

## **ASSESSMENT OF TWO OR MORE ANTIBIOTICS REGIMEN VERSUS ONE OR NO ANTIBIOTIC REGIMEN IN POST-OPERATIVE SURGERY**

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### **ABSTRACT**

**Objective:** Surgical site infections [SSI] are the leading cause of hospital-acquired infections. The objective of this study was to evaluate whether surgical site infections can be reduced with two or more antibiotics regimen versus one or no antibiotic regimen in post-operative surgery.

**Methods:** The patients were grouped into 2 groups. Group A (two or more antibiotics regimen) and Group B (one or no antibiotic regimen). Then the patients were followed on 1st, 2nd, 3rd and 4th week respectively after surgery to check for any surgical site infection by direct interviewing the patients.

**Results:** The overall surgical site infection rate was 48.3% (58 out of 120 patients). However, this study was more dominated by female patients—there were 63% female patients compared to 37% male patients enrolled in this study. Also, the post-operative surgical site infection was comparatively observed more in female patients than in male. General surgery department too had many gynaecology related patients followed by Orthopaedic and Endocrinology surgeries. Results revealed that the patients in Group A (Two or more antibiotics) had significantly lower number of surgical site infections when compared with Group B (One or no antibiotics) with  $p < 0.001$ .

**Conclusion:** Our study concludes that patients receiving two or more antibiotics had significantly less number of post-operative surgical site infections when compared to patients receiving one or no antibiotics and following two or more antibiotics can reduce the excess hospital cost.

**Keywords:** Two or more Antibiotics Regimens, Surgical Site Infection, Post-Operative surgery, Prophylaxis

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### **INTRODUCTION**

Surgical site infections [SSI] are the leading cause of hospital-acquired infections [1] and are associated with excess hospital costs [2]. SSI can lead to economic loss and injury to patients due to several factors including the need for prolonged use of antimicrobial drugs and secondary surgery among others.

The risk factors associated with infection are those intrinsic to the patient, such as smoking, diabetes, malnutrition, obesity, rheumatoid arthritis, chronic use of corticosteroids and neoplasm and extrinsic such as increased surgical time and a high number of professionals in the surgical field.

Some measures adopted in the intraoperative and immediate postoperative period may help to decrease the rate of postoperative infections. Among them, the maintenance of the aseptic field, attention to haemostasis, devitalized tissue minimization, proper use of drains and antibiotic prophylaxis are highlighted [3].

Surgical antibiotic prophylaxis means the use of antibiotics to prevent infections at the surgical site. Prophylaxis usually consists of the administration of an antimicrobial agent or agents before initiation of certain specific types of surgical procedures to reduce the number of microbes that enter the tissue or body cavity. SSI is the utmost reason for a patient's readmission after a wide variety of surgical operations. Infection is a disturbing complication giving rise to increased costs, length of stay and patient morbidity. Infection rates for breast surgery are 3 to 15 percent higher than average for a clean surgical procedure. Preoperative and postoperative antibiotics have lowered infection rates in other surgical groups, yet there is no consensus on postoperative prophylactic antibiotic use in breast surgery [4, 5].

Choosing an appropriate antibiotic for the specific type of procedure may prevent the occurrence of the post-operative infection but prescribing the antibiotic based on the sensitivity and

resistant patterns show a high rate of success in healthy outcomes [6]. Drugs should be selected with a reasonable spectrum of activity against pathogens likely to be encountered and antibiotics should be chosen with kinetics that will ensure adequate serum and tissue levels throughout the risk period [7-9].

Parenteral antibiotics seem to be more appropriate than oral or topical antibiotics because the chosen antibiotics must reach high concentrations at all sites of danger. It is well recognized that broad-spectrum antibiotics are more likely to prevent gram-negative sepsis. There are many factors that affect physician's compliance with world health organization [WHO] guideline recommendations [10] including cultural factors, educational background, training, nurse and pharmacist influences medication supply and logistics. The post-operative prophylactic antibiotic administration has been shown to consistently reduce the rate of postoperative surgical site infections. In addition, the Joint Commission's Surgical Care Improvement Project has issued a list of procedure-specific prophylactic antibiotics. Studies have shown that compliance with these guidelines varies across institutions and procedures and regimens not in compliance have involved both undertreated and over treated cohorts [11-18].

SSI monitoring requires active, patient-based, prospective surveillance. Post-discharge and anti-discharge surveillance methods should be used to detect SSIs following inpatient and outpatient operative procedures. These methods include direct examination of patients wounds during follow-up visits to either surgery clinics or physician's offices, review of medical records or surgery clinic patient records, surgeon surveys by mail or telephone and patient surveys by mail or telephone (though patients may have a difficult time assessing their infections). Any combination of these methods is acceptable for use; however, Centre for Disease Control [CDC] criteria for SSI must be used [7, 19-25].

