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Audit of Antibiotic Prescription Pattern for Surgical Prophylaxis and Estimating the Proportion of Compliance with Existing Institutional Guidelines in a Tertiary Care Private Hospital in Kerala

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ABSTRACT

This study provides a comprehensive evaluation of antibiotic prescription patterns for surgical prophylaxis and assesses adherence to institutional guidelines in a tertiary care hospital in Kerala. The retrospective cross-sectional analysis included 216 patients from various departments, with the highest proportions from Obstetrics and Gynecology (34%), General Surgery (26%), Urology (16%), and Orthopedics (11%). The findings revealed that overall compliance with the recommended choice of antibiotics, according to institutional guidelines, was 63.42%, while compliance with dosing guidelines was slightly lower at 57.15%. Cefuroxime was the most frequently prescribed antibiotic, used in 60% of cases, followed by Cefotaxime (16%), Ceftriaxone (4%), and Amoxicillin (4%). The study uncovered significant inconsistencies in antibiotic application, particularly concerning the selection and timing of administration. The study emphasizes the critical role of robust antimicrobial stewardship programs in promoting the rational use of antibiotics, which is essential for minimizing the risk of antibiotic resistance and improving patient outcomes. By identifying these critical areas of non-compliance, the study provides valuable insights that can inform the development of targeted interventions and updates to guidelines, aimed at enhancing adherence to best practices in surgical prophylaxis. Such initiatives are crucial for advancing patient care, ensuring safety, and mitigating the growing threat of antibiotic resistance in healthcare settings.

INTRODUCTION

Antibiotics are among the most frequently prescribed drugs in hospitals, particularly in surgical departments, where they play a crucial role in preventing infections. However, the irrational prescription and misuse of antibiotics have become significant problems in contemporary medical practice[1]. The consequences of inappropriate antibiotic use are far-reaching and include ineffective treatment, the development of antibiotic resistance, adverse effects on patients, and a substantial economic burden on both individuals and society[2].

One of the most pressing issues arising from the misuse of antibiotics is the widespread and indiscriminate use of broad-spectrum antibiotics, which has contributed to the emergence of multidrug-resistant organisms. There is clear evidence of a causal link between hospital antimicrobial usage and the development of antimicrobial resistance. As bacteria evolve to withstand commonly used antibiotics, treating infections becomes increasingly difficult, leading to longer hospital stays, higher medical costs, and increased mortality[3-4].

To address these challenges, antibiotic prophylaxis guidelines have been developed globally to optimize the use and prescription of antibiotics based on current health issues and clinical indications.

These guidelines are a fundamental part of antimicrobial stewardship programs, which aim to ensure that antibiotics are used appropriately and effectively. The guidelines are designed to assist surgeons in selecting the most rational and effective approach to antibiotic use[3-5]. However, despite their importance, compliance with these guidelines remains a significant challenge, particularly in developing countries. A survey conducted by the Indian Council of Medical Research (ICMR) in 2013 found that only 30% of healthcare institutions were adhering to antimicrobial stewardship guidelines and recommendations.

Surgical site infections (SSIs) are among the most common postoperative complications and represent a significant burden in terms of patient morbidity and mortality. SSIs are defined as infections that occur at or near the surgical site within 30 days or up to a year after the procedure. These infections can lead to delayed wound healing, increased use of antibiotics, and the development of multidrug-resistant bacteria. The risk factors for SSIs include existing infections, poor hygiene, diabetes, anemia, and obesity. However, proper use of prophylactic antibiotics can significantly reduce the incidence of SSIs.

Surgical site infections (SSIs) continue to be a significant challenge in healthcare, contributing to considerable morbidity and increasing healthcare costs despite being largely preventable. The inconsistency in adhering to international guidelines for surgical antimicrobial prophylaxis is a major factor in the persistence of these infections. These guidelines are specifically designed to optimize the use of antibiotics, recommending the correct selection, timing, and duration of prophylaxis to minimize the risk of SSIs. However, in many clinical settings, there is a notable deviation from these best practices, particularly in the selection of antimicrobial agents. The improper choice of antibiotics, which may not effectively target the pathogens most likely to cause infections in specific surgical contexts, often leads to inadequate protection and an increased risk of infection. This issue is compounded by the unnecessary use of antibiotics in cases where they may not be needed, such as in clean or clean-contaminated wounds, which generally require minimal to no prophylaxis. This misuse not only fails to prevent infections but also contributes to the growing problem of antibiotic resistance.

The effectiveness of surgical antimicrobial prophylaxis hinges on several key factors: selecting the appropriate antibiotic based on the likely pathogens, administering it at the optimal time (typically within 30 to 60 minutes before the surgical incision), and limiting the duration of antibiotic use to less than 24 hours post-surgery. These practices ensure that adequate drug levels are present in the tissues at the critical moment of potential bacterial contamination while minimizing the risk of developing resistant bacterial strains. In cases where surgery is prolonged or complications arise, additional doses may be warranted, but the overall goal should always be to use antibiotics judiciously. By strictly adhering to these guidelines, healthcare providers can significantly reduce the incidence of SSIs, improve patient outcomes, and contribute to the global effort to combat antibiotic resistance.

Optimal timing for antibiotic prophylaxis is crucial and is recommended to be administered approximately 30 minutes before the surgical incision. The duration of antimicrobial prophylaxis should generally be less than 24 hours for most procedures. In cases of prolonged surgeries, additional doses may be necessary to maintain therapeutic drug levels. Additionally, in the event of excessive intraoperative bleeding or other complications, re-administration of antibiotics should be considered to prevent infection.

