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Research Article

## Comparative study on prophylactic antibiotic versus empirical antibiotic in prevention of surgical site infection

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### ABSTRACT

The main aim of the study was to compare the single dose prophylactic antibiotic versus empirical postoperative antibiotics in prevention of surgical site infection. The study was a prospective observational study conducted over a period of 8 months. A total of 100 number of surgery cases were selected randomly, to groups of 50 each. The study group received a single dose of antibiotic preoperatively while the control group received 3 to 5 days of empirical antibiotic therapy. Data analysis and statistical analysis was done with the help of graph pad prism trial version software. Student t test was carried out for paired analysis to find P value. There was no significant association of surgical site infection, grades of infection, and other complications. The hospital stay of patients, cost to the patients, and number of antibiotics used in patients were significantly more. The single dose prophylactic antibiotics are better than empirical post operative therapy in reducing the hospital stay and hospital cost to patients. Since the complete eradication of surgical site infection is not possible, only the reduction in infection rate can be achieved to a minimal level.

**Keywords:** Prophylactic antibiotics, surgical site infection, surgical complications, post operative antibiotics.**Article Info:** Received 15 Jan 2019; Review Completed 20 Feb 2019; Accepted 21 Feb 2019; Available online 15 March 2019

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### INTRODUCTION

The surgical site infection is a common post operative complication that develops after 30 days of the operation. The surgical site infection affects the skin and subcutaneous tissue of the incision and deep soft tissue of the incision and any part of the anatomy<sup>1,2</sup>. Clinical features of the surgical site infection depend upon the skin surface, the nature of the infecting organism and host resistances. The signs of infections are heat, redness, swelling, pain and loss of function where the site in which the invasive procedure took place<sup>3</sup>. During the local phase of infection the macrophages unable to phagocytosing all dead cells resulting there may be chance of bacterial growth in surrounding area when systemic phase of infection occurs the micro organism eventually invade the blood stream and reaches into distant organ<sup>4</sup>. The toxins produced by the microorganism invade into the host and damage the host tissue<sup>5</sup>. The wound healing process taken place by a set of pathway like

inflammatory phase, fibroblastic phase and remodelling phase<sup>6</sup>.

Due to the fear of occurrence of the surgical site infection post operatively, many surgeons prescribe antimicrobials for a period of 7-10 days for even clean cases. This may lead to more expense to the patients and also chances to get hospital acquired infections<sup>7</sup>. For the prevention of surgical site infection after clean surgeries usually the antibiotics are not necessary but some studies provide evidence that antibiotics were used irrationally for the treatment of the surgical site infection by giving direct prophylactic antibiotic therapy before the surgery will reduce the risk of both wound infections and complication due to infection<sup>8</sup>. The prophylactic antibiotic administration minimizes the risk for the infection. It should be given to all clean contaminated cases. The therapeutic antibiotics are needed to the contaminated and dirty wounds<sup>9</sup>. Selection of antibiotics for the prevention of surgical site infection based on the pathogen isolated. It must be cost effective and safe to the

patient. The first and second generation antibiotics are commonly used<sup>10</sup>.

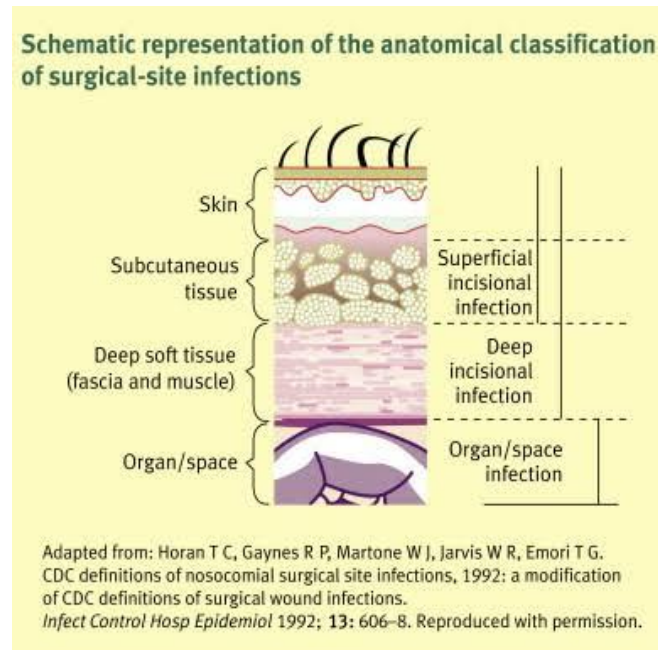


Figure 1: Schematic representation of the anatomical classification of surgical – site infection