Patients should be selected for prophylaxis if the medical condition or the surgical procedure is associated with a considerable risk of

infection or if a postoperative infection would pose a serious hazard to the patient's recovery and well-being. Surveillance of SSI with feedback of appropriate data to surgeons has been shown to be an important component of strategies to reduce SSI risk [26, 27]. A successful surveillance program includes the use of epidemiologically sound infection definitions and effective surveillance methods, stratification of SSI rates according to risk factors associated with SSI development and data feedback. Hence a number of antibiotics prescribed after surgery can play a major role in the prevention of surgical site infection [28-30]. Surveillance on a number of antibiotics used post-surgery will give the surgeons an appropriate data to prescribe antibiotics, reduce the number of antibiotics post-surgery which will reduce the burden on patient's pocket or increasing the number of antibiotics in cases where there is a higher risk of surgical site infection. Also, there is no substantial evidence to confirm the regimen of antibiotics prescribed shows significant benefit in prevention of surgical site infections. Hence this study was carried out to quantify the effectiveness of two or more antibiotics regimen versus one or no antibiotic regimen in post-operative surgery.

## MATERIALS AND METHODS

### Methods

This study was a prospective study which was conducted over a period of 6 mo (Nov 2015 to April 2016) in The Oxford Medical College, Hospital and Research Centre, Attibele, Bangalore. Prior Institutional ethics committee approval was taken [IEC/TOMCHRC/033/15-16 dated 03/05/2015]. This study included hospital in-patients (elective surgery patients) treated in Surgical Department for various surgeries. Patient who met the following criteria were enrolled.

### Inclusion criteria

1. Patients aged  $\geq 18$  y of both genders from general surgery ward undergoing elective surgery.
2. Obstetrics and Gynaecology patients (Pregnant and Lactating patients).
3. Patients with clean and clean-contaminated surgical wound.

### Exclusion criteria

1. Patients with confounding factors/co-morbidities affecting the choice of antibiotics regimen.
2. Comatose and cognitively ill patients.
3. Emergency Surgery.
4. Patients with contaminated and dirty wounds.

### Sources of data

Indoor case papers (Medical case records).

Patient interview for the assessment of surgical site condition.

### Criteria for presence of surgical site infection

The infection occurs within 30 D of the surgical procedure. At least one of the following is present:

1. Purulent drainage from the surgical site.
2. Surgical site that is deliberately opened by a surgeon or attending physician AND
3. At least one of the following is present: fever, pain or tenderness, localized swelling, redness, or heat (warmth) at the surgical site [7].

### Study procedure

Patients who satisfy the above study criteria were included into the study and duly signed written informed consent form was obtained from the study participants in English or in patient's vernacular language beforehand. 120 Patients meeting the above criteria were included in the study.

Patient's demographic details, post-surgery medication chart (only the prescribed antibiotics) were collected and documented in a suitably designed data collection form.

The patients were grouped into 2 groups i.e. Group A (two or more antibiotics regimen) which include 72 patients and Group B (one or no antibiotic regimen) which include 48 patients.

Then the patients were followed on 1st, 2nd, 3rd and 4th week respectively after surgery to check for any surgical site infection by direct interviewing the patients.

Simple (yes or no type) questionnaires were asked to check the following parameters during each follow-up interview:

- Purulent/Pus drainage
- Reopening of surgical site by a surgeon or attending physician.
- Presence of fever, pain or tenderness, localized swelling, redness or heat (warmth) at the surgical site.

### Statistical analysis

The surgical site infections encountered by two groups of patients were then compared among each other by two sample Z test for mean proportions (Independent samples) using IBM SPSS 20 setting level of significance to 0.05 (confidence interval 95%). Standard deviation and mean was calculated using IBM SPSS 20.

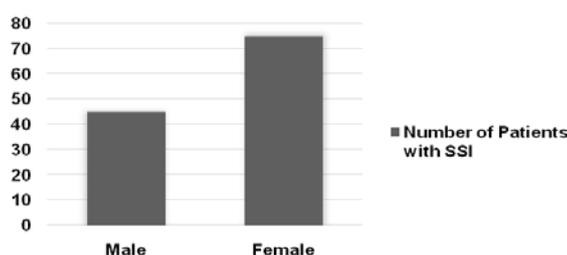
## RESULTS

A total of 120 patients meeting the inclusion criteria and receiving postoperative antibiotics were enrolled in the study. The overall surgical site infection rate was found to be 48.3% (58 out of 120 patients). Surgical site infection was correlated with increased age, surgery type, antibiotics used, the occurrence of SSI in group A and Group B which are given in fig. 1, fig. 2, fig. 3, fig. 4 and fig. 5 and table 1. The results clearly state that the two or more antibiotic regimen is better in controlling the SSI.

