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## Surgical Site Infections in the Department of General Surgery and Surgical Gastroenterology in a Teaching Hospital: A Prospective Study



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**Dr. Radha Krishna. K<sup>\*1</sup>, Sumaya Fatima<sup>2</sup>, Shafia Fatima<sup>2</sup>, Syed Ibad Uddin Taqui<sup>2</sup>, Dr. Sara Fatima<sup>3</sup>**

<sup>1</sup>*Assistant professor, Department of Surgical Gastroenterology, Owaisi Hospital and Research, Center, DMRL 'X' road, Santoshnagar, Kanchan Bagh, Hyderabad, Telangana 