ejpmr, 2021,8(7), 626-630

SJIF Impact Factor 6.222

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article

ISSN 2394-3211

EJPMR

STUDY ON ANTIMICROBIAL USE IN SURGICAL PROPHYLAXIS

Sriram A.*, Junior Sundresh N. and Dheepthi M.

*Department of Pharmacy Practice, Annamalai University, Annamalai Nagar, India.
Department of Surgery, Rajah Muthaih Medical College Hospital, Annamalai University, Annamalai Nagar, India.

***Corresponding Author: Sriram A.**

Department of Pharmacy Practice, Annamalai University, Annamalai Nagar, India.

Article Received on 20/05/2021 **Article Revised on 09/06/2021** **Article Accepted on 30/06/2021**

ABSTRACT

Objectives: To observe and document the commonly used prophylaxis in this study. To observe and document the antimicrobials used to treat post-surgical infections. To observe the total consumption of antimicrobials used in the study using defined daily dose. **Methods:** This is cross-sectional study conducted in rajah muthaih medical college it is based on ASHP therapeutic guidelines for antimicrobial prophylaxis in surgery. **Results:** This result comprises 150 samples were admitted in surgery ward and investigated prospectively. Among that women were more in number with 54.67% than men with 45.33%. The majority of the patients were with an age group of 20-30 years (42.60%), 31-40 years (24%), 41-50 years (10%), 51-60 years (23.4%) were admitted in the surgery wards. In this study, the most commonly occurring surgery was appendicitis (60%), followed by inguinal hernia (13.3%), wound debridement (10%) hydrocele (6.7%), abscess left thumb (6.7%) and gastric perforation (2.7%) were mainly admitted for surgery. The most commonly used antimicrobial prophylaxis in this study was said to be Cefotaxime (58%) and ceftriaxone (27%) in this study. The antimicrobial agents which was prescribed to treat post-surgical infections in most of the cases was Gentamycin which was given to 32% of the cases followed by 22.7% patients were prescribed metronidazole, while 21.3% patients received Cefixime, a third generation cephalosporin and amikacin 16% were used along with the above antimicrobials. **Conclusion:** Third generation cephalosporins were considered as the most commonly used prophylaxis in this study. Gentamycin, metronidazole and Cefixime were used to treat post-surgical infections. Metronidazole, Cefixime and ciprofloxacin were frequently observed in surgical patients during hospital discharge. There is a need of hospital specific guidelines for antimicrobial use in choosing prophylaxis and proper counseling were needed for the patients in this study. Optimal timing of antibiotic administration is considered an important factor for effective prophylaxis.

KEYWORDS: Antimicrobials, Prophylaxis, Surgical site infections.

INTRODUCTION

Emerging antibiotic resistance is a major global public health challenge. At the same time, untreated infections are one of the main causes of surgical mortality in low and middle income countries. Surgical site infections were most common type of infections associated with surgery among worldwide. In India, surgical site infections were commonly occurred after surgery which gives significant burden with regards to the patient's mortality, morbidity rates, lengthy hospital stay and increased health care costs. Increased infection coupled with the usage of antimicrobials can also lead to the progressing antimicrobial resistance in India.[1] Surgical antimicrobial prophylaxis is one of the most commonly used practices in surgery to prevent the incidence of SSI. Prophylaxis may become the standard care for contaminated and clean contaminated infections and for surgery.[2] The use of prophylactic antimicrobials is one of the important factors in surgery and has been regularly used to eradicate endogenous microorganism and to prevent infection complication. Surgical site infection of the incised tissue is an infection that occurs after surgery. It remains the major cause of post-operative mortality, prolonged hospitalization and increased cost of medical care in surgical unit. Appropriate prophylactic antimicrobials administration before surgery can reduce the incidence of surgical site infection.[3-4] The proper use of antimicrobial prophylaxis can reduce the risk of post-surgical infections but the use of additional antimicrobials may increase the risk of antimicrobial resistance.[5] Almost 30-50% of antimicrobials used as prophylaxis in hospital care setting. However between 40-90% of this prophylaxis is inappropriate because the antimicrobials were given at wrong time or given for long time.[6] Choosing antimicrobials for prophylaxis is based on some factors, antimicrobial regimen, dose, route, time of administration. Before going to choose an antibiotic always ask the patient about the prior history of antimicrobial allergy. It is important to select an antimicrobials with narrowest antibacterial spectrum

required to reduce the pathogens.[7-8] The timing of dosing is important for most of the beta lactam antimicrobials because they are having short half-life. Intramuscular antimicrobials are less common used than i.v antimicrobials. They are given at the time of premedication so that peak tissue levels are attained at the most critical time, and at the time of surgical incision. Normally prophylaxis may give before 30 minutes prior to surgery. In a recent survey showed that the preoperative administration of antimicrobials within 2 hours before surgical incision reduced the rate of Surgical site infections compared with 3.8% for early administration (2–24 hours before surgical incision) and 3.3% for any postoperative administration (any time after incision).[9]

