International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2015): 78.96 | Impact Factor (2015): 6.391

Evaluation of Rational use of Antibiotics for Surgical Prophylaxis

Shubham Babu Gupta[1], S. Sangeetha[2], G. Sudha Rani[3], M.Gopi[4], Mehraj Fatima[5]

Malla Reddy Institute of Pharmaceutical Sciences, Maisammaguda, Dhulapally, (Post Via Hakimpet), Secunderabad – 500014

Abstract: ***Aim:*** ***To evaluate the rational use of antibiotics as surgical prophylaxis and assess the patient knowledge regarding the usage of antibiotics.*** ***Methods****: This was a prospective, observational study in which a total of 250 in patients subjected for surgical procedures in gynecology and obstetrics, orthopedics and general surgery admitted in Malla reddy Narayana hospital, Hyderabad were included. The study has begun with the approval of ethics committee.* ***Results****: We assessed 250 cases of which 75 gynecology and obstetrics surgical cases of which 33.3% & 36% of Pre & Post-operative antibiotics were according to guidelines and 66.6% & 64 % were deviated, Out of 75 orthopedic cases 28 % & 44% of Pre & Post OP are as per guidelines were as 72% & 56 & were not. 100 General surgery cases were assessed & found to be Pre & Post- OP cases 58% & 82% were as per guidelines where as 34% of Pre & 17% of Post OP deviated from guidelines.* ***Conclusion****: The current study revealed that there is inappropriate usage of antibiotics both preoperatively and post operatively. The most common mistake was selection of antibiotic which deviated from guidelines. Patient counseling regarding the antibiotic usage is also important.*

Keywords: Prophylaxis, Surgical site infection, Rational use, ASHP guidelines.

1. Introduction

The use of prophylactic antibiotic is one of the important factors in surgery and has been regularly used to eradicate endogenous microorganisms and to prevent postoperative infectious complications manipulated during the procedure. The majority of SSI becomes apparent within 30 days of an operative procedure and most often between the 5 and 10 postoperative days. However, where a prosthetic implant is used, SSI affecting the deeper tissues may occur several months after the operation. Although the outcome measure for SSI used by many studies is based on standard definitions such as those described by the centers for disease control and prevention (CDC) or the surgical site infection surveillance service. It remains a major cause of postoperative morbidity and mortality, prolong hospitalization and cost increase of medical care in the surgical unit. Appropriate prophylactic antibiotics administration before surgery can reduce the incidence of SSI. However, inappropriateness of antibiotic prophylaxis administration is still commonly found in various surgical procedures. Approximately 30–50% of antibiotic use in hospital practice is now for surgical prophylaxis. However, between 30% and 90% of this prophylaxis is inappropriate. Most commonly, the antibiotic is either given at the wrong time or continued for too long. Controversy remains as to duration of prophylaxis and also as to which specific surgical procedures should receive prophylaxis.

Surgical Prophylaxis

Surgical site infection (SSI) includes superficial incisional infections (e.g. stitch abscess), deep incisional infection (of soft tissue) and organ or space infection. The purpose of surgical prophylaxis is to reduce the incidence of SSI with minimal alteration of normal microbial flora of the host and minimal adverse effects.

Surgical Antimicrobial Prophylaxis

- To be administered within 1 hr before the surgical incision.
- Single dose is recommended. Consider for second intra-operative dose in prolong Surgery based on the choice of antibiotic used for prophylaxis.
- Prophylaxis should not be given beyond surgery duration (except for cardiothoracic Surgery, up to 48 hours permissible).
- Choice of the prophylaxis should be based on the local antibiogram.