The core aspect of any surgical procedure is the prevention of infection at the surgical site, which is achieved primarily through prophylactic antibiotic administration. Ensuring that antibiotics are used appropriately not only helps in preventing infections but also promotes wound healing without complications. However, the success of these efforts depends on strict adherence to established guidelines and a commitment to antimicrobial stewardship. By reducing the irrational use of antibiotics, healthcare providers can help mitigate the risk of antibiotic resistance, improve patient outcomes, and reduce the economic burden associated with postoperative infections.

Therefore, Antibiotics are indispensable in surgical care, their misuse poses significant risks to patient health and public safety. Adhering to antibiotic prophylaxis guidelines is essential to prevent surgical site infections and combat the growing threat of antibiotic resistance. Healthcare institutions must prioritize the implementation of antimicrobial stewardship programs to ensure that antibiotics are prescribed rationally and effectively, thereby safeguarding both individual patients and the broader community from the dangers of antibiotic misuse.

MATERIALS AND METHODS

A retrospective cross-sectional observational study was conducted across the departments of General Surgery, Urology, ENT, Neurosurgery, Cardiology, Orthopaedics, and Gynaecology at MOSC Medical College, Kolenchery, Kerala, India. Ethical approval for the study was obtained from the Institutional Ethics Committee.

Study Population

Patients for the study were recruited from the General Surgery, Urology, ENT, Neurosurgery, Cardiology, Orthopaedics, and Gynaecology departments, specifically those who underwent clean and clean-contaminated surgeries. Inclusion criteria encompassed patients of all ages who had undergone these types of surgeries without any prior confirmed infections. Exclusion criteria included patients with incomplete information, those with a confirmed infectious diagnosis, and those who had undergone dirty or contaminated surgeries.

DATA ANALYSIS

Data collection was completed over approximately three months following IRB approval, spanning from April to June 2022. Categorical variables will be summarized using frequencies and percentages, while quantitative variables will be summarized using the mean and standard deviation if the data meets the normality assumption; otherwise, the median and interquartile range (IQR) will be used. The normality of the data will be assessed using the

Kolmogorov- Smirnov and Shapiro-Wilk tests. All analyses will be conducted using SPSS and EZR software.

RESULTS

A total of 216 patients were included in the study, out of which 120 (55.55%) were females and 96 (44.44%) were males. Surgeries from the Obstetrics and Gynecology department constituted the majority, with 34% of surgeries performed, followed by General Surgery (26%), Urology (16%), Orthopedics (11%), Neurosurgery (5%), ENT (5%) and Cardiology (3%).

Table 1:

Table 1: Profile of Patients Undergoing Various Surgeries

Departments with Procedures	Total Number	Male	Female	Mean Age in Years
Neurosurgery	**10**			**55.735**
1. Cranial Surgeries (Cranioplasty, Craniotomy, Craniectomy)	7	7	0	38.14
2. Burr Hole	3	2	1	73.33
ENT	**11**			**47.73**
1. Ear Surgeries (Tympanoplasty)	3	2	1	55.66
2. Nasal Surgeries (Diagnostic Nasal Endoscopy, FESS, Trans Nasal Incision and Drainage)	5	1	4	24.2
3. Laryngeal Surgeries (MLS)	3	3	0	63.33
Cardiology	**6**			**62.5**
1. CABG	4	2	2	58
2. Permcath Insertion	2	0	2	67
Urology	**34**			**55**
1. TURP	5	5	0	70
2. AVF	3	3	0	55
3. URSL + DJ Stenting	22	18	4	45
4. Cystoscopy	4	4	0	50
Orthopaedics	**24**			**52.115**
1. Interlocking Nail Femur	3	1	2	60.66
2. Arthroscopic Surgeries	5	3	2	47.8
3. Total Knee Replacement	2	1	1	58
4. Open and Closed Reduction and Internal Fixation, External Fixation	14	9	5	42
OBG	**74**			**37.515**
1. LSCS	44	0	44	29.15
2. Hysterectomy	12	0	12	51.75
3. Post-Partum Sterilization	6	0	6	36
4. Laparoscopic Procedures	12	0	12	33.16
General Surgery	**57**			**32.86666667**
1. Hernia Surgeries (Open/Laparoscopic Hernioplasty, Herniotomy, Hernia Repair)	21	15	6	45.63
2. Groin Surgeries	11	11	0	14.34
3. Breast Surgeries (Breast Lump Excision, Left Breast Conservative Surgery)	3	0	3	45.33
4. Thyroidectomy (Total Thyroidectomy)	5	1	4	50.2
5. Abdominal Surgeries (Open/Laparoscopic Appendicectomy, Laparoscopic Cholecystectomy)	15	7	8	39
6. Bone Marrow Aspiration	2	1	1	2.7
Total	**216**	**96**	**120**	

