

Single Dose of Cefotaxime in Preventing Surgical Site Infections in Abdominal Surgery: A Prospective Study

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Abstract

Background: In both developed and developing countries, surgical site infections (SSI) are the most commonly identified healthcare-acquired infection and surgical complication, which have an adverse impact on patients. It leads to an increased rate of morbidity, which is an important factor for increased healthcare costs.

Aim: The aim of the study was to the single-dose use of cefotaxime antibiotic in SSI in elective abdominal surgery.

Materials and Methods: The study was conducted on over 50 patients admitted for elected surgery in the hospital. The patients were taken care of as per NICE guidelines to prevent SSI. Cefotaxime 1 g antibiotic injection was administered intravenously 30 min before the incision site before surgery.

Results: In 50 patients included in the study, 56% were males and 44% were females. The 32% who have undergone surgery were from age groups 41-50 and 28% from age group 31-40. Most patients underwent hernioplasty (38%), followed by excisions, hernia mesh repair, cholecystectomy 22%, 14%, and 12%. The post-operative wound complications were also reduced in the patients.

Conclusions: To conclude, single-dose antibiotics Cefotaxime before 30 min of surgery may help prevent SSI in uncomplicated surgeries.

Key words: Antibiotic, Cefotaxime, Elective surgery, Surgical site infection

INTRODUCTION

Every year, hundreds of millions of people around the world undergo surgery. Surgical infections are infections that occur due to a surgical procedure or need surgical intervention as part of their treatment. They are caused due to failure in mechanical/anatomic defense mechanisms and are associated with increased morbidity, significant mortality, and increased healthcare costs.

Surgical site infections (SSIs) continue to be a significant cause of morbidity and mortality among surgical patients,

accounting for approximately one-fifth of all healthcare-associated infections.^[1] They are also sometimes responsible for increased treatment costs, re-admission of the patients, prolonged length of hospital stay, and a significant increase in patient's morbidity and mortality, causing increased economic burden.

Despite advancements in operating room practices, modern instrument sterilization methods, improved surgical techniques, preventive strategies, and SSI remain a concerning cause of hospital-acquired infection.^[2]

Considering the developed countries with the most modern facilities and best standard protocols, SSI has been reported to affect 5% to 15% of hospitalized patients in regular wards and up to 50% or more of patients in intensive care units (ICUs), while the magnitude of the problem remains primarily underestimated in developing countries.^[3]

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Endogenous contamination, such as skin flora, and exogenous contamination, such as healthcare personnel or contaminated surgical instruments, have been highly correlated to the pathogenesis of SSI. Other factors, such as organism burden and pathogen virulence factors, also play a significant role in SSI occurrence.^[4]

People who develop SSI need advanced medical care. An unwanted medical stay also increases by 60% of the patients with SSI than an uninfected surgical patient. It was well observed that the most commonly found organisms associated with SSI are Gram-positive bacteria such as *Staphylococcus aureus*, coagulase-negative *Staphylococcus*, *Enterococcus* species.^[5]

It has also been observed that patients who develop SSIs have a 2–11 times higher mortality rate than patients who do not develop SSIs.

Due to the high incidence of SSI, antibiotics play a particularly important role in the post-operative care of patients undergoing elective surgery (SSI). It has been reported that when an antibiotic is not used, 30–40% of patients develop post-operative SSI.^[6] Considering the importance of antibiotic administered along with anesthesia, induction is recommended during any surgery.

Antibiotics should be specific and targeted to the likely causative organisms and appropriate for the patient, taking allergies, and co-morbidities into account. The dose should be not being administered sooner than 120 min before the incision is made (WHO).

Aim

The aim of the study was to the single-dose cefotaxime antibiotic before the surgery in preventing SSI in elective surgery.

MATERIALS AND METHODS

The study is a type of prospective study conducted in the department of general surgery in which the patients who were admitted and underwent abdominal surgeries were involved. The study included 50 patients who underwent elective surgery in a tertiary care hospital's general surgery department.

Patients who were admitted and met the inclusion criteria were recruited for the study. Following that, written consent to participate in the study was obtained, and a full history and physical examination were performed. A pretested interviewer-administered semi-structured questionnaire was used to collect patient data.