Procedure	*Likely Pathogen(s)*	*Recommended Drugs*	*Alternative Regimen*
Cardiothoracic	Staph epi, Staph aureus, Streptococcus, Corynebacteria, enteric-Gram negative bacilli	Cefazolin 2gm IV stat / 2nd or 3rd generation cephalosporin	Clindamycin
General Surgery Appendectomy (non-perforated)	Enteric Gram(-) bacilli	Cefazolin / 2nd or 3rd generation cephalosporin /Metronidazole	Clindamycin + Aminoglycoside
Colorectal Surgery	Enteric Gram(-) bacilli, Enterococcus, Anaerobes	Cefazolin + Metronidazole	Clindamycin + Aminoglycoside
High-risk esophageal, gastoduodenal or biliary surgery	Enteric Gram(-) bacilli, Gram(+) cocci	Cefazolin / 2nd or 3rd generation cephalosporin	Clindamycin + Aminoglycoside
Penetrating abdominal trauma	Enteric Gram(-) bacilli, E. Anaerobes	2nd or 3rd generation cephalosporin /Metronidazole	Clindamycin + Aminoglycoside
Hysterectomy	Enteric Gram(-) bacilli, Group B Strep, Enterococcus	Cefazolin / 2nd or 3rd generation cephalosporin	Clindamycin + Aminoglycoside
Head and Neck Surgery	Anaerobes, Staph aureus, Gram(-) bacilli	Clindamycin	Cefazolin + Metronidazole

Neurosurgery Clean	Staph aureus, Staph epi	Cefazolin	Clindamycin
Skull fracture, CSF leak	Anaerobes, Staph epi, Staph aureus	Cefazolin	Clindamycin
Penetrating trauma	Staph, strep, Gram(-) bacilli, anaerobes	Ceftriaxone, Clindamycin	N/A
Spine	Staph aureus, Staph epi	Cefazolin	Clindamycin
Orthopedic Surgery Closed fracture	Staph epi, Staph aureus	Cefazolin	Clindamycin
Open fracture	Staph, strep, Gram(-) bacilli, anaerobes	Cefazolin + Gentamicin	Clindamycin+ Gentamicin
Urologic Surgery Genitourinary (high risk only)	Gram(-) bacilli, Enterococcus	Cefazolin	Ciprofloxacin
Vascular Surgery	Staph epi, Staph aureus, Gram(-) bacilli, Enterococcus	Cefazolin	Clindamycin

2. Literature Review

Title	Yr.	No. of Obs.	Conclusion
Evaluation of surgical antibiotics prophylaxis in Tertiary care hospital in Jakarta, Indonesia	2012	161	Of 161 patients 34 patients were developed SSI, (21.11%).The adherence to guidelines of surgical antibiotic prophylaxis was still very poor.
The Practice of Per-operative Antibiotic Prophylaxis in German Hospitals	2002	A total of 627 surgical procedures	397 with PAP and 224 without PAP; six procedures could not be evaluated. Of the 397 PAP recorded, only 180 (45.3%) were performed correctly.
Evaluation of rational use of antibiotics as surgical prophylaxis in a tertiary care teaching hospital	2014	106 cases	Out of 106 cases, 26 cases were received antibiotics at right time and right dose, while right selection of antibiotics was noted in 25 cases. Out of 106 cases of surgeries, 80 cases were not received any prophylactic antibiotics as per the ASPH guidelines
Antimicrobial prophylaxis in surgery in Belgian hospitals: room for improvement	1992-1993	100 cases	It was given in 57% of the procedures for which prophylaxis is generally not recommended, but it was not used in 14% of procedures for which it is generally recommended, nor in 14% of all contaminated procedures. Large differences were found in hospital university affiliation status.

3. Need for Study

1) The ultimate goal of such research is to facilitate the use of antibiotics as per W.H.O guidelines in surgical prophylaxis.
2) To promote the rational use of antibiotics.
3) To reduce the incidence of antibiotics resistance.
4) To Asses & improve patients knowledge on antibiotics & its usage thus reducing the Complications & ADR's associated with antibiotic administration.

4. Methodology

The study was conducted in the Department of General Surgery, Orthopedic, Gynecology & Obstetrics of Malla Reddy Narayana Hospital, Hyderabad, India. The study was designed to be a Prospective, Descriptive and Observational Study and was conducted of six months (i.e. from Oct., 2016 to March 2017). The sample size was 250 patients.