In 2017, Bengaru H et al; showed that single dose prophylactic should be sufficient in case of laproscopic appendectomy for simple uncomplicated non-perforated acute appendicitis<sup>10</sup>. A controlled clinical trial done by ChuonZong in 2015, on the effectiveness of antibiotic prophylaxis before skin incision and results demonstrate that antibiotic prophylaxis before skin incision and after umbilical cord clamping were equivalent for elective caesariandelivery<sup>11</sup>.

The aim of the study was to compare the single dose prophylactic antibiotic versus empirical post operative antibiotics in prevention of the SSI. An this prospective observational study was carried out with an objective of study the efficacy of single dose prophylactic antibiotic versus both pre operative and post operative antibiotics in

reducing SSI and compare the length of the hospital stay of the patients in both groups.

## MATERIALS AND METHODS

The study is a prospective observational study conducted in Govt. headquarters hospital Tirupur from October 2017 to august 2018. A predesigned structured 'Proforma' is used to collect the relevant data including; Patient's demographic profile, diagnosis and details of the antimicrobial drugs prescribed namely its name, strength, dose, route to be taken and frequency. The study population includes the patients in Government head quarters hospital Tirupur. A total of 100 number of surgery cases were selected randomly, to groups of 50 each. The study group received a single dose of antibiotic preoperatively while the control group received 3 to 5 days of empirical antibiotic therapy.

Study group: Patients received a single dose of antibiotics half hour preoperatively.

Control group: Patients received post operative antibiotics after surgery for about 5-10 days.

### Inclusion criteria

1. Clean and clean contaminated cases in department of general surgery and gynaecology. (Local, regional, and general anaesthesia cases.)
2. Including both genders.
3. Patients admitted in the secondary care hospital Tirupur. (Inpatients admitted in the surgery ward).

### Exclusion criteria

1. Contaminated cases are excluded.
2. Those patients who do not consent are excluded.
3. Patients below 10 yrs age were excluded.
4. Pregnant patients were excluded.
5. Emergency cases were excluded.

Data analysis and statistical analysis was done with the help of graph pad prism trial version software. Student t test was carried out for paired analysis to find P value.

## RESULTS

### Gender:

Table 1: Summarizes the gender wise comparison of control and study group. Out of total patients (100), 20 patients (5%) were males and 30 patients (16.66%) were females in control group. 33patients (18.18%) were males and 17 patients (58.82%) were females.

Gender	Control	Percentage %	Study	Percentage %	p value
Male	20(1)	5%	33(6)	18.18%	0.8591 (NS)
Female	30(5)	16.66%	17(1)	58.82%	

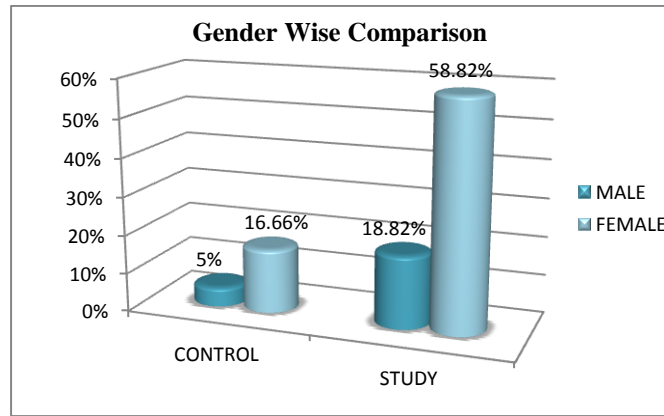


Figure 2: Gender Wise Comparison n-(100)

**SSI:**

Table 2: Summarizes the comparison of patients with SSI, out of 50 patients in control group, 5 patients (10%) had SSI and 45 patients (90%) had no SSI. In study group out of 50 patients, 6 patients (10%) developed SSI and 44 patients (90%) not with SSI.

