Research Paper

International Journal of Pharmaceutical Sciences and Nanotechnology
Volume 10 • Issue 5 • September – October 2017
MS ID: IJPSN-07-05-17-SATISH KUMAR

Evaluation of Post-Surgical Antibiotic Utility Patterns in an Indian Tertiary Care Teaching Hospital

B.P. Satish Kumar[1], Azad Moidul Islam[1]*, Ankit Acharya[2], Faruk Azad Kibria[1], Renukaa Aradhya Chitti[1], and C.H. Vinay[2]

[1]Department of Pharmacy Practice and [2]Department of Pharmaceutics, Sri Adichunchanagiri College of Pharmacy, Karnataka- 571448, India.

Received July 5, 2017; accepted July 24, 2017

ABSTRACT

Rationale use of antibiotic prophylaxis is essential to reduce the incidence of surgical site infections and cost inefficiency. However, inappropriateness of antibiotic prophylaxis administration is still commonly observed in surgical hospitals. A prospective and observational study was carried out in 111 patients at tertiary care hospital in India. Among the 111 study population enrolled in the study, the majority of study populations were males 70.270% and the females were about 29.729%. Among the 111 study populations enrolled in the study, the majority of the subjects belonged to the age group ≥18 years (88%) and followed by 13-17 years (7%) and 1-12 years (4%). Among 111 patients included in the study, the majority of patients were found ulcer (18%) and followed by hernia (12%), appendicitis (9.9%), head injury (4.5%), burn (3.6%), abscess (3.6%), cystitis (2.7%), hemorrhoids (2.7%), cholelithiasis (2.7%), cancer (3.6%), breast infection (1.81%), miscellaneous (4.5%). Among 111 subjects enrolled in the study, the majority of the subjects (74) had surgery (66%) and 37 subjects did not get surgery (33.33%). Among 111 subjects included in the study, the majority of subjects stayed (5-10days) in the hospital for 11 to 31 days. In 78 (70%) cases, there was no drug interaction and only 33 (30%) subjects showed drug interactions at mild to moderate level. In 66 subjects, antibiotics were prescribed in fixed dose combination. In 45 subjects, antibiotic were prescribed by generic name and 35 subjects got antibiotics from both fixed dose combination and generic version. Within 111 subjects, majority of subjects got rational use of antibiotics (85 subjects, 76%) and irrational use of antibiotic found in 26 subjects (23%). This study confirms that the use of antibiotic prophylaxis needs to be continuously focused in surgery department in order to improve rational use of antibiotic prophylaxis to decrease morbidity and cost.

KEYWORDS: Antibiotic; surgical prophylaxis; rational use; resistance.

Introduction

Antibiotic prophylaxis for surgical procedures plays an important role in preventing surgical site infection. Most studies demonstrated that non-compliance is mostly caused by incorrect antibiotic selection, timing of administration and prolonged duration of prophylaxis. The inappropriateness and excessive in the administration of prophylactic antibiotics can increase the treatment costs and the emergence of antimicrobial resistance (Ashok et al., 2014). Surgical antibiotic prophylaxis is defined as the use of antibiotics to prevent infections at the surgical site. Selection of an appropriate antimicrobial agent (AMA) depends on the pathogen most likely to cause an infection. The antibiotic selected should only cover the likely pathogens. It should be given at the correct time. SSI is one of the most common post-operative complication and represents burden in terms of patient morbidity and mortality and costs to health services around the world (Aya et al., 2014). SSIs are also the second commonest nosocomial infection accounting for one quarter of 2 million hospital acquired infections in USA annually. In India, due to lack of adequate information and guidelines for antimicrobial prophylaxis in surgery there is a need to generate baseline data on the pattern of use of prophylactic antibiotics (Sneha et al., 2013). Common types of irrational use of medicines include non-compliance with health worker prescription, self-medication with prescription drugs, overuse and misuse of antibiotics, overuse of injection and relatively safe medicines, use of unnecessary expensive medicines and poor patient compliance. Many individuals or factors influence the irrational use of medicines such as patients, prescribers, the workplace environment, the supply system including industry influences, government regulation, and drug information and misinformation (Maksum, 2014).

Wound infections are the commonest hospital-acquired infections in surgical patients.