MATERIALS AND METHODS

A Prospective observational study was conducted at rajah muthaih medical college Hospital (RMMCH), Annamalai Nagar, Chidambaram. It was 1450 bedded tertiary care teaching hospital. Patients admitted in the wards of surgery in surgery department were used as the samples for the study. The patient details were collected from the case sheets. The size of the sample was randomly selected to find 200 cases, out of that 150 cases were included in this study. The study period was carried out for 6 months.

Inclusion criteria

- Patients who were receiving antimicrobial prophylaxis prior to surgery.
- Patients who were receiving antimicrobials for post-surgical infection
- Patients with age group between 20-60 years.

Exclusion criteria

- Patients who are above 60 years of age.
- Patients with pregnancy.
- Patients who are not willing to cooperate.

Data Collection

The first step in the study was to design a data collection form and prescription analysis form. The patient data collection form was used to collect all the details like inpatient number, patient name, age, sex, date of admission, date of discharge, chief complaints, history of present illness, past medication history, laboratory data, diagnosis, dose, route of administration, the frequency of the therapeutic management.

RESULTS

Table 1: Demographic Details (n=150).

Age	Males		Females		Total
	No's	(%)	No's	(%)	(%)
20-30	23	15.3	41	27.3	42.60
31-40	11	7.3	25	16.6	23.90
41-50	6	4	9	6	10
51-60	28	18.6	7	4.6	23.2

Table 2: classification of patients based on surgical site infection.

Surgical site infection	No's	(%)
Clean	13	8.6
Clean contaminated	23	15.4
Contaminated	36	24
Dirty/infected	78	52

Table 3: classification of patients prevalence based on various conditions.

S.No.	Surgery	Prevalence	
		No's	(%)
1.	Hernia	20	**13.3**
2.	Acute appendicitis	90	**60**
3.	Abscess left thumb	10	6.7
4.	Hydrocele	10	6.7
5.	Gastric perforation	5	3.3
6.	Wound debridement	15	10

Table 4: Days of hospital stay.

Surgery	2-4 days		5-7 days		>7 days	
	No's	(%)	No's	(%)	No's	(%)
Hernia	8	5.3	10	6.6	2	1.3
Acute appendicitis	11	7.3	42	28	37	24.6
Abscess left thumb	9	6	1	0.6	-	-
Hydrocele	5	3.3	4	2.6	1	0.6
Gastric perforation	3	2	2	1.3	-	-
Wound debridement	-	-	9	6	6	4

Table 5: Prescribed prophylactic antimicrobials used in the study.

S.No.	Drugs	No's	%
1.	Cefotaxime	88	58%
2.	Ceftriaxone	40	27%
3.	Metronidazole	22	15%

Table 6: Prescribed antimicrobials used to treat post-surgical infections & at Discharge.

Post-surgical infections				At Discharge	
S.No.	Drugs	No's	%	No's	%
1.	Metronidazole	33	22.7	75	50
2.	Ciprofloxacin	12	8	28	18.7
3.	Gentamycin	48	32	-	-
4.	Amikacin	25	16	-	-
5.	Cefixime	32	21.3	47	31.3

Table 7: ATC codes and DDD/100 bed days for antimicrobials used in surgery.

Drugs	ATC code	DDD value	DDD/100 days
Cefotaxime	J01DD01	4gm	0.42
Gentamycin	J01GB04	0.24gm	0.36
Metronidazole	J01XD01	1.5gm	0.14
Amikacin	J01GB06	1gm	0.14
Ciprofloxacin	J01MB03	1gm	0.13
Ceftriaxone	J01DD04	2gm	0.06