SSI	Control	Percentage %	Study	Percentage %	p value
Yes	5	10%	5	10%	1.000 (NS)
No	45	90%	45	90%	

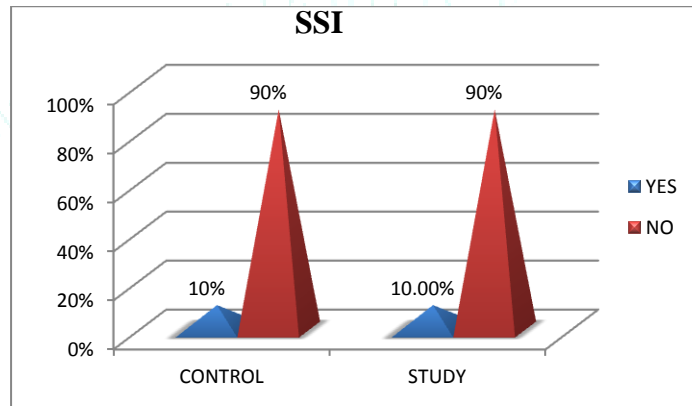


Figure 3: Comparison of patients with ssi n-(100)

**Hospital stay**

Table 3: summarizes the hospital stay of patients in both control and study group (100). In control group out 50 patients, 6 patients (12%) were stayed in hospital about 1-3 days, 24 patients (48%) were stayed in hospital about 4-7 days, 20 patients (40%) were stayed in hospital more than 7 days. In study group out of 50 patients, 42 patients (84%) were stayed in hospital about 1-3 days, 6 patients (12%) were stayed in hospital about 4-7days, 2 patients (4%) were stayed in hospital more than 7 days.

Hospital stay	Control	Percentage %	Study	Percentage %	pvalue
1-3 days	6	12%	42	84%	0.04(*)
4-7 days	24	48%	3	6%	0.02(*)
>7 days	20	40%	2	4%	0.0198(*)

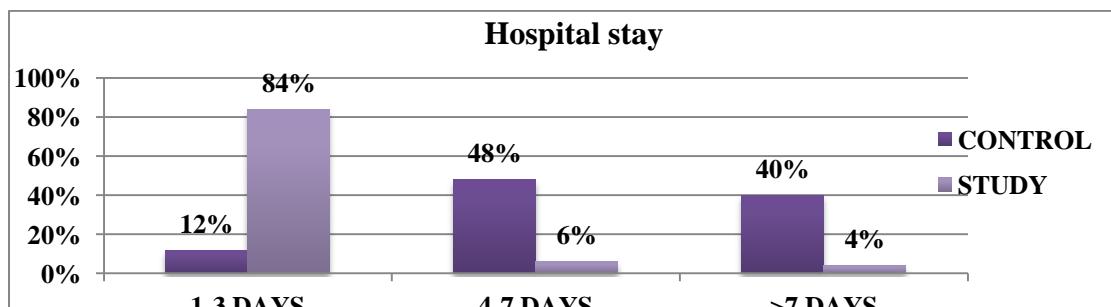


Figure 4: Hospital stay of patients n-(100)

### Number of antibiotic used in patients

Table 4: Summarizes the number of antibiotics used in patients (100), In control group 46 patients (92%) were used cephalosporin antibiotics, 39 patients (78%) were used aminoglycoside antibiotics, 6 patients (12%) were used fluoroquinolones, 32 patients (64%) were used antihelminthetics antibiotics, 2 patients (4%) were used penicillins.

In study group 11 patients (22%) were used cephalosporin antibiotics, 10 patients (20%) were used aminoglycoside antibiotics, 10 patients (20%) were used fluoroquinolones, 1 patient (2%) were used antihelminthetics antibiotic, 1 patient (2%) were used penicillin antibiotics.