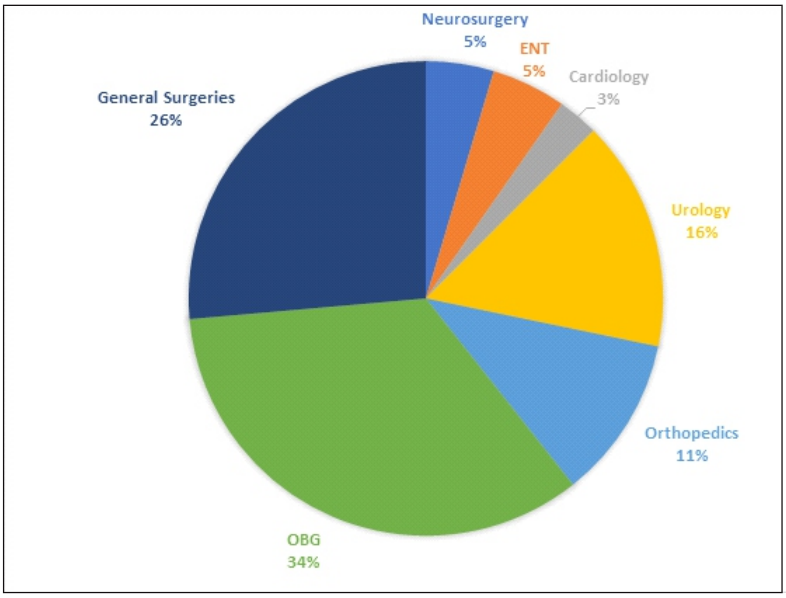

Figure 1: Department-Wise Distribution of Surgeries.

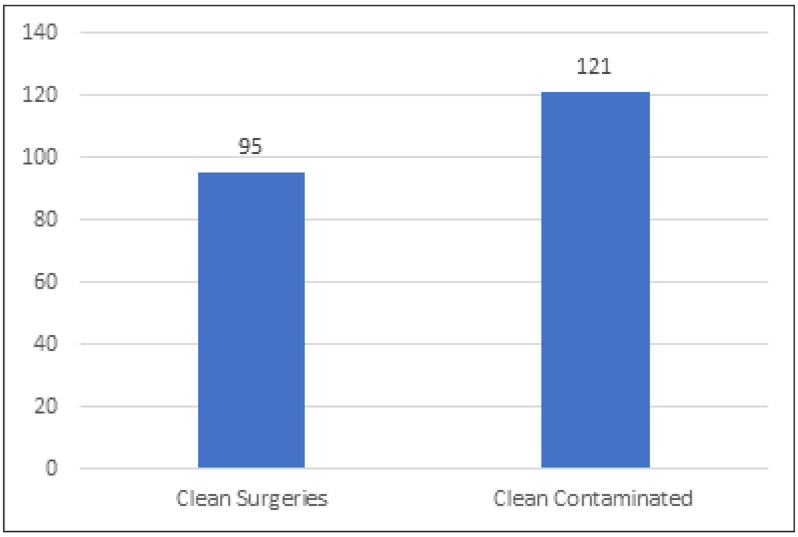

Figure 2: Types of Surgeries

ompliance with single dosing and choice of antibiotic prescribed concerning each department is explained below (Table 2, Table 3). All pre-operative dosing was given on an average of 30 minutes before surgery. The most common antibiotics used in surgeries were Cefuroxime (15/25) followed by Cefotaxime (4/25), Ceftriaxone (1/25) and Amoxycillin (1/25).

In the Neurosurgery department, all surgeries required post-operative doses. Cefuroxime/Cefazolin is the antibiotic needed to be prescribed according to guidelines. Ceftriaxone was the most common antibiotic to be prescribed for Cranial Surgeries. Burr Hole surgeries, on the other hand, had Cefuroxime prescribed. Compliance with the choice of antibiotic prescribed was 40% both pre and post-operatively. Single-dosing compliance was 60% and 40% pre-operatively and post-operatively respectively.

Table 2: Compliance with Choice of Antibiotics					
Departments with Procedures	Most Common Antibiotic Used Pre-Operatively	Most Common Antibiotic Used Post Operatively	Choice of Antibiotic According to Guidelines	Compliance to Choice Pre-Operatively	Compliance to Choice Post-Operatively
Neurosurgery					
1. Cranial Surgeries (Cranioplasty, Craniotomy, Craniectomy)	Ceftriaxone	Ceftriaxone	Cefuroxime/Cefazolin	14.28% (1/7)	14.28% (1/7)
2. Burr Hole	Cefuroxime	Cefuroxime	Cefuroxime/Cefazolin	100% (3/3)	100% (3/3)
ENT					
1. Ear Surgeries (Tympanoplasty)	Cefuroxime	Cefuroxime	None	33.33% (1/3)	100% (3/3)
2. Nasal Surgeries (Diagnostic Nasal Endoscopy, FESS, Trans Nasal Incision and Drainage)	Amoxycillin	Amoxicillin	None (Clean) Cefuroxime/Cefazolin + Metronidazole (Clean-Contaminated)	60% (3/5)	80% (4/5)
3. Laryngeal Surgeries (MLS)	Cefuroxime	Cefuroxime	None (Clean) Cefuroxime/Cefazolin + Metronidazole (Clean-Contaminated)	100% (3/3)	100% (3/3)
Cardiology					
1. CABG	Cefuroxime	Cefuroxime	Cefuroxime/Cefazolin	100% (4/4)	100% (4/4)
2. Permcath Insertion	None	Cefuroxime	None (Clean) Cefuroxime/Cefazolin + Metronidazole (Clean-Contaminated)	100% (2/2)	50% (1/2)
Urology					
1. TURP	Cefotaxime	Cefotaxime	Cefazolin/Cefuroxime	20% (1/5)	20% (1/5)
2. AVF	None	Cefotaxime	None (Clean) Cefuroxime/Cefazolin (Clean-Contaminated)	100% (3/3)	33.33% (1/3)
3. URSL + DJ Stenting	Cefotaxime	Cefotaxime	Cefazolin/Cefuroxime	36.36% (8/22)	36.36% (8/22)
4. Cystoscopy	Cefotaxime	Cefotaxime	Cefazolin/Cefuroxime	0% (0/4)	0% (0/4)
Orthopaedics					
1. Interlocking Nail Femur	Cefuroxime	Cefuroxime	Cefazolin/Cefuroxime	100% (3/3)	100% (3/3)
2. Arthroscopic Surgeries	Cefuroxime	Cefuroxime	None	0% (0/5)	0% (0/5)
3. Total Knee Replacement	Cefuroxime	Cefuroxime	Cefazolin/Cefuroxime	100% (2/2)	100% (2/2)
4. Open and Closed Reduction and Internal Fixation, External Fixation	Cefuroxime	Cefuroxime	Cefazolin/Cefuroxime	92.85% (13/14)	92.85% (13/14)
OBG					
1. LSCS	Cefuroxime	Cefuroxime	None (Clean) Cefuroxime/Cefazolin + Metronidazole (Clean-Contaminated)	93.81% (41/44)	95.45% (42/44)
2. Hysterectomy	Cefuroxime + Metronidazole	Cefuroxime + Metronidazole	None (Clean) Cefuroxime/Cefazolin + Metronidazole (Clean-Contaminated)	91.66% (11/12)	91.66% (11/12)
3. Post-Partum Sterilization	Cefuroxime	Cefuroxime	Cefazolin/Cefuroxime	66.66% (4/6)	66.66% (4/6)
4. Laparoscopic Procedures	Cefuroxime	Cefuroxime	Cefazolin/Cefuroxime	83.33% (10/12)	83.33% (10/12)