RESULTS

This result comprises 150 samples were admitted in surgery ward and investigated prospectively over 6 month period. Among that women were more in number with 54.67% than men with 45.33%. The majority of the patients were with an age group of 20-30 years (42.60%), 31-40 years (24%), 41-50 years (10%), 51-60 years (23.4%) were admitted in the surgery wards. Among those surgical site infections, 52% had dirty/infected cases, (24%) were contaminated cases, 15.4% were clean contaminated cases and 8.6% were clean. In this study, the most commonly occurring surgery was appendicitis (60%), followed by inguinal hernia (13.3%), wound debridement (10%) hydrocele (6.7%), abscess left thumb (6.7%) and gastric perforation (2.7%) were mainly admitted for surgery. Antimicrobial prophylaxis was received by all the 150 patients. In this study, three different parameters were seen in prophylaxis administration such as the choice of antimicrobial agent, timing of administration of first dose as prophylaxis and the duration of prophylaxis were assessed in all the cases. The most commonly used antimicrobial prophylaxis in this study was said to be Cefotaxime (58%) and ceftriaxone (27%) in this study. The antimicrobial agents which was prescribed to treat post-surgical infections in most of the cases was Gentamycin which was given to 32% of the cases followed by 22.7% patients were prescribed metronidazole, while 21.3% patients received Cefixime, a third generation cephalosporin and amikacin 16% were used along with the above antimicrobials. It was preferred for most of the post-operative surgical cases. The duration of the postoperative prophylaxis extended to most of the cases during their hospital stay. Oral Cefixime was prescribed in 21.3% of the cases and other Oral antimicrobials were also prescribed on discharge. Cefixime was commonly prescribed, followed by metronidazole, levofloxacin, and amoxicillin were prescribed during discharge. In addition, topical antimicrobials were also prescribed for few patients. The consumption of antimicrobials used in the surgical wards during the study period was calculated in terms of defined daily dose/100 bed days. In this study DDD/100 bed days for commonly used antimicrobials in surgery wards were gentamycin (0.36) followed by amikacin (0.14), metronidazole (0.14), ciprofloxacin (0.13), and ceftriaxone (0.06).

DISCUSSION

Antibiotic prophylaxis is associated with a decreased risk of postoperative SSIs. This study assessed the

appropriateness of antimicrobial use in prophylaxis and post-surgical infections among hospitalized patients. In this study all the patients received antimicrobial prophylaxis prior to the surgery and they were given within one hour before incision by intravenous infusion. The most commonly prescribed prophylactic antimicrobials in this hospital were 3rd generation cephalosporins as mentioned in earlier studies in Kerala.[10-11] The usage of antimicrobials in this study seems to be rational and based on experience of the physician. Ceftriaxone and Cefotaxime followed by metronidazole were commonly prescribed antibiotics as prophylaxis and it is given for all types of surgery in this study. The doses of antimicrobial prophylaxis in this study were Cefotaxime 1gm, ceftriaxone 1gm and metronidazole 500mg respectively. Whenever Administered the initial dose of antimicrobial prophylaxis to the patient was considered as the most important factor associated with reduction in surgical site infection rate from 96% to 80% by 0–2 hr. before the incision.[11] The best time for administration of prophylaxis for preoperative doses is within 30-60 minutes before surgical incision. In this study drugs such as Amikacin, Gentamycin, ciprofloxacin, require administration over 60-120 minutes. Therefore, the administration of these agents should begin within 30-60 minutes before surgical incision.[12] This study shows the higher rates of usage of antimicrobial prophylaxis were third generation cephalosporins and then macrolides, aminoglycosides play an important role in treating post-surgical infections [All the drugs used in the study are in injectable form. Most of the drugs were prescribed by generic names. These shows less cost medicines were used for all cases. Meanwhile antibacterial usage is commonly occurs in few cases. Few patients received metronidazole for pre and post-surgical cases. Furthermore it was found that the combination therapy such as (Cephalosporins+ Metronidazole), (Gentamycin+ Metronidazole) were often prescribed for the patients with some post-operative infections.[13-17]

CONCLUSION

From past few years lot of steps has been taken to reduce the unnessary prescribing of antimicrobials but the usage of antimicrobials was considerably increased especially in surgical patients. New antimicrobials needed to meet the challenge of resistance are often more expensive than the predecessor and this likely to increase the challenge for vulnerable groups to afford treatment with antimicrobials during and after surgery. Prophylaxis helps to prevent many infections at surgical site. The recent clinical practice of the antimicrobials in surgical prophylaxis in our hospital was found to be rational and comparable to the standard guidelines, with regards to the timing of administration, and dosing of prophylaxis. In this study we conclude that there was a significant reduction in surgical site infection due to prophylactic antimicrobials use. The patients with appendicitis and hernia were having more prevalence in this study. Patients with the age group over 40 years with lengthy hospital stay for more than 7 days, administrating first dose of surgical antimicrobial prophylaxis before 30 to 60 mins of surgical incision and time duration of surgery for more than 60 mins were independent predictors for Surgical site infections. This study concludes that patients were unaware about infections, usage of antimicrobials. Third generation cephalosporins were considered as the most commonly used prophylaxis in this study. Gentamycin, metronidazole and Cefixime were used to treat post-surgical infections. Metronidazole, Cefixime and ciprofloxacin were frequently observed in surgical patients during hospital discharge. There is a need of hospital specific guidelines for antimicrobial use in choosing prophylaxis and proper counseling were needed for the patients in this study. Optimal timing of antibiotic administration is considered an important factor for effective prophylaxis in this study.