Approximately 30-50% of antibiotic use in hospitals is now for surgical prophylaxis. However, between 30-90% of the prophylaxis is inappropriate, that increases the selective pressure favoring the emergence of antimicrobial resistance. Judicious use of antibiotics in

hospital through effective antibiotic policy and guidelines development is thus essential (Maksum, 2014). Postoperative SSI is rare in patients undergoing clean head and neck operations, surgeons often aim to initiate proper wound healing by prophylactic preoperative antibiotics in "clean" contaminated sites. In this case, the aim is to minimize the preoperative bacterial load to a level that will not lead to clinical infection. Hence, a close look on the current evidence regarding prophylactic preoperative antibiotic regimes in common surgery seems to be appropriate (Patrick et al., 2014). Antibiotics administered prior to the contamination of previously sterile tissues or fluids are deemed 'prophylactic antibiotics. Prevention of SSI is the main goal of antibiotics prophylaxis. An estimated 40-60% of SSI preventive with appropriate use of prophylactic antibiotics (Sohil et al., 2006).

In the recent years, in response to the medical improvements, the field of infection control has progressed by cooperation of the epidemiology with health sciences to decrease risk factors for health care-associated infections (HAIs); therefore, interventions to prevent HAIs should be implemented. The primary role of an infection-control program is to reduce the risk of nosocomial infection through protecting patients, employees, health care students, and visitors. Health care-associated infections are reported in 1.7 million cases annually in the United States with approximately 100,000 deaths. Nearly 60% of the admitted patients receive antibiotics and antibiotics usage varies widely across hospital (Gokul et al,. 2014). Following elective surgery, wound infection in patients who receive pre-operative antibiotics (within three hours following skin incision) occurs in 1.4% compared with 0.6% in those who receive antibiotics within two hours prior to skin incision. Prophylactic antibiotics reduce the incidence of SSIs and evidence based guidelines recommend their use prior to incision as opposed to during or after the procedure (Rehan et al., 2010). Thus, this study was undertaken to evaluate the utility patterns of post-surgical antibiotic use in a surgical Hospital in India.

Materials and Methods

This study was conducted at the Surgery Department at Adichunchanagiri Hospital and Research Center, B.G. Nagara-571448.

Study Criteria

Inclusion criteria: The all adults and children in patients (any sex) are subjected for surgical procedure at Adichunchanagari Hospital and Research Centre were included in study.

Exclusion criteria: The patient undergoing surgery of minor importance without (significant indication) and the patient with pre-existing infections.

Study procedure: This is a prospective and observational study, the patients who were satisfied the inclusion criteria were enrolled in the study after obtaining their written consent. The clinical pharmacist had reviewed the patient case notes, medication chart, laboratory data and other relevant documents. A suitably designed data collection form used to record all the necessary data including patient demographic details, patient medication history, and reason for admission, any allergic reaction, medication details and lab investigations. In this if any harmful medication errors were observed, interventions were done. The collected data were subjected for suitable statistics.

Results and Discussion

Results of gender wise distribution, among the 111 study population enrolled in the study, the majority of study population were males about 78 (70.270%) and the females were about 33(29.729%). The result is shown in Table 1.

TABLE 1

Gender wise distribution of subjects.

Sex	Number	%
Male	78	70.270
Female	33	29.729
Total	111	100

As shown in the table, among the 111 study population enrolled in the study, the majority of study population were males about 78(70.270%) and the females were about 33(29.729%).

Results of distribution of the patients based on age group, among the 111 study populations enrolled in the study, the majority of the subjects i.e. belongs to the age group ≥18 years (88.288%) and followed by 13-17years (7.207%) and 1-12 years (4.504). The result are shown in Table 2.

TABLE 2

Distribution of the subjects based on age.

Age group	Number	%
1-12 Years	05	4.504
13- 17 Years	08	7.207
≥ 18 Years	98	88.288
Total	111	100

As shown in the table, among the 111 study populations enrolled in the study, the majority of the subjects i.e. belongs to the age group ≥18 years (88.288%) and followed by 13-17years (7.207%) and 1-12 years (4.504).

Results of social history of patient, among the 111 study populations enrolled in the study, the majority of populations were found none (alcoholic and smoker) about 78 (70.270%), and followed by alcoholic about 21 (18.918%) and smoker were found about 12 (10.81%). The results are shown in Table 3.

TABLE 3

Social history of subjects.

History	Number	%
Alcoholic	21	18.918
Smoker	12	10.81
None	78	70.270
Total	111	100

As shown in table, among the 111 study populations enrolled in the study, the majority of populations were found none (alcoholic and smoker) about 78(70.270%), and followed by alcoholic about 21 (18.918%) and smoker were found about 12 (10.81%).