General Surgeries					
1. Hernia Surgeries (Open/Laparoscopic Hernioplasty, Herniotomy, Hernia Repair)	Cefuroxime	Cefuroxime	Cefazolin/Cefuroxime	57.14% (12/21)	42.81% (9/21)
2. Groin Surgeries	Cefotaxime	Cefotaxime	Cefazolin/Cefuroxime	0% (0/11)	0% (0/11)
3. Breast Surgeries (Breast Lump Excision, Left Breast Conservative Surgery)	None, Cefuroxime (used in one surgery)	None, Cefuroxime (used in one surgery)	None Cefazolin/Cefuroxime (for extra lymph node dissection)	100% (3/3)	100% (3/3)
4. Thyroidectomy (Total Thyroidectomy)	Cefuroxime	Cefuroxime	Cefazolin/Cefuroxime	60% (3/5)	60% (3/5)
5. Abdominal Surgeries (Open/Laparoscopic Appendicectomy, Laparoscopic Cholecystectomy)	Cefuroxime	Cefoperazone	Cefazolin/Cefuroxime (Clean) Cefazolin/Cefuroxime + Metronidazole (Clean -Contaminated)	53.33% (8/15)	26.66% (4/15)
6. Bone Marrow Aspiration	None	None	None	100% (2/2)	100% (2/2)

ENT department as a whole required no antibiotics to be prescribed for clean surgeries but required Cefuroxime/Cefazolin+Metronidazole for clean-contaminated surgeries. The most common antibiotics prescribed were Cefuroxime and Amoxicillin. Single-dosing compliance pre and post-operatively were 36.00% and 18.00% each. Only 64% and 91% of the surgeries pre and post-operatively showed compliance to the choice of antibiotics.

Cardiology also follows that no antibiotics need to be prescribed for clean surgeries but Cefuroxime/Cefazolin+M-etronidazole should be given for clean-contaminated surgeries. The most common antibiotic prescribed is Cefuroxime with the Permcath surgeries, having no pre-operative dosing of the antibiotic. 100% of the surgeries complied preoperatively with the choice of antibiotic according to the schedule, as well as with single dosing. Compliance with the choice of antibiotic post-operatively was 67% while single post-operative dosing was followed in only 33%.

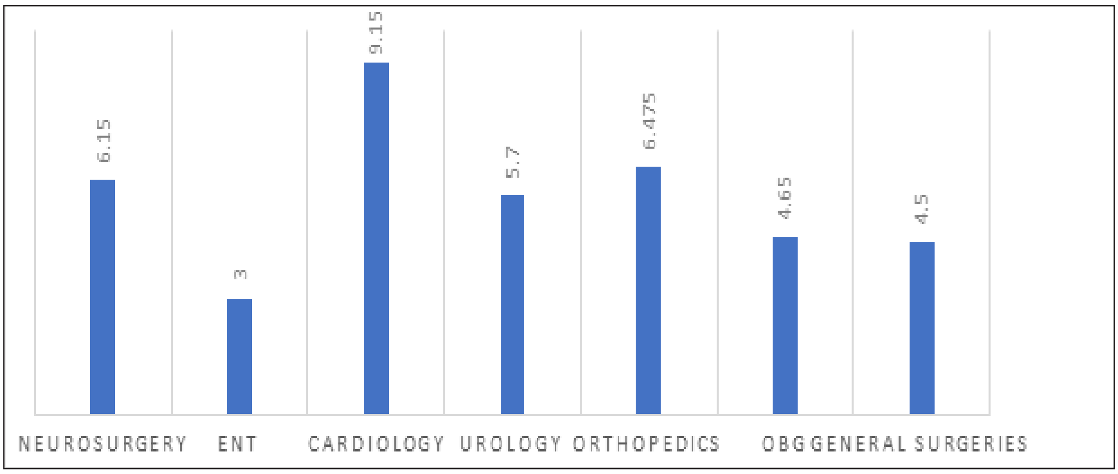

Figure 3: Mean Duration of Hospital Stays in Days

In Urology the most common antibiotic prescribed was Cefotaxime. Guidelines state the use of Cefuroxime/Cefazolin for clean contaminated surgeries and none for clean surgeries. Arterio-Venous Fistula surgeries had no antibiotics prescribed pre-operatively. Pre-Operative and Post-Operative compliance with the choice of antibiotic was 35% and 29% respectively. Single dosing was followed pre-operatively in 94% of surgeries whereas only 3% of the surgeries post-operatively showed compliance.