Conflict of interest

No conflict of interest.

ACKNOWLEDGEMENTS

We would like to acknowledge Rajah Muthaih Medical College hospital, Chidambaram, India.

REFERENCES

1. Dale W. Bratzler, E. Patchen Dellinger, Keith M. Olsen, Trish M. Perl, Paul G. Auwaerter, Maureen K. Bolon, Douglas N. Fish, Lena M. Napolitano, Robert G. Sawyer, Douglas Slain, James P. Steinberg, and Robert A. Weinstein, Clinical practice guidelines for antimicrobial prophylaxis in surgery. American Journal of Health-System Pharmacy, 2013; 70: 195-283.
2. Wendy Munckhof, Antibiotics for surgical prophylaxis. Australian Prescriber, 2005; 28: 38–40.
3. Maksum Radji , Fithrotul Aini, Siti Fauziyah, Evaluation of antibiotic prophylaxis administration at the orthopedic surgery clinic of tertiary hospital in Jakarta, Indonesia, Asian Pacific Journal of Tropical Disease, 2014; 4(3): 190-193.
4. Horan TC, Culver DH, Gaynes RP, Jarvis WR, Edwards JR, Reid CR, Nosocomial infections in surgical patients in the United States, January 1986-June 1992. National Nosocomial Infections Surveillance (NNIS) System, Send to Infection Control Hospital Epidemiology, 1993 Feb; 14(2): 73-80.
5. McGowan JE Jr., Cost and benefit of perioperative antimicrobial prophylaxis: methods for economic analysis. Reviews of Infection Disease, 1991 Sep-Oct; 13 Suppl 10: S879-89.
6. M. Dettenkofer, D. H. Forster, W.Ebner, P. Gastmeier, H. Ruden, F. D. Daschner, The Practice Of Perioperative Antibiotic Prophylaxis In Eight German Hospitals, Infection, 2002; 30: 3.

7. Goodman and Gilman's the pharmacological basics of therapeutics; McGraw hill medica publishing division, 2006; 11: 1143-1146.
8. Roger walker and Clive Edwards's clinical pharmacy and therapeutics, 1999; 2: 531: 545.
9. David C. Classen, R. Scott Evans, Stanley L. Pestotnik, Susan D, Ronald L. Menlove. The Timing of Prophylactic Administration of Antibiotics and the Risk of Surgical-Wound Infection. New England Journal of Medicine, 1992; 326: 281-286.
10. John P. Burke, Maximizing Appropriate Antibiotic Prophylaxis for Surgical Patients: An Update from LDS Hospital, Salt Lake City, Clinical Infectious Disease, 2001 Sep 1; 33(2): S78-83.
11. Clinical Practice Guidelines for Antimicrobial Prophylaxis in Surgery, 654 ASHP Therapeutic Guidelines.
12. Walter P. Weber, Walter R. Marti, Marcel Zwahlen, Heidi Misteli, Rachel Rosenthal, Stefan Reck, et al. The Timing of Surgical Antimicrobial Prophylaxis, Annals of Surgery, 2008; 247(6).
13. Raj Kumar. K, A study on the antimicrobial usage pattern for the prevention of surgical site infections in a teaching hospital, International Surgery Journal, 2019 Apr; 6(4): 1318-1322.
14. Afzal Khan A.K, Mirshad P.V, Mohammed Rafiuddin Rashed, Gausia Banu, A Study on the Usage Pattern of Antimicrobial Agents for the Prevention of Surgical Site Infections (SSIs) in a Tertiary Care Teaching Hospital, Journal of Clinical and Diagnostic Research, 2013 April; 7(4): 671-674.
15. Cartmill C, Lingard L, Regehr G, Espin S, Bohnen J, Baker R, et al. Timing of surgical antibiotic prophylaxis administration: complexities of analysis. BMC Medicinal Research Methodology [Comparative Study Letter Research Support, Non-U.S. Gov't], 2009; 9: 43.
16. Salman MT, Akram MF, Rahman SZ, Khan FA, Haseen MA, Khan SW. Drug prescribing pattern in surgical wards of a teaching hospital in North India. Indian Journal for the Practicing Doctor, 2008; 5(2).
17. Al-Azzam SI, Alzoubi KH, Mhaidat NM, Haddadin RD, Masadeh MM, Tumah HN, et al. Preoperative antibiotic prophylaxis practice and guideline adherence in Jordan: A multi-centre study in Jordanian hospitals. Journal of Infections in Developing Countries, 2012; 6: 715-20.