Inclusion Criteria

Patients who underwent elective surgery, more than 18 years had no sign of infection before the surgery.

Exclusion Criteria

The study excluded surgeries on severely immunocompromised patients, patients with incomplete primary wound closure, and re-look surgeries or with any other co-morbidities.

An in-depth examination of these cases in terms of admission date, history, clinical features, type of surgery (emergency or elective), preoperative preparation, type of incision, contamination, a procedure performed, preoperative findings, drain used, and its type and duration of operation and post-operative management were recorded and tabulated.

The Swabs were collected from infected post-operative wounds of the patients using standard microbiological methods. Sterile swabs of collected samples were transported to the laboratory at room temperature within 15 min of the collection; swabs were inoculated on different culture media types. The chocolate, blood, and MacConkey agar as a culture media were used. The inoculated plates were incubated for 24–48 h at 35–37°C. A Gram stain procedure was performed on culture growths to report the organisms.

RESULTS

In this study, 50 people were recruited from the hospital who had elective surgery. Patients over the age of 18 who did not have diabetes, high blood pressure, antibiotic allergies, or immunosuppressive diseases were eligible. Patients were treated following NICE guidelines. The patients were examined preoperatively, intra-operatively, and postoperatively. The patients included 28 males 22 females, as depicted in Figure 1. The age of the patients was in the range of 18 years to 70 years. Twelve patients, that is, 24% of the sample studied, were in the age group of > 30. Fourteen patients, that is, 28%, were in the age group of 31–40. Sixteen patients, that is, 32%, were in the age group of 41–50 and 8 patients, that is, 16% of the total population studied were > age of 50, as shown in Graph 1.

Among various abdominal elective surgery opted by the patients, the hernioplasty was the most commonly performed procedure (38%), followed by excisions (22%), hernia mesh repair (14%), and cystolithotomy (12%) followed by 3 procedures of appendicectomy 1 patient of cholecystectomy was observed as shown in Figure 2.

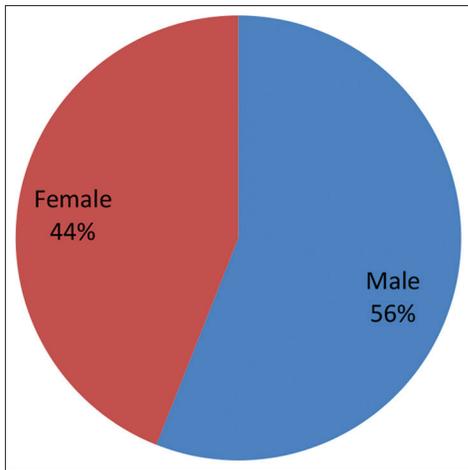


Figure 1: The total number of patients involved in the study

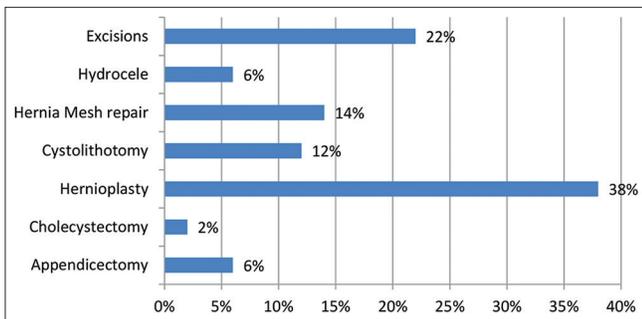


Figure 2: Distribution of surgery

The study witnessed and reported a significantly lower SSI incidence after being injected with a single dose of a cefotaxime antibiotic before elected surgery. The study shows a reduced incidence of <10% of post-wound complications such as fever, pain swelling, or any wound discharge from the surgery site, as depicted in Figure 3.

It was also very clearly reported that after the single-dose administration of cefotaxime antibiotic 14 days before the elected surgery, there was a significant reduction in SSI development cases. There were 94% cases in which there was no SSI development, whereas 6% of the cases experience moderate SSI development after the medical procedure, as shown in Graph 2.