- **Inclusion Criteria**

Patients with Pre & Post-Operative in : General Medicine, Male Surgery, Female Surgery, Gynecology & Obstetrics, Orthopedics, Patients with co-morbid conditions, Patients of either Sex.

- **Exclusion Criteria**

Pediatrics, Pregnant women, Cardiology, who have previous infections and undergone minor incisions.

- **Development of Tool**

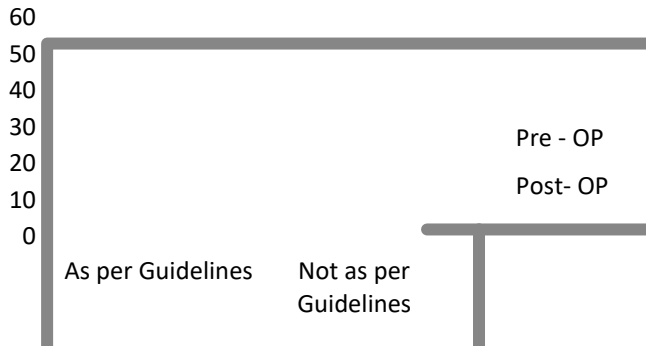
An extensive study and review of literature helped in the preparation of the tool. A self-prepared CRF was used as the tool for this study. Patient's medical records also were reviewed to collect data.

5. Results

Gynecology & Obstetrics Surgery: (75 Cases)

Table 1: Showing the comparison of Pre & Post - Operative antibiotics Prescribed

S. No		As Per Guidelines	Not As Per Guidelines
1.	Pre- Operative	25 (33.3%)	50 (66.7%)
2.	Post- Operative	27 (36%)	48 (64%)

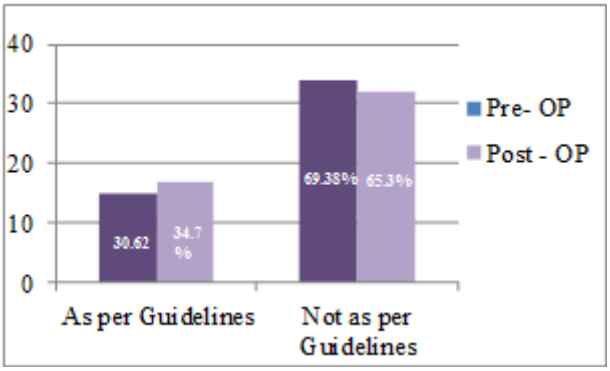


Out of 75 gynecology and obstetrics surgical cases of which 33.3% of pre-operative antibiotics were according to guidelines and 66.6% were not, 36% of post-operative antibiotics were according to guidelines and 64% were not.

Orthopedic Surgery (Male): (49 Cases)

Table 2: Showing the comparison of Pre & Post- Operative of Antibiotics Prescribed

S.no		As Per Guidelines	Not As Per Guidelines
1.	Pre- Operative	15 (30.62%)	34 (69.38)%
2.	Post- Operative	17 (34.7%)	32 (65.39%)

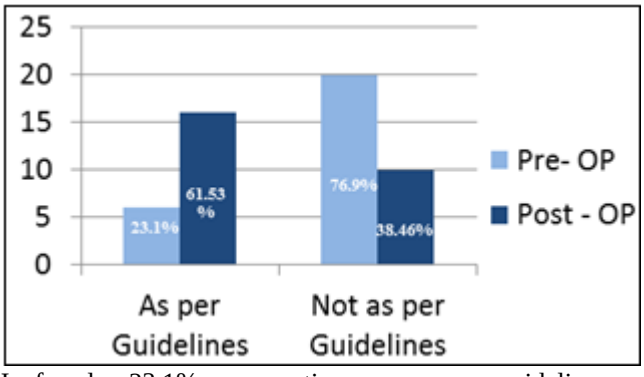


Out of 49 male, pre-operative male cases as per guidelines were 30.62%, post-operative according to guidelines were 34.7%, 69.38% of pre-operative were not as per guidelines followed by 65.3% post-operative were deviated from guidelines.

