# **Original Research Article**

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# Study of efficacy of short course peri-operative antibiotics in clean contaminated surgeries

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#### **ABSTRACT**

**Background:** Surgical site infection is a one of the most common postoperative complication and causes significant postoperative morbidity and mortality. WHO described Hospital acquired infections as one of the major infectious diseases having huge economic impact. Perioperative antibiotics constitute the bulk of antimicrobial consumption in any hospital. We need to adapt the policies that decrease the incidence of postoperative wound infection.

**Methods:** Patients undergoing elective surgeries for clean contaminated cases for various causes from 15<sup>th</sup> May 2014 to 15<sup>th</sup> June 2017 under Surgical 1st Unit of District hospital Gulbarga (Affiliated to Gulbarga Institute of Medical Sciences, Gulbarga) are included in our study. During this period, a total of 216 patients participated, of which 145 were males and 71 were females. Patients received two doses of perioperative antibiotics, first dose before surgery and second dose after surgery, 12 hours apart during this period.

**Results:** In this study, surgical site infection rate is 2.3% in clean-contaminated surgeries.

**Conclusions:** The findings indicate that a short course of perioperative antibiotics where in first dose is given 30 minutes to one hour before surgery and second dose is given 12 hours after surgery are sufficient and efficacious as infection rate is acceptable (1%-3%).Infection rate in our study was 2.3%. It is cost-effective as well for prevention of surgical site infections in clean-contaminated surgeries in Indian surgical setup.

Keywords: Clean-contaminated surgeries, Perioperative antibiotics, Surgical site infections

# INTRODUCTION

Surgical site infections (SSIs) are infections that occur in the wound created by an invasive surgical procedure.<sup>1-4</sup>

Surgical site infection is a one of the most common postoperative complications and causes significant postoperative morbidity, mortality, prolongs hospital stay, and increase hospital costs also.

There are many factors that affect the susceptibility of any wound to infection. These factors include preexisting illness, length of operation, wound class, and wound contamination. Other factors are extremes of ages, malignancy, metabolic diseases, malnutrition, immunosuppression, remote site infection, emergency procedures, and long duration of preoperative hospitalization.<sup>5</sup>

However, the period of greatest risk remains the time between opening and closing the operating site. <sup>6-8</sup>

The main outcomes for perioperative antibiotics are the choice, the timing, and the discontinuation. Perioperative antibiotics should be limited to the 24 hrs after the surgical procedures, nevertheless, a single dose could be considered enough in most of the procedures. <sup>9,10</sup>

Perioperative antibiotics constitute the bulk of antimicrobial consumption in any hospital. Usually, long

courses (conventional course) of perioperative antibiotics are administered, which are often associated with increasing antimicrobial resistance, super infection with resistant pathogens, toxicity and unnecessary cost. Success in surgery depends on prevention and proper management of the wound.<sup>11</sup> We need to adapt the policies that decrease the incidence of postoperative wound infection.

Surgical wounds can be divided into 4 classes: 12-14

The National Research Council developed a standard classification of surgical wounds as follows:

- Clean: elective (not urgent or emergency), primarily closed; no acute inflammation or transection of gastrointestinal, oropharyngeal, genitourinary, biliary, or tracheobronchial tracts; no technique break (e.g., elective inguinal herniorrhaphy).
- Clean-contaminated: urgent or emergency case that is otherwise clean; elective, controlled opening of gastrointestinal, oropharyngeal, biliary, or trcheobronchial tracts, minimal spillage and/or minor technique break, reoperation via clean incision within 7 days; blunt trauma, intact skin, negative exploration (e.g., vagotomy and pyloroplasty).
- Contaminated: acute, nonpurulent inflammation; major technique breaks or major spill from hollow organ; penetrating trauma <4 hour old, chronic open wounds tobe grafted or covered (e.g., acute, nonperforated, nongangrenous appendicitis).
- *Dirty:* purulence or abscess; preoperative perforation of gastrointestinal, oropharyngeal, biliary, or tracheobronchial tracts; penetrating trauma >4 hour old (e.g., perforated appendicitis with abscess).

Widespread use of current antibiotics has resulted in the emergence of many multi-resitant bacterial pathogens.<sup>13</sup> Compliance with the principles of appropriate antibiotic perioperative for surgical procedures should be strictly reviewed and the performance of audits should be part of the routine activity of infection control teams.<sup>14</sup>

Aims of the study ware to determine the effectiveness of short course perioperative antibiotics, first dose given before surgery and second dose given after surgery, 12hours apart for clean contaminated cases and to compare with the existing literature.