Results of distribution of diagnosed disease, among 111 patients included in the study, the majority of

patients were found ulcer 18.93% (where diabetic foot ulcer 14.41%, ulcer dorsum left foot 0.909%, left varicose ulcer 0.909% and non-healing ulcer 2.702%) and followed by Hernia 12.61%, appendicitis 9.909%, head injury 4.50%, burn 3.60, abscess 3.60%, cystitis 2.702%, haemorrhoids 2.702%, cholelithiasis 2.702%, breast cancer 1.801%, soft tissue sarcoma 1.801%, breast infection 1.801%, miscellaneous 4.504%, and others including-small bowel obstruction, wet gangrene right foot, paraphimosis, phimosis, lipoma, benign prostatic hyperplasia, right ankle developing injury, cholecystitis, cleft palate, stitch granuloma, fracture of 4th RCB with COPD, multi nodular goitre, inflammatory bowel disease, atherosclerosis pulmonary vascular disease, pneumocephalous and faciomaxillary injury, UTI, chronic lymphedema of right lower limb, omphalitis, pancreatitis, left dorsum forearm and hand PIRA, epididymoarchitis, bilateral epidymal cyst, GERD, right nasal mass, varicocele, neurofibromatosis, deiratal nasal septum to right, cell carcinoma of left upper aid, port site infection, hirudentis supportive, and thorn prick injury with disarticulation of little toe (where each of these diseases found 0.909%). The result are shown in Table 4.

TABLE 4

Distribution of specific diagnosis in the subjects.

S. No.	Disease	Number	%
1	Acute appendicitis	11	9.909
2	Small bowel obstruction	1	0.909
3	Wet gangrene right foot	1	0.909
4	Head injury	5	4.50
5	Ulcer dorsum left foot	1	0.909
6	Diabetic foot	16	14.41
7	Left varicose ulcer	1	0.909
8	Hernia	14	12.61
9	Paraphimosis	1	0.909
10	Phimosis	1	0.909
11	Lipoma	1	0.909
12	Burn	4	3.60
13	Breast cancer	2	1.801
14	Benign prostatic hyperplasia	1	0.909
15	Right ankle developing injury	1	0.909
16	Cholecystitis	1	0.909
17	Cleft palate	1	0.909
18	Soft tissue sarcoma	2	1.801
19	Stitch granuloma	1	0.909
20	Cystitis	3	2.702
21	Fracture of 4th RCB with COPD	1	0.909
22	Multi nodular goitre	1	0.909
23	Inflammatory bowel disease	1	0.909
24	Atherosclerosis, pulmonary vascular disease	1	0.909
25	Abscess	4	3.603
26	Pneumocephalous and faciomaxillary injury	1	0.909
27	Urinary tract infection	1	0.909
28	Chronic lymphedema of right lower limb	1	0.909
29	Omphalitis	1	0.909
30	Pancreatitis	1	0.909
31	Haemorrhoids	3	2.702
32	Breast infection	2	1.801
33	Left dorsum forearm and hand PIRA	1	0.909
34	Epididymoarchitis	1	0.909
35	Bilateral epididymal cyst	1	0.909
36	GERD	1	0.909
37	Cholelithiasis	3	2.702
38	Right nasal mass	1	0.909
39	Varicocele	1	0.909
40	Neurofibromatosis	1	0.909
41	Non-healing ulcer	3	2.702
42	Deiratal nasal septum to right	1	0.909
43	Cell carcinoma of left upper aid	1	0.909
44	Port site infection	1	0.909
45	Hirudentis supportiva	1	0.909
46	Thorn prick injury with disarticular of little toe	1	0.909
47	Miscellaneous	5	4.504

Among 111 patients included in the study, the majority of patients were found ulcer 18.93% (where diabetic foot ulcer 14.41%, ulcer dorsum left foot 0.909%, left varicose ulcer 0.909% and non-healing ulcer 2.702%) and followed by Hernia 12.61%, appendicitis 9.909%, head injury 4.50%, burn 3.60, abscess 3.60%, cystitis 2.702%, haemorrhoids 2.702%,cholelithiasis 2.702%, breast cancer 1.801%, soft tissue sarcoma 1.801%, breast infection 1.801%, miscellaneous 4.504%, and others including-small bowel obstruction, wet gangrene right foot, paraphimosis, phimosis, lipoma, benign prostatic hyperplasia, right ankle developing injury, cholecystitis, cleft palate, stitch granuloma, fracture of 4th RCB with COPD, multi nodular goitre, inflammatory bowel disease, atherosclerosis pulmonary vascular disease, pneumocephalous and faciomaxillary injury, UTI, chronic lymphedema of right lower limb, omphalitis, pancreatitis, left dorsum forearm and hand PIRA, epididymoarchitis, bilateral epidymal cyst, GERD, right nasal mass, varicocele, neurofibromatosis, deiratal nasal septum to right, cell carcinoma of left upper aid, port site infection, hirudentis supportive, and thorn prick injury with disarticulation of little toe (where each of these diseases found 0.909%).