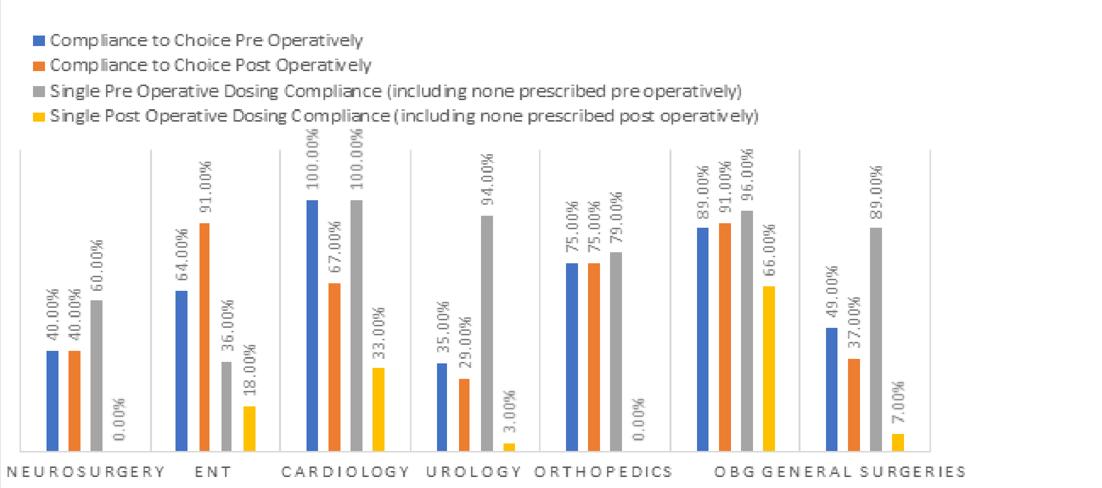

Figure 4: Mean duration of Hospital Stays in days

Cefuroxime was the preferred antibiotic pre and post-operatively in the Orthopedics department. Guidelines state the use of Cefuroxime/Cefazolin for all surgeries except Arthroscopic surgeries that need no antibiotics. Arth-roscopic surgeries still used Cefuroxime as the preferred antibiotic pre and post-operatively. Choice of antibiotics showed 75% compliance both pre and post-operatively. Single dosing was followed in 79% of the surgeries.

Table 3: Compliance with Dosing Guidelines		
Departments with Procedures	Single PreOperative DosingCompliance (including none prescribed pre-operatively)	Single Post Operative Dosing Compliance (including none prescribed post-operatively)
Neurosurgery		
1. Cranial Surgeries (Cranioplasty, Craniotomy, Craniectomy)	42.85% (3/7)	0% (0/7)
2. Burr Hole	100% (3/3)	0% (0/3)
ENT		
1. Ear Surgeries (Tympanoplasty)	33.335 (1/3)	0% (0/3)
2. Nasal Surgeries (Diagnostic Nasal Endoscopy, FESS, Trans Nasal Incision and Drainage)	60% (3/5)	40% (2/5)
3. Laryngeal Surgeries (MLS)	0% (0/3)	0% (0/3)
Cardiology		
1. CABG	100% (4/4)	0% (0/4)
2. Permcath Insertion	100% (2/2)	0% (0/2)
Urology		
1. TURP	100% (5/5)	0% (0/5)
2. AVF	100% (3/3)	0% (0/3)
3. URSL + DJ Stenting	100% (22/22)	4.54% (1/22)
4. Cystoscopy	50% (2/4)	0% (0/4)
Orthopaedics		
1. Interlocking Nail-Femur	100% (3/3)	0% (0/3)
2. Arthroscopic Surgeries	100% (5/5)	0% (0/5)
3. Total Knee Replacement	100% (2/2)	0% (0/2)
4. Open and Closed Reduction and Internal Fixation, External Fixation	64.28% (9/14)	0% (0/14)
OBG		
1. LSCS	100% (44/44)	84.09%(37/44)
2. Hysterectomy	91.66% (11/12)	0% (0/12)
3. Post-Partum Sterilization	66.66% (4/6)	50% (3/6)
4. Laparoscopic Procedures	100% (12/12)	75% (9/12)
General Surgeries		
1. Hernia Surgeries (Open/Laparoscopic Hernioplasty, Herniotomy, Hernia Repair)	95.23% (20/21)	0% (0/21)
2. Groin Surgeries	90.90% (10/11)	0% (0/11)
3. Breast Surgeries (Breast Lump Excision, Left Breast Conservative Surgery)	100% (3/3)	66.66% (2/3)
4. Thyroidectomy (Total Thyroidectomy)	100% (5/5)	0% (0/5)

5. Abdominal Surgeries (Open/Laparoscopic Appendicectomy, Laparoscopic Cholecystectomy)	73.33% (11/15)	0% (0/15)
6. Bone Marrow Aspiration	100% (2/2)	100% (2/2)

Clean surgeries require no antibiotics to be prescribed but clean contaminated surgeries require Cefuroxime/Cefazolin + Metronidazole for OBGYN surgeries. 52.27% of surgeries had post-operative antibiotic dosing. Cefuroxime was the most common antibiotic prescribed except in Hysterectomy where Cefuroxime/Cefazolin + Metronidazole was used. Complice rate with the choice of antibiotic pre-operatively and single pre-operative dosing was 89% and 91%. Postoperative choice of antibiotic and single post-operative dosing showed 96% and 66% compliance respectively.