#### **METHODS**

This is a prospective study. Patients undergoing elective surgeries for clean contaminated cases for various causes from 15<sup>th</sup> May 2014 to 15<sup>th</sup> June 2017 under Surgical 1st Unit of District hospital Gulbarga (Affiliated to Gulbarga Institute of Medical Sciences, Gulbarga) are included in our study. During this period, a total of 216 patients were participated. Two doses of antibiotics 12 hrs apart

perioperatively were administered to the patients during this period. Patients received Inj. Cefotaxime 1g IV after test dose 30 minutes to 1 hour before the surgery and 1 more dose of Cefotaxime at 12hrs post surgery. Surgical wounds were inspected on post-operative day 3, 6, 10 or until suture removal, in case patient's complaints of pain or discharge from surgical site and at the end of 30days. Most of the patients were discharged on post-operative day 3 and followed up in out-patient department

#### Inclusion criteria

- Patients Aged 14-70 years
- Patients operated for clean contaminated surgeries
- Perioperative antibiotics given for 12 hours only
- Patients willing to get follow up for 30 days.

#### Exclusion criteria

- Patients aged below 14 or above 70 years
- Patients operated for surgeries other than clean contaminated cases
- Patients not willing for 30 days follow up.

The diagnosis of surgical site infection was made on clinical and bacteriological basis. Patient with surgical site wound infection were kept inpatient and treated accordingly. The study protocol, pro-forma, and other documents like patient information sheet and informed consent were taken according to standard protocol.

Study was analysed statistically by SPSS. Chi square test was applied. A p value of <0.05 was considered statistically significant.

### **RESULTS**

A total of 216 procedures were performed who received two doses of perioperative antibiotics, first dose given before surgery and second dose given after surgery, 12hours apart for clean contaminated cases, of which 145 were males and 71 were females out of whom four female patients and one male patient had surgical site infection. Patient's age ranged from 14 to 70 yrs. Surgical site infection was more in patients aged more than 40 years.

Table 1: Infections in various surgeries.

Operations	Number of performed	Number of infected
Recurrent appendicitis	137	01
Small bowel and large bowel surgeries	30	01
Gall bladder surgeries	42	01
Genito-urinary surgeries	07	02
Total	216	05

Among 216 patients, 5 patients had wound infection. One patient had surgical site infection, detected on  $3^{\rm rd}$  post-operative day who underwent open appendectomy for recurrent appendicitis, pus was drained and sent for culture and sensitivity and the organism was  $E.\ coli$  and treated accordingly with oral antibiotics. One patients who underwent open cholecystectomy had SSI on  $6^{\rm th}$  post-operative day, pus drained and sent for culture and sensitivity and the organism was  $E.\ coli$  and treated accordingly with oral antibiotics, one patients who

underwent right hemicolectomy for carcinoma caecum, presented with SSI on post-operative day 5, pus drained and sent for culture and sensitivity and the organism was *Klebshiella*, was managed conservatively. Two patients who underwent open visicolithotomy had surgical site infection, detected on 3rd post-operative day, pus drained and sent for culture and sensitivity and the organism was *E. coli* and treated accordingly with intravenous antibiotics. Patient was discharged on 10<sup>th</sup> post-operative day.

Table 2: Surgical site infection from different studies in india.

	Grant Medical College, Mumbai, Maharashtra			B. J. Medical College, Ahmedabad, Gujarat		
Wound class	No. of patients	No. of infected	Infection rate%	No. of patients	No. of infected	Infection rate%
Clean-contaminated	58	13	22.41	70	08	11.4

Surgical site infection was seen more commonly in patients operated for disease of lower genitourinary tract.

Most common organism responsible for surgical site infection was *E. coli*.

In our study, surgical site infection rate is 2.3% in clean-contaminated surgeries.

Table 3: Surgical site wound infection rates seen in our study and compared to other study.

Study	No. of patients	No. of infected	Infection rate%
Vivek et al	107	2	1.86
Our study	216	05	2.3

Table 4: Sex distribution of infections.