Results of distribution of surgery information, among 111 subjects enrolled in the study, the majority of the subjects were found surgery had done about 74 (66.66%) and for 37 subjects surgery had not done (33.33%).The result are shown in Table 5.

TABLE 5

Distribution of surgery information.

Surgery details	Number	%
Surgery Done	74	66.66
Surgery not Done	37	33.33
Total	111	100

As shown in the table, among 111 subjects enrolled in the study, the majority of the subjects were found surgery had done about 74(66%) and for 37 subjects surgery had not done (33%).

As shown in Table 6, results of length of hospital stay, among 111 subjects included in the study, the majority of subjects were found to be stayed (5-10days) in the hospital about 99 (89.189%) and then for 0-4 days the number of subjects were found about 8 (7.207%), for 11-15 days found about 3 (2.702%) and for ≥ 31 days the number of subjects found about 1 (0.909%).

TABLE 6

Length of hospital stay.

Days	Number of patients	%
0-4 days	8	7.207
5-10 days	99	89.189
11-15 days	3	2.702
16-20 days	0	0
21-30 days	0	0
≥ 31 days	1	0.90
Total	111	100

As shown in the table, among 111 subjects included in the study, the majority of subjects were found to be stayed (5-10days) in the hospital about 99(89.189%) and then for 0-4 days the number of subjects were found about 8(7.207%), for 11-15 days found about 3 (2.702%) and for ≥ 31 days the number of subjects found about 1(0.909%).

Results of distribution of drug interactions, among 111 subjects enrolled in the study, the majority of subjects were found that there was no drug interaction about 78 (70.27%) and only on 33 (29.723%) subjects found drug interaction where mild about 29 (26.12), moderate about 4 (3.603%) and severe 0 (Table 7).

TABLE 7

Occurrence of drug interactions.

Category of Drug Interactions	Number	%
Mild	29	26.12
Moderate	4	3.603
Severe	0	0
No Drug Interactions	78	70.27
Total	111	100

As shown in the table, among 111 subjects enrolled in the study, the majority of subjects were found that there was no drug interaction about 78 (70.27%) and only on 33(29.723%) subjects found drug interaction where mild about 29(26.12), moderate about 4(3.603%) and severe 0.

Results of antibiotic prescribing pattern, among 111 subjects enrolled in the study, on about 66 subject's antibiotics prescribed in fixed dose combination, on 45 subjects antibiotic prescribed by generic name and on 35 subjects antibiotics prescribed by both prescribed in fixed dose combination and prescribed by generic name (Table 8). Results of rationality of antibiotics, among 111 subjects enrolled in the study, majority of subjects got rational use of antibiotics about 85 (76%) and irrational use of antibiotic found about 26 (23.42). The result are shown in Table 9.

TABLE 8

Rationality of antibiotic use.

Antibiotics	Number	%
Rational use of Antibiotics	85	76.576
Irrational Use of Antibiotic	26	23.42
Total	111	100

As shown in the table, among 111 subjects enrolled in the study, majority of subjects got rational use of antibiotics about 85(76.576%) and irrational use of antibiotic found about 26 (23.42%).

TABLE 9

Antibiotic prescribing pattern.

Antibiotics	No	%
Prescribed in fixed dose combination	66	59.45
Prescribed by Generic Name	45	40
Prescribed both	35	31.53

As shown in table, among 111 subjects enrolled in the study, on about 66 subjects antibiotics prescribed in fixed dose combination, on 45 subjects antibiotic prescribed by generic name and on 35 subjects antibiotics prescribed by both prescribed in fixed dose combination and prescribed by generic name.