Table 4: Mean Duration of Hospital Stay and Post-Op Dosing

Departments with Procedures	Duration of Hospital Stay in Days	Duration of Post-Op Dosing in Days
Neurosurgery		
1. Cranial Surgeries (Cranioplasty, Craniotomy, Craniectomy)	7.3	8.7
2. Burr Hole	5	9
ENT		
1. Ear Surgeries (Tympanoplasty)	3.3	4
2. Nasal Surgeries (Diagnostic Nasal Endoscopy, FESS, Trans Nasal Incision and Drainage)	3	4.6
3. Laryngeal Surgeries (MLS)	2.7	2
Cardiology		
1. CABG	9.3	5.8
2. Permcath Insertion	9	5
Urology		
1. TURP	5.8	9.2
2. AVF	2	3
3. URSL + DJ Stenting	3.7	6.1
4. Cystoscopy	11.3	7.5
Orthopaedics		
1. Interlocking Nail Femur	6	12
2. Arthroscopic Surgeries	5	7.8
3. Total Knee Replacement	8.5	13
4. Open and Closed Reduction and Internal Fixation, External Fixation	6.4	8.1
OBG		
1. LSCS	6.4	1.1
2. Hysterectomy	6	4
3. Post-Partum Sterilization	4.2	2.2
4. Laparoscopic Procedures	2	1.2
General Surgeries		
1. Hernia Surgeries (Open/Laparoscopic Hernioplasty, Herniotomy, Hernia Repair)	4.4	7.2
2. Groin Surgeries	3.8	7.5
3. Breast Surgeries (Breast Lump Excision, Left Breast Conservative Surgery)	2.7	1.3
4. Thyroidectomy (Total Thyroidectomy)	6.2	7.6
5. Abdominal Surgeries (Open/Laparoscopic Appendicectomy, Laparoscopic Cholecystectomy)	7.9	8.6
6. Bone Marrow Aspiration	2	0

In General Surgeries, no antibiotics needed to be prescribed for Bone Marrow aspiration but other surgeries required the use of Cefuroxime for clean surgeries and Cefuroxime/Cefazolin+Metronidazole for clean contaminated surgeries. Bone marrow aspiration showed 100% compliance to single dosinng and choice of antibiotic as no antibiotics are prescribed pre and post-operatively. Compliance with the choice of antibiotic was 49% pre-operatively and 37% post-operatively. Single pre=operative dosing was followed in 89% of the surgeries but dropped to 7% post-opratively.

The incidence of brand names in prescription was less in the Neurosurgery and Cardiology department as compared to other departments (Figure 5).

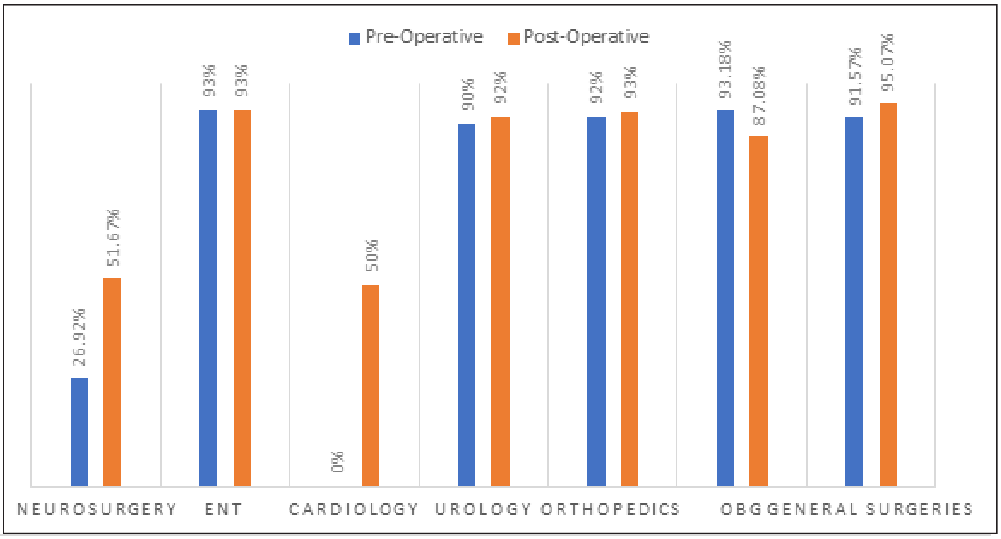

Figure 5: Incidence of Brand Name in Prescription

The compliance to preoperative and post-operative choice of antibiotic was 64.81% and 62.03% bringing the total compliance to the choice of antibiotic to 63.42%. Single pre and post-operative dosing compliance was 87.5% and 26.85% making the total compliance to single dosing 57.15%.3

DISCUSSION

With the incidence of antibiotic resistance increasing coupled with a few antibiotics being developed in the recent past, there is a need for the rational use of antibiotics to prevent the adverse events associated with irrational usage. The standard guidelines provide the basis for the rationale for the prescription of antibiotics, helping in preventing the development of resistance.