Antibiotic used	Control	Percentage %	Study	Percentage %	P value
Cephalosporins	46	92%	11	22%	0.0225 (*)
Aminoglycosides	39	78%	10	20%	
Fluroquinolones	6	12%	10	20%	
Antihelminthetics	32	64%	1	2%	
Penicillins	2	4%	1	2%	

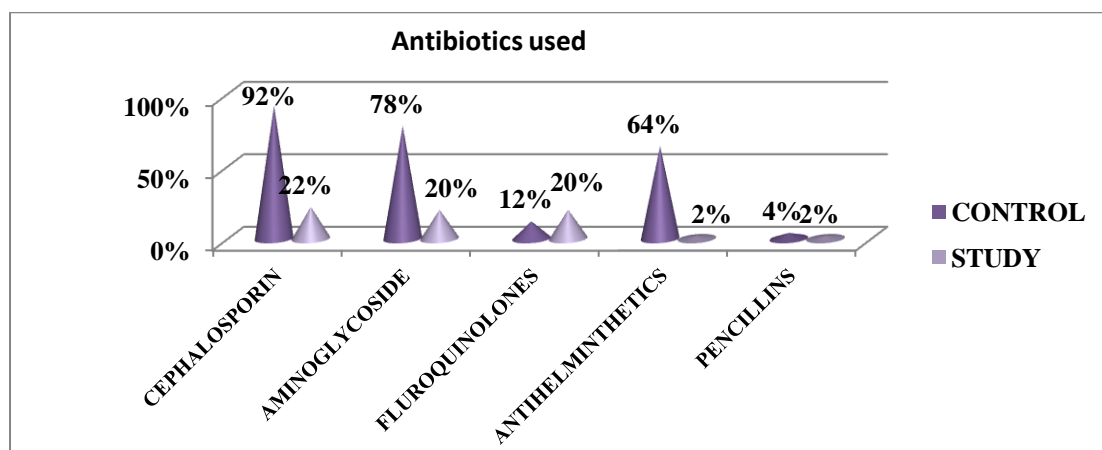


Figure 5: Antibiotics Used In Patients N-(100)

## DISCUSSION

A surgical site infection is an infection that occurs after surgery in the part of the body where the surgery took place. Surgical site infections can sometimes be superficial infections involving the skin only. Other surgical site infections are more serious and can involve tissues under the skin, organs, or implanted material.

It is a prospective observational study done in surgical ward. Totally 100 patients were taken in this study and divided in to two groups; 50 patients of control group and another 50 of study group. Patients in control group treated with both pre operative and post operative antibiotics. While patients in study group treated with pre operative antibiotics only.

The aim of the study was to compare the single dose prophylactic antibiotic versus empirical post operative antibiotic in the prevention of surgical site infection.

In this study there was no significant difference in age (p value- 0.8103) and gender (p value- 0.8591) and this was also done by Bangaru et al. In this BMI (0.4681) has no association with SSI it was also found in Bangaru et al. studies<sup>11</sup>.

There is no significant association is present for complications like pain (0.9729), swelling (0.9691), wound discharge (0.9674), complications occurred in both study group and control group was more or less same. The same results were observed in the study of Thejeswi et al. 2012<sup>13</sup>.

There was no significant association of surgical site infection (0.400), surgical site infection occurred in both groups are

same manner this same findings was also found by Rejab et al., 2012<sup>14</sup>.

The grades of infection (P value- 0.8167) occurred in both groups were shown no significant difference. A study conducted by Bangaru et al, 2017<sup>22</sup> has shown the similar findings.

The duration of postoperative hospital stay in control group is more significant (1-3 days- P value- 0.04(\*), 4-7 days- 0.02(\*), >7days 0.0198(\*), a study conducted by Shah et al. 2015<sup>8</sup> shown the similar findings.

The cost to the patients in control group is significantly more. This might be due long hospital stay in control group. The study findings were observed Shah et al 2015<sup>15</sup> studies.

In our study the number of antibiotics used (p value- 0.0225) in control group is more than that of in study group. Wanjare VS 2014<sup>16</sup> showed that number of antibiotics is more used in post operative patients, than patient taking preoperative antibiotics alone.