Orthopedic Surgery (Female): (26 Cases)

Table 3: Showing the comparison of Pre & Post- Operative of Antibiotics Prescribed

S.no		As Per Guidelines	Not As Per Guidelines
1.	Pre- Operative	6 (23.1)%	20 (76.9%)
2.	Post- Operative	16 (61.53%)	10 (38.46%)

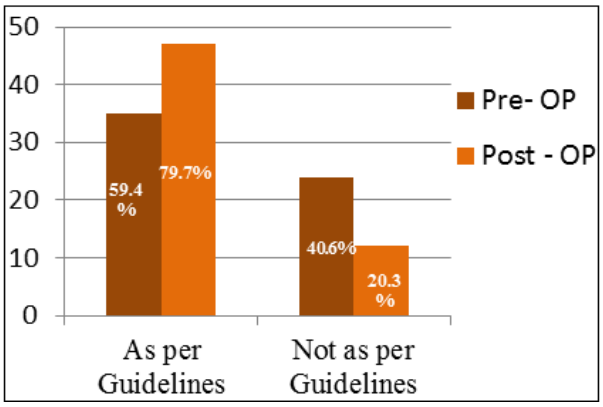


In females 23.1% preoperative were as per guidelines and 76.9% were not, 61.53% post-operative cases were according to guidelines and 38.46% were not according to guidelines.

Genral Surgery (Male) (59 Cases):

Table 4: Showing comparison of Pre & Post - Operative Surgical Prophylaxis of Antibiotics Prescribed

S.no		As Per Guidelines	Not As Per Guidelines
1.	Pre- Operative	35 (59.4%)	24 (40.6%)
2.	Post- Operative	47 (79.7%)	11(20.3%)

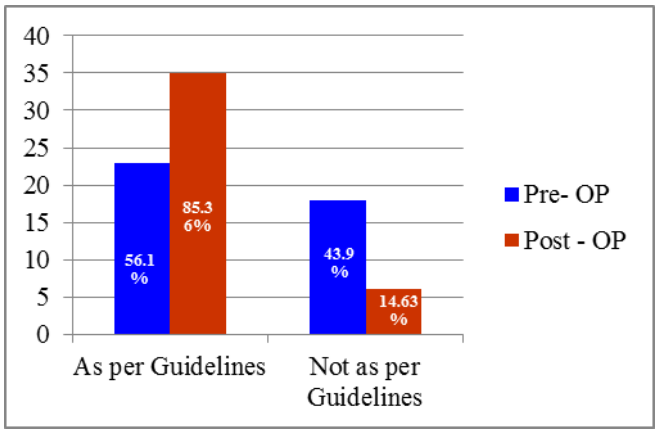


Out of 59 male, pre-operative as per guidelines were 59.4% post-operative were 79.7% and 40.6% of male preoperative were not according to guidelines, 20.3% of post-operative were not according to guidelines.

Genral Surgery (Female): (41cases)

Table 5: Showing the comparison of Pre & Post - Operative Antibiotics Prescribed:

S.no		As Per Guidelines	Not As Per Guidelines
1.	Pre- Operative	23 (56.1%)	18 (43.9%)
2.	Post- Operative	35 (85.3%)	06(14.63%)



Out of 41 Female it is found to be 56.1% of pre-operative were according to guidelines and 43.9% were not, 85.36% of post-operative antibiotics were according to guidelines and 14.63% were deviated from guidelines.

6. Discussion

With the advent of antibiotics and their widespread use, the incidence of surgical site infection has come down remarkably. Antibiotics are the most commonly prescribed drugs in Indian hospitals, and approximately one-third of prescriptions are for antimicrobial prophylaxis. As a result, appropriate prophylaxis should be viewed as an important issue. But the inappropriate and excessive use of antibiotics for surgical prophylaxis is a worldwide problem.