In our study, a total of 216 patients were included, with the majority of surgeries performed in the Obstetrics and Gynecology department (34%), followed by General Surgery (26%), Urology (16%), Orthopedics (11%), ENT (5%), Neurology (5%), and Cardiology (3%). The Centers for Disease Control and Prevention (CDC) classification system for surgical wounds plays a crucial role in identifying patients at risk of developing infections at the incision site, underscoring the importance of knowing the wound type before administering antimicrobials to prevent infections during surgical procedures[10].

Compliance with the choice of antibiotics according to hospital guidelines was 63.42%, and compliance with dosing was 57.15%. Similar findings were reported by Parulekar L et al., with 68% compliance in antibiotic choice and 63% in dosing[15]. Studies outside India, such as one by Shrestha S et al. in Nepal, showed higher compliance with local guidelines at 75%[22]. In our study, except for specific surgeries like Micro Laryngeal Surgery, Tympanoplasty, two Cystoscopies [1], and one Appendicectomy[2], which involved more than one pre-operative dosing (1 day before tand pre-operatively), all other surgeries administered the pre operative antibiotic dose 30 minutes before surgery, with no additional doses during surgery[20]. This is consistent withhe findings of Ravi G et al., where timing adhered to guidelines. In contrast, Kaur R et al. observed no consistency in the timing of antimicrobial administration, with antibiotics given between 30 minutes to 6 hours before surgery[19]. Similarly, Rehan S et al. reported a mean administration time of 3.22 ± 1.03 hours before surgery[17].

For surgical prophylaxis, it is crucial to select an antibiotic with the narrowest antibacterial spectrum to minimize the risk of resistance and reserve broad-spectrum antibiotics for potential serious sepsis. Consequently, the use of third-generation cephalosporins like ceftriaxone and cefotaxime is generally discouraged. While there may be valid reasons to use antibiotic combinations, their indiscriminate use can lead to adverse effects such as the emergence of resistant organisms, superinfection, toxic and allergic reactions, and increased treatment costs. In this study, Permcath insertion, bone marrow aspiration, and breast surgeries did not involve a pre-operative antibiotic dose. The most commonly used antibiotics in surgeries were Cefuroxime (60%), followed by Cefotaxime (16%), Ceftriaxone (4%), and Amoxicillin (4%). This finding aligns with Parulekar L et al., where cefazolin and cefuroxime were the most frequently prescribed antibiotics. Other studies also identified cephalosporins as the most common antibiotics used, with Cefotaxime often administered alone or in combination with other agents[16-21].

Cefazolin, a first-generation cephalosporin, is highly effective against most organisms responsible for postoperative infections, causing minimal allergic reactions and side effects, achieving adequate tissue levels, and being relatively cost-effective. These advantages make cefazolin the most suitable agent for prophylactic antibiotic therapy (PAP) in the majority of surgical procedures, as recommended by the World Health Organization (2016).

However, despite its recommendation as the preferred drug for surgical prophylaxis, cefazolin was not used in any instance in our study due to its unavailability in the hospital supply[19]. Our study had several strengths: it utilized routinely collected data, providing a realistic reflection of actual clinical practices, and data collection was closely supervised by the principal investigator, ensuring high data quality.

With the exception of Neurosurgery and Cardiology, all other surgical departments exhibited a high prevalence of brand names in prescriptions compared to generic names. Similar findings were reported in a study conducted at Era's Lucknow Medical College and Hospital by Kaur R et al. A study by Machowska A et al in Madhya Pradesh found that brand name usage in prescriptions was lower in teaching hospitals compared to non-teaching hospitals[19]. The same study also noted that patients in teaching hospitals had significantly longer stays than those in non-teaching hospitals, likely due to the provision of free services, including medications and diagnostics, in teaching institutions. Conversely, in non-teaching hospitals, where patients must pay out-of-pocket for services and medicines, shorter hospital stays and prescription durations were observed[21].

Inappropriate use of antimicrobials, particularly in terms of antibiotic selection, dosage, and treatment duration, can not only elevate the risk of surgical site infections but also contribute to antibiotic resistance. Guidelines play a crucial role in assisting surgeons in selecting the appropriate antibiotics. This study assessed adherence to antimicrobial surgical prophylaxis practices by comparing the prescribed antibiotic selection, dosage, and timing of administration against established guidelines to validate compliance and its impact on outcomes.

For surgical prophylaxis, it is crucial to choose antibiotics with the narrowest antimicrobial spectrum to minimize the risk of developing resistance. Broad-spectrum antibiotics should be reserved for potential cases of severe sepsis. Therefore, the use of third-generation cephalosporins, such as ceftriaxone and cefotaxime, is generally discouraged in surgical prophylaxis. While there may be valid reasons to use multiple antibiotics in combination, their indiscriminate use can lead to several adverse effects, including the emergence of resistant organisms, superinfection, increased risk of toxic and allergic reactions, and higher treatment costs.

CONCLUSION

The results of this study will provide new insights into the prescription patterns among medical practitioners and their adherence to surgical antibiotic prophylaxis guidelines. These findings could inform recommendations and potential revisions to the guidelines, based on the observed prescribing practices of doctors.

