6. Distribution of patients based on outcomes of therapy

4. Discussion

The present study was a prospective observational study conducted among subjects who underwent surgery attending the General Surgery and Orthopedics department of a tertiary care hospital and focused mainly on prescription pattern of antibiotics. Pre-operative and post-operative data were analyzed. Antimicrobial agents are very important class of drugs which are essential in treating or preventing development of infections in patients. Patients in surgical wards develop infections post-surgery; many of the infections are caused by bacteria that are highly virulent. As a result, there is a need for prophylactic or empirical treatment with antimicrobial agents that can cover broad spectrum of pathogens. This study provides an overview of total antimicrobial use in surgery department of a tertiary care teaching hospital [8].

In this study, predominant were male patients 101(68.7%) than females 46 (31.3%) and fracture (51.8%) was the most frequent surgical procedure done, followed by 11.6% hernia and 8.1% ulcer. When coming to the prescription trends in or hospital. Among the subjects, monotherapy was prescribed for 59.9% patients, combination therapy for 38.8% and only 1.3% for more than 2 antibiotics pre-operatively while combination therapy prescribed for 47% followed by 19% for monotherapy and 34% for more than 2 antibiotics post-operatively. Similar results were obtained with Revathi R et al., Prescribing Pattern of Antimicrobials in Patients during Post-Operative Period – An Observational Study [13].

In this study, patients were divided into six groups based on different ages. Out of 147 patients 34 (23.1%) were from 51-60 years. The results revealed that 51-60 years aged patients underwent surgery most frequently during the study period. Vivekkumar SP et al., conducted a study on the topic “Antimicrobial Drugs Usage in a Tertiary Hospital–Descriptive Study” and a similar result was observed in the distribution of patients based on age groups [14].

Cephalosporins are the mainstay of treatment pre-operatively (77.5%) and post-operatively (47.4%). Similar results were obtained by a study conducted by Shah A et al., on Antibiotic Utilization for Surgical Prophylaxis in a Tertiary Care Teaching

Rural Hospital and the results revealed that Cephalosporins were the most frequently prescribed in 176 (88%) patients pre-operatively and 164 (82%) patients post-operatively [15].

In this study population, 47.6% had received antibiotics through intravenous route followed by 37.4% received through oral route and only 15% received through both IV and oral route preoperatively and 95% received through IV followed by 35% received through oral route and only 17% received through both IV and oral route postoperatively. Khan AKA et al., conducted a study on A Study on the Usage Pattern of Antimicrobial Agents for the Prevention of Surgical Site Infections (SSIs) in a Tertiary Care Teaching Hospital and highlighted that IV dosage form were given more as compared to oral [9].

Among 147 patients, 88.4% had been discharged from hospital satisfactorily and 11.6% had negative complaints (referral to higher centres). Recent study conducted by Alavi SM et al., on Antibiotics Use Patterns for Surgical Prophylaxis Site Infection in Different Surgical Wards of a Teaching Hospital Ahvaz, Iran concluded with same [16]. Similar results were found from Lundine KM et al., study on Adherence to perioperative antibiotic prophylaxis among orthopedic trauma patients [17].

5. Conclusion

According to the analyzed results and from view of literature, the conclusions made are;

- The present study provides us patterns of antibiotic usage in patients admitted in orthopedic and surgery wards.
- Cephalosporins were prescribed more frequently.
- Majority of drugs were given by intravenous route followed by oral route.
- Drug related problems identified were minimal.
- Majority of patients were discharged satisfactorily.
- Antibiotic prescription in the patients were prescribed appropriately and beneficially.

Acknowledgement

It is a pleasure and privilege to express my deep sense of thanks and indebtedness to my parents and the management of SJM College of Pharmacy Karnataka, Mr. B. Shankar Reddy, Associate professor, Department of Pharmacy Practice and Dr. Bharathi D. R, Principal SJM College of Pharmacy for giving the consent and facilities to carry out this work.

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