In this study we can found that an economical advantage in using pre-operative prophylactic antibiotic than post operative empirical therapy. The patients in both groups showed more or less same complications. Short term administration of antibiotic minimizes the risk of antibiotic resistance in patients, so it is more effective than using antibiotic for a longer period of time.

Its misuse not only affects the individual patient but also affect the hospital environment. The use of single dose prophylactic antibiotic may be limited to 1-2 doses of a

suitable agent pre- operatively and never more than 24 hours.

## CONCLUSION

Surgical site infection is one of the most common post operative complication which increases the risk of post operative morbidity and mortality, increases hospital stay and hospital cost to patients. Our study concludes that single dose prophylactic antibiotics are better than empirical post operative therapy in reducing the hospital stay and hospital cost to patients. Since the complete eradication of surgical site infection is not possible, only the reduction in infection rate can be achieved to a minimal level.

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## REFERENCES

1. Global guidelines for the prevention of surgical site infection, world health organization 2016.
2. Nandi PL, Rajan SS, Mak KC, Chan SC, So YC, Surgical wound infection. Hong Kong Medical Journal. 1999; 5 (1):82-86.
3. Jonathan N, Meakins, M.D, D.S.C, F. A.G.S, and Byron F, Master son, F.D.G.S, Prevention of post operative infection. ACS surgery: Principle and practise 2005.
4. Mangram AJ, MD; Teresa C. Horan, MPH, CIC; Michele L. Pearson, MD; Silver LC, BS; Jarvis WR, MD; Guideline for prevention of surgical site infection. 1999; 251-266.
5. The Biochemical scientist, Mechanisms involved in wound healing 2008:609-615.
6. Anderson DK, Billiar TR, Dunn DL, Hunter JG, Mathews JB, Pollock RE, Schwartz's Principles of Surgery:135.
7. Thejeswi P, Shenoy D, Tauro L, Ram S, Comparative Study Of One-Day Perioperative Antibiotic Prophylaxis Versus Seven Day Postoperative Antibiotic Coverage In Elective Surgical Cases. The Internet Journal of Surgery. 2012; 28(2):1-7
8. NICE clinical guideline 74. NHS Surgical site infection Prevention and treatment of surgical site infection 2008; 74:1-27
9. Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection. JAMA Surg. 2017; 152(8):784-791.
10. Bangaru H, Gaiki VV, Reddy MVR. Comparative study of single dose preoperative antibiotics versus both preoperative and postoperative antibiotics in laparoscopic appendectomy for nonperforated appendicitis. International Surgery Journal. September 2017; 4(9):3092
11. Zhang C, Zhang L, Liu X, Zhang L, Zeng Z, Li L, Liu G, Jiang H. Timing of Antibiotic Prophylaxis in Elective Caesarean Delivery: A Multi-Center Randomized Controlled Trial and Meta-Analysis. PLOS ONE 2015; 10:1371.
12. Malik AZ, Ali Q, Surgical Site Infections after Elective Surgery in Pakistan. Surgipak Study. Journal of Rawalpindi Medical College (JPMC) 2015; 19(3):209-214.
13. Thejeswi P, Shenoy D, Tauro L, Ram S, Comparative Study Of One-Day Perioperative Antibiotic Prophylaxis Versus Seven Day Postoperative Antibiotic Coverage In Elective Surgical Cases. The Internet Journal of Surgery. 2012; 28 (2):1-7
14. Rejab AF, Hassouni MK. The use of single versus multiple doses of cefotaxime as a Prophylactic Antibiotic in maxillofacial fractures. Al-Rafidain Dent J. 2012; 12(1):96-101.
15. Shah Z, Kshirsagar N S, Shah S. "Comparison of Single Dose Prophylactic Antibiotics versus five days Antibiotic in Cesarean Section". Journal of Evolution of Medical and Dental Sciences 2014; 3(12):3123-3129.
16. Wanjare VS, Wanjare SW, Akulwar SL, Tabhane MK, Rahule AS. A Study of Postoperative Wounds Infections with Special Reference to Pseudomonas. J Cont Med A Dent 2014; 2(2):17-21.