Antibiotics in surgery are antibacterial agents used in a surgical patient for the purposes of reducing the risk of surgical site infection and/or treating established infection. Improper selection of the antibiotic, dosage, administration and duration of administration can be deleterious to the patient or ineffective. Antibiotic are considered as the second most prescribed drugs in the world. Proper usage of antibiotic may save life. Irrational use of antibiotic prophylaxis makes resistance bacteria to antibiotic which is very difficult to treat and increased treatment cost. Due to the lack of data and guidelines for surgery prophylaxis, it becomes most important to develop at baseline data on use of antibiotic prophylaxis in surgery department. Hence, prescribing pattern of antibiotic prophylaxis need to be evaluated, monitored and modified if needed to make sure the treatment more and more rational. Among 111 subjects of our study, the majority of the subjects were founded males, which is contradictory to Indian scenario that female population are reluctant to use health services if they are critically ill. A study has done by Rehan and colleagues showed that the majority of the subjects found were male. The majority of subjects enrolled in the study were within the age 50-70 years of age, which agrees with the common concept of age related issues. The occurrence of chronic disease among these patients decreases their immunity and leads to increase the risk of an infection.

Most of subjects were hospitalized due to Diabetic foot, Hernia and Appendicitis. A study done by Gokul and colleagues showed that the majority of cases founded were Foot ulcer and Hernia. This was because our study hospital center is referral hospital from the area. A large number acute abdomen cases reporting even to this hospital indicate insufficient healthcare facilities at the primary and secondary health care centers of this region. Moreover, excess cases of ulcer and hemorrhoids might be due to lack of awareness to get early medical help in populations. Among 111 subjects enrolled in the study, majority of subjects got rational use of antibiotics about 85 (76.576%) and irrational use of antibiotic found about 26 (23.42%). A study done by Ashok and colleagues showed out of 106 cases of surgeries, 80 cases were not received any prophylactic antibiotics as per the ASPH guidelines. This is due to inadequate data and insufficient guidelines and sometimes due to professional negligence.

Conclusions

Evaluation of antibiotic prophylaxis always helps to rule out modification if any irrational prescribing of antibiotics. A prospective study was done in 111 patients those were shown rationality in majority of cases. Most of cases founded were Diabetic foot, Hernia and Appendicitis. Cephalosporins were most widely used antibiotics and in most of condition, penicillins were replaced by cephalosporin along with metronidazole. Multiple antibacterial drug use is very commonly observed. Inappropriate and Irrational use of antibiotic prophylaxis for surgery mostly founded on choice of antibiotics, dose, route of administration, frequency and duration. Hence, antibiotic prophylaxis needs to be evaluated continuously for further in surgery department in order to develop and implement hospital formulary for promoting the more rational use of antibiotic prophylaxis to reduce the morbidity.

References

Ashok SM, Kalburgi EB, and Mallappa H (2014). Evaluation of rational use of antibiotics as surgical prophylaxis in a tertiary care teaching hospital. *Med Innova* **3(2):** 15-20.

Aya ME, Nagwa AS, and Ayman A (2014). An evaluation of effectiveness of antibiotic prophylaxis protocols for paediatric

surgical procedures in an Egyptian teaching hospital. *Int J Pharm Sci Res* **1:** 1-5.

Gokul VRR, Vidya SRA, Gopala GK, and Senthivelan M (2014). Surgical antibiotic prophylaxis in a tertiary care teaching hospital in India. *World J Pharm Pharma Sci* **3(7):** 968-76.

Maksum R (2014). Evaluation of surgical antibiotic prophylaxis in a tertiary care hospital in Jakarta Indonesia. *Int J Sci Tech* **18(4):** 1292-6.

Patrick OE, and Mary OE (2010). Assessment of rational prescribing and relative cost of antibiotics for in-patients treated in selected tertiary care facilities in southern Nigeria. Int *J Pharma Bio Sci* **1(1):** 1-15.

Sneha SG, Shereen RV, and Clarence JS (2013). Evaluation of antibiotic prescribing patterns among medical practitioners in north India. *Indian J Basic Appl Med Res* **2(8):** 952-7.

Sohil AK, Padma GMR, Anand R, and Gabriel R (2006). Survey and evaluation of antibiotic prophylaxis usage in surgery wards of tertiary level institution before and after the implementation of clinical guidelines. *Indian J Surg* **68(3):** 150-6.

Rehan HS, Ashish KK, and Shipra G (2010). Surgical antibiotic prophylaxis in a tertiary care teaching hospital in India. *Int J Infect Control* **6(2):** 1-6.

Address correspondence to: Azad Moidul Islam, *Department of Pharmacy Practice, S.A.C. College of Pharmacy, B.G. Nagar, Karnataka, India.*
Tel: 88847-02529
E-mail: islamazadmoidul@gmail.com;
Ankit Acharya <ankitbaba99@gmail.com>