Prophylaxis with the broad spectrum antibiotics is not recommended because it leads to the unacceptable increases in hospital costs and emergence of resistant bacteria and super infections without increase in the effectiveness.

Prophylactic antibiotic therapy is more effective when begun preoperatively and continued through the intraoperative period, with the aim of achieving therapeutic blood levels throughout the operative period. The antibiotic agent should be present in the tissues insufficient concentration at the time of incision to overcome the bacterial load.

A prospective, descriptive and observational study was conducted to evaluate the surgical prophylaxis of antibiotics as per WHO and National treatment guidelines, and assess the patient knowledge. The study was carried out in the departments of general surgery, orthopedics and gynecology and obstetrics. There are abundant data to show that prolonged postoperative dosing of antimicrobials does not provide additional benefit. Thus, this indicates a misuse or overuse of antibiotics in surgical prophylaxis and this can be responsible for drastic development of microbial resistance.

Overall results of this study show that most participants had moderate to adequate knowledge regarding antibiotic use. They were un aware with the risks of antibiotic use; for example, regarding antimicrobial resistance, allergic and possible side effects. Most of them knew that antibiotics are effective for bacterial infections, but had inappropriate knowledge regarding antibiotics' effectiveness for viral infections. In terms of beliefs about antibiotic use, overall they expressed beliefs that antibiotics can prevent any symptoms/diseases from becoming worse. Only a few believed that antibiotics have no side effects; that antibiotics can cure any diseases.

7. Conclusion

We conclude that, the prophylactic antibiotics significantly reduce the incidence of post-operative wound infection. Compliance with the principles of appropriate antibiotic prophylaxis for surgical should be strictly reviewed. To promote the rational use of antibiotics in surgical prophylaxis, implementation of the evidence based guidelines and recommendations for antimicrobial surgical prophylaxis is strictly required. And adherence of the antimicrobial prophylaxis to these guidelines are needed to be evaluated routinely.

There is a need to emphasize on the rational use of antibiotics in order to avoid the antibiotic resistance and increase awareness among the patients regarding the antibiotic usage.