The most commonly identified bacteria from the SSI were *E. coli* followed by the Staphylococcal was isolated from a case of hernioplasty, appendicectomy, and ventral hernia mesh repair. Patients who had SSI were evaluated. Antibiotics were administered and the patients were monitored regularly.

DISCUSSION

SSIs are widely recognized as one of the leading causes of nosocomial infections worldwide. They continue to be a

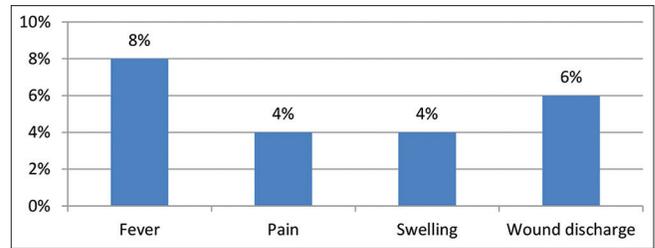
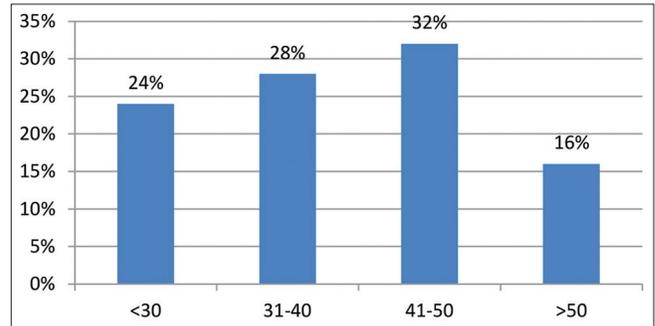
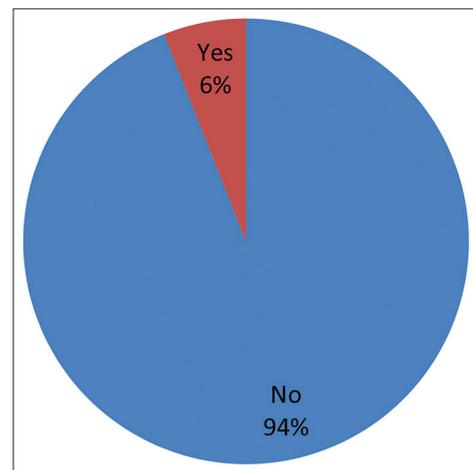


Figure 3: Distribution of post wound complication



Graph 1: Age group of the sample studied



Graph 2: Distribution of SSI cases post-surgery

major public health issue, resulting in increased antibiotic use, increased associated costs, prolonged hospitalization, and increased patient morbidity and mortality.^[7] According to various studies, the SSI rate ranges from 2.5% to 41.9% worldwide and from hospital to hospital.^[8]

From a historical perspective, there has been a significant improvement in postsurgical outcomes. However, these incremental gains have slowed in recent decades. The benefit of antibiotics was reported as far back as the 1960s from randomized trials, and this practice has had a marked impact on surgical practice. Antibiotics are typically given intravenously at the time of anesthesia induction.

This systematic study aimed to identify implementation interventions used in the field of abdominal surgery to

implement SSI prevention measures. The study conducted by Borade *et al.* reported 3% of superficial SSI.^[9] In another study conducted by Shah *et al.*, it was compared that single-dose antibiotics before surgery were compared with multiple-dose antibiotics treatment and found that 11% of patients undergoing laparoscopic surgery had SSI both the single-dose and multiple-dose antibiotic regimens. It was concluded that a single dose of antibiotics is more patient-friendly, cost-effective, has fewer side effects, and prevents the emergence of antibiotic resistance.^[10] The results regarding the administration of antibiotics are mostly consistent with findings from other reviews. The present study's overall infection rate was < 1%, a very less occurrence of SSI compared to the other studies that reported rates ranging from 2.5% to 41.9%.^[11]

CONCLUSION

This study concluded with a reduced rate of SSI. SSI when single dose prophylactic Cefotaxime is used. A multidisciplinary and multifaceted approach to SSI is necessary to continue to improve these critical outcomes of surgery.

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