REFERENCES

1. Salman MT, Akram MF, Rahman SZ, Haseen MA, Khan SW. Drug Prescribing Pattern in Surgical Wards of a Teaching Hospital in North India. Indian J Practicing Doctor 2008; 5(2): 47-50
2. Dancer S, Coyne M, Robertson C, Thomson A, Guleri A, Alcock S. Antibiotic use is associated with resistance of environmental organisms in a teaching hospital. Journal of Hospital Infection. 2006;62(2):200-206.
3. J van Disseldorp , E J M H Slingenberg, A Matute, E Delgado, E Hak, I M Hoepelman. Application of guidelines on preoperative antibiotic prophylaxis in León, Nicaragua (Internet). PubMed. 2022 (cited 9 January 2022). Available from: https:// pub me d.ncbi.nlm.nih.gov/17179571/
4. Mahmoudi L, et al. Optimizing compliance with surgical antimicrobial prophylaxis 12 guidelines in patients undergoing gastrointestinal surgery at a referral teaching hospital in southern Iran: clinical and economic impact. Infect Drug Resist 2019; 12: 2437– 2444.
5. Tarchini G, Liau K, Solomkin J. Antimicrobial Stewardship in Surgery: Challenges and Opportunities. Clinical Infectious Diseases. 2017;64(suppl_2):S112-S114.
6. Satti M, Hamza M, Sajid Z, Asif O, Ahmed H, Zaidi S et al. Compliance Rate of Surgical Antimicrobial Prophylaxis and its Association with Knowledge of Guidelines Among Surgical Residents in a Tertiary Care Public Hospital of a Developing Country. Cureus. 2019.
7. Walia K, Ohri V, Madhumathi J, Ramasubramanian V. Policy document on antimicrobial stewardship practices in India. Indian Journal of Medical Research. 2019;149(2):180.
8. Burke J. Infection Control — A Problem for Patient Safety. New England Journal of Medicine. 2003;348(7):651-656.
9. National Nosocomial Infections Surveillance (NNIS) report, data summary from October 1986-April 1996, issued May 1996. A report from the National Nosocomial Infections Surveillance (NNIS) System (Internet). PubMed. 2022 (cited 9 January 2022). Available from: https://pubmed. ncbi. nlm.nih.gov/8902 113/
10. AJ M, TC H, ML P, LC S, WR J. Guideline for Prevention of Surgical Site Infection, 1999. Centers for Disease Control and Prevention (CDC) Hospital Infection Control Practices Advisory Committee (Internet). PubMed. 2022 (cited 9 January 2022). Available from: https://pubmed.ncbi.nlm.nih.gov/10196487/
11. Rizvi M, Rizvi MW, Sultan A, Khan F, Shukla I, Malik A. Emergence of coryneform bacteria as pathogens in nosocomial surgical site infections in a tertiary care hospital of North India. Journal of infection and public health. 2013 Aug 1;6(4):283-8.

12. Anand Saxena, Mahendra Pratap Singh, Swagata Brahmachari, Malay Banerjee. Surgical site infection among postoperative patients of tertiary
13. McDonald M, Grabsch E, Marshall C, Forbes A. SINGLE.VERSUS MULTIPLE–DOSE antimicrobial prophylaxis for major surgery: a systematic review. Australian and New Zealand Journal of Surgery. 1998 Jun;68(6):388-95.
14. Scottish Intercollegiate Guidelines Network (2008) Antibiotic prophylaxis in surgery. A national clinical guideline. http://www.sign.ac.uk/pdf/sign104.pdf
15. Parulekar L, Soman R, Singhal T, Rodrigues C, Dastur F, Mehta A. How good is compliance with surgical antibiotic prophylaxis guidelines in a tertiary care private hospital in India? A prospective study. Indian Journal of Surgery. 2009;71(1):15-18.
16. P. K, R. JR, Raja S. Prescription pattern of prophylactic antimicrobial agents used in preoperative patients at a tertiary care teaching hospital (Internet). International Journal of Pharmacy and Pharmaceutical Sciences. (cited 2022 Oct31).
17. Rehan HS, Kakkar AK, Goel S. Pattern of surgical antibiotic prophylaxis in a tertiary care teaching hospital in India. International journal of infection control. 2010;6(2).
18. Kisshore Kumar G, Preethy R, Srinivasan V. A study to evaluate and assess the antibiotic prescription pattern for the surgical prophylaxis to prevent post-operative wound infection (SSI) in a tertiary care hospital. International Journal of Research in Pharmaceutical Sciences. 2019;10(4):2786-2791.
19. Kaur R, Salman MT, Gupta NK, Gupta U, Ahmad A, Verma VK. Presurgical Antibiotic Prophylaxis Pattern In An Indian Tertiary Care Teaching Hospital. JK Science. 2015 Apr 1;17(2).
20. Ravi G, Chikara G, Bandyopadhyay A, Handu S. Compliance of surgical antimicrobial prophylaxis practices in the departments of general surgery and orthopaedics at a tertiary care centre in India. International Journal of Advances in Medicine. 2020;7(10):1492.
21. Machowsk A, Sparrentoft J, Dhakaita S, Stslsby Lundborg C, Sharma M. Perioperative antibiotic prescribing in surgery departments of two private sector hospitals in Madhya Pradesh, India. Perioperative Medicine. 2019;8(1):8-10.
22. Shrestha S, Hann K, Kyaw K, Koju P, Khogali M. Surgical antibiotic prophylaxis administration practices. Public Health Action. 2021;11(1):18-23.
23. Alshehhi H, Ali A, Jawhar D, Aly E, Swamy S, Fattah M et al. Assessment of implementation of antibiotic stewardship program in surgical prophylaxis at a secondary care hospital in Ras Al Khaimah, United Arab Emirates. Scientific Reports. 2021;11(1).

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