References

[1] Koda-Kimble MA, Alldredge BK, Corelli RL, Ernst ME. Koda-Kimble and Young's Applied Therapeutics: The Clinical Use of Drugs: Lippincott Williams & Wilkins;2013.
[2] Kurz X, Mertens R, Ronveaux O. Antimicrobial prophylaxis in surgery in Belgian hospitals: room for improvement. Eur J Surg 1996;162:15-21.
[3] Gorecki P, Schein M, Rucinski J, Wise L. Antibiotic administration in patients undergoing common surgical procedures in a community teaching hospital: the chaos continues. World J Surg 1999;23:429-32.
[4] Burke JP. Maximizing appropriate antibiotic prophylaxis for surgical patients: an update from LDS Hospital, Salt Lake City. Clin Infect Dis 2001;33(Suppl 2):S78-S83.
[5] World Health Organization (WHO). Antimicrobial resistance: the facts. Essential Drugs Monitor 2000;28 and 29:8-9.
[6] Harvey K, Dartnell J, Hemming M. Improving antibiotic use: 25 years of antibiotic guidelines and related initiatives. Commun Dis Intell Q Rep 2003;Suppl 27:S9-S12.
[7] Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR. Guideline for Prevention of Surgical Site Infection,1999. Centers for Disease Control and Prevention (CDC) Hospital Infection Control Practices Advisory Committee. Am J Infect Control 1999;27:97-132.
[8] Pharmacists ASoH-S. ASHP therapeutic guidelines on antimicrobial prophylaxis in surgery. Am J Health Syst Pharm 1999;56:1839-88.
[9] Rafati M, Shiva A, Ahmadi A, Habibi O. Adherence to American society of health-system pharmacists surgical antibiotic prophylaxis guidelines in a teaching hospital. J Res Pharm Pract 2014;3:62-6.
[10] Askarian M, Moravveji AR, Mirkhani H, Namazi S, Weed H. Adherence to American Society of Health-System Pharmacists surgical antibiotic prophylaxis guidelines in Iran. Infect Control Hosp Epidemiol 2006;27:876-8.
[11] van Disseldorp J, Slingenberg EJ, Matute A, Delgado E, Hak E, Hoepelman IM. Application of guidelines on pre-operative antibiotic prophylaxis in Leon, Nicaragua. Neth J Med 2006;64:411-6.
[12] Al-Momany NH, Al-Bakri AG, Makahleh ZM, Wazaify MM. Adherence to international antimicrobial prophylaxis guidelines in cardiac surgery: a Jordanian study demonstrates need for quality improvement. J Manag Care Pharm 2009;15:262-71.
[13] van Kasteren M, Kullberg BJ, de Boer AS, Mintjes-de Groot J, Gyssens I. Adherence to local hospital guidelines for surgical antimicrobial prophylaxis: a multicentre audit in Dutch hospitals.J Antimicrob Chemother 2003;51:1389-96.
[14] Lallemand S, Thouverez M, Bailly P, Bertrand X, Talon D.Non-observance of guidelines for surgical antimicrobial prophylaxis and surgical-site infections. Pharm World Sci 2002;24:95-9.
[15] Voit SB, Todd JK, Nelson B, Nyquist AC. Electronic surveillance system for monitoring surgical antimicrobial prophylaxis. Pediatrics 2005;116:1317-22.
[16] Kriaras I, Michalopoulos A, Turina M, Geroulanos S. Evolution of antimicrobial prophylaxis in cardiovascular surgery. Eur J Cardiothorac Surg 2000;18:440-6.
[17] Ozgun H, Ertugrul BM, Soyder A, Ozturk B, Aydemir M. Peri-operative antibiotic prophylaxis: Adherence to guidelines and effects of educational intervention. Int JSurg 2010;8:159-63.
[18] Engelman R, Shahian D, Shemin R, Guy TS, Bratzler D, Edwards F, et al. The Society of Thoracic Surgeons practice guideline series: antibiotic prophylaxis in cardiac surgery, part II: antibiotic choice. Ann Thorac Surg 2007;83:1569-76.

[19] Paradiso-Hardy FL, Cornish P, Pharand C, Fremes SE. A national survey of antimicrobial prophylaxis in adult cardiac surgery across Canada. Can J Infect Dis 2002;13:21-7.
[20] Ozkurt Z, Kadanali A, Ertek M, Erol S, Parlak M. Cerrahi proflakside antibiyotik kullanımı Ankem Derg. J Ankem 2005;19:111-4.
[21] Hosoglu S, Aslan S, Akalin S, Bosnak V. Audit of quality of perioperative antimicrobial prophylaxis. Pharm World Sci 2009;31:14-7.
[22] Prado MA, Lima MP, Gomes Ida R, Bergsten-Mendes G. The implementation of a surgical antibiotic prophylaxis program: the pivotal contribution of the hospital pharmacy. Am J Infect Control 2002;30:49-56

Author Profile

Pharm-D Intern. **Shubham Babu Gupta** from Malla reddy college of phramaceutical Sciences working as a clinical Research Moniter from Cliniserve India.

Pharm-D Intern. **S. Sangeetha** from Malla reddy college of phramaceutical Sciences. Special intrest in R &D.

Pharm-D Intern. **S. G. Sudha Rani** from Malla reddy college of phramaceutical Sciences.

Pharm-D Intern. **M. Gopi** from Malla reddy college of phramaceutical Sciences.

Assistant Professor **Dr. Mehraj Fatima (Doctor of Pharmacy)**: I am an **Assistant Professor** in the Department of PHARM-D, Malla reddy Institute of Pharmaceutical Sciences, Secunderabad (India). A lecturer of under-graduate and post-graduate courses (Pharm-D) and a research supervisor for higher studies students in the field of pharmacy practice.