Sex	Surgical site infections		Total	Chi aguana valua	P value	SIG
Sex	No	Yes	Total	Chi square value	r value	31G
Female	67 (94.4%)	4 (5.6%)	71 (100%)		0.023	Significant
Male	144 (99.3%)	1 (0.7%)	145 (100%)	5.152		
Total	211 (97.7%)	5 (2.3%)	216 (100%)	•		

Table 5: Incidence of surgical site infection in different age groups.

A go in woons	Surgical site in	fection	Total	Chi canara valua	P value	SIG
Age in years	No	Yes	Total	al Chi square value		SIG
<= 40y ears	103 (100%)	0 (0.0%)	103 (100%)			
>40 Years	108 (95.6%)	5 (4.4%)	113 (100%)	4.666	0.031	Significant
Total	211 (97.7%)	5 (2.3%)	216 (100%)			

Table 6: Organism isolated in surgical site infections.

Name of the organism isolated	Number
E. coli	4
Klebsiella	1
Total	5

This study was found to be statistically significant.

#### **DISCUSSION**

Although only few literatures recommend prolonged usage of perioperative antibiotics in clean contaminated

surgeries, most surgeons however use prolonged antibiotics for the fear of surgical site infections.

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. One study found that the cost of inappropriate use of antibiotics perioperatively is approximately 10 times higher than the values expected. Thus, a cost effective perioperative antibiotic protocol is needed.<sup>15</sup>

Timing of antimicrobial prophylaxis is the most important factor for the prevention of surgical infections.

Perioperative antibiotics are more effective when begun preoperatively within two hours prior to surgery 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 in sufficient concentration at the time of incision to overcome the bacterial load.

In the study, the surgical wound was examined daily till the patients' were discharged and then followed till 30 days. Wound infection was suspected based on CDC guidelines given below:

The CDC definition of three levels of SSI:

- Superficial incisional, affecting the skin and subcutaneous tissue. These infections may be indicated by localized (Celsius) signs such as redness, pain, heat or swelling at the site of the incision or by the drainage of pus.
- Deep incisional, affecting the facial and muscle layers. These infections may be indicated by the presence of pus or an abscess, fever with tenderness of the wound, or a separation of the edges of the incision exposing the deeper tissues.
- Organ or space infection, which involves any part of the anatomy other than the incision that is opened or manipulated during the surgical procedure, for example joint or peritoneum. These infections may be indicated by the drainage of pus or the formation of an abscess on radiological examination or during re-operation.<sup>16</sup>

Once wound infection was suspected swabs or aspirates were collected from these sites following all precautions, sent for culture and sensitivity and respective antibiotics started.

In our study, the surgical wound infection rate in clean contaminated cases after two doses of perioperative antibiotic 12 hours apart was 2.3% which is very low compared to many studies from India at different places which have shown the SSI rate to vary from 6.09% to 38.7%. <sup>17-20</sup> Our study is consistent with study done by Vivek S et al, which showed that surgical site infection

rate is 1.86% after 48 hrs of antibiotics in clean contaminated cases.

Eleven patients were lost to attrition. The cases were not considered in our study. In present study patients were divided in five age groups. The rate of SSI was highest in age group >55 years which is comparable to other studies. <sup>21,22</sup> This could be due to poor immunity, existing co morbidities in old patients and reduced compliance with treatment.

The percentage of operated cases of males (67%) was found to be higher than that of females (33%) in this study which was similar to that found in other studies where males 62.68% and females were 37.32%.<sup>23</sup> Similarly, females were also found to have higher SSIs as compared to males in another study.

Perioperative antibiotics for general surgeries is a standard protocol in Indian surgical setup. Appropriate perioperative antibiotic protocol could decrease post-operative morbidity, lessen the hospital stay and it could possibly reduce the overall expenditure which are attributable to the infection. The antibiotics should be administered ideally within 30 minutes and certainly within two hours of the time of incision.<sup>24</sup>

#### **CONCLUSION**

Our findings indicate that a short course of perioperative antibiotics where in first dose is given 30 minutes to one hour before surgery and second dose is given 12 hours after surgery are sufficient and efficacious as infection rate is acceptable (1%-3%). Infection rate in our study was 2.3%. It is cost-effective as well for prevention of surgical site infections in clean-contaminated surgeries in Indian surgical setup. Maintaining aseptic precautions, incorporating appropriate operation theatre protocols, following short course perioperative antibiotic protocol and sterile dressings will reduce surgical site infection.

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institutional ethics committee

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