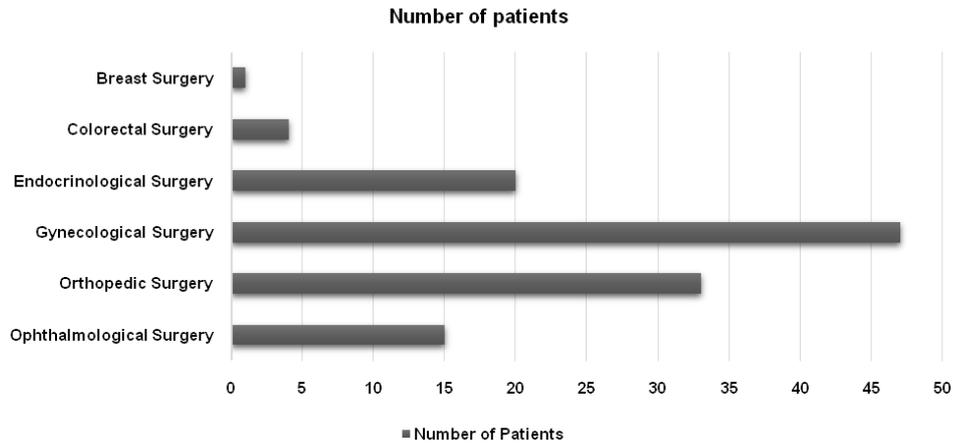
**Table1: It compares group A and group B by using two sample Z test for proportions**

	Total number of patients	Number of patients with SSI	Z value	P value
Group A (Two or more post-operative antibiotics)	72	26	-3.29	0.001
Group B (One or no postoperative antibiotics)	48	32		

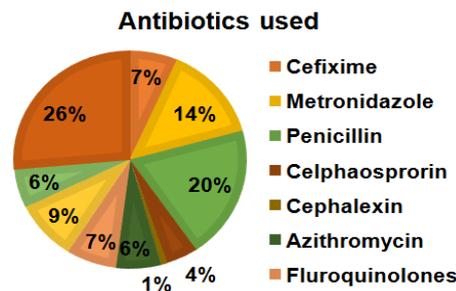
N=120; P<0.001 significant by Z test.



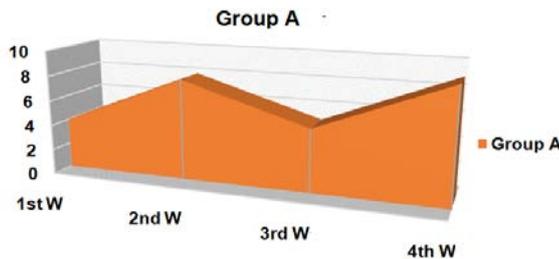
**Fig.1: Gender distribution in patient with surgical site infection [SSI]**



**Fig.2: Distribution of patients according to surgery type**



**Fig.3: Antibiotics used in general surgery**



**Fig.4: Occurrence of SSI in group A (W wise)**



**Fig.5: Occurrence of SSI in group B (w wise)**

**DISCUSSION**

Increased hospital length stays and increased cost after surgery episodes are often associated with surgical site infections which in a nutshell add a lot of burden onto the patients. This prospective study was undertaken to evaluate the effects of a number of antibiotic regimens and on surgical site infection.

A total of 120 patients were enrolled in this study for a period of six months i.e. from November to April. The overall surgical site

infection rate was 48.3% (58 out of 120 patients). However, this study was more dominated by female patients; there were 63% female patients compared to 37% male patients enrolled in this study. Also, the post-operative surgical site infection was comparatively observed more in female patients than in the male. General surgery department too had many gynaecology related patients followed by Orthopaedic and Endocrinology surgeries [20].

An average number of antibiotics prescribed per prescription was 2.1 which correlate with a study done [14]. Amoxicillin was

prescribed more commonly 26% among 120 patients and followed by penicillin with 20%.

Our main aim of the study was to evaluate and compare the effect of two or more antibiotics prescribed versus one or no antibiotics prescribed on postoperative surgical site infection. This study revealed that the patients in Group A (Two or more antibiotics) had significantly lower number of surgical site infections compared with Group B (One or no antibiotics) p-value 0.001. Hence this study concludes the surgeons to prescribe at least two or more antibiotics in general surgery to avoid SSI (surgical site infections). The surgical site infections were observed more frequently in the 2nd week after surgery in both Group A and Group B.

### CONCLUSION

Our study concludes that Group A (patients receiving two or more antibiotics) had significantly less number of post-operative surgical site infections when compared to Group B (patients receiving one or no antibiotics) with  $P < 0.001$ . Further, the study was conducted for a short duration of time and was also done in a small number of populations. Also, patients of general surgery department were enrolled in this particular research study. Further research should be done considering particular department. Our study concluded with the importance of post-operative two or more antibiotic prescribing.

### Study limitation

The numbers of patient studied were 120. Equal gender ratio with SSI should have been used but the Hospital had more female cases with SSI when compared to male patients. Further, the study was conducted for a short duration of time and was also done in a small number of populations.

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### AUTHORS CONTRIBUTION

Conceptualization of the study was suggested by SG. The relevant literature survey, data collection and analysis were done by MB, AS and NS (contributed equally). The analysis of results and writing of paper were done by SG and PMP.

### CONFLICT OF INTERESTS

The authors declare that they have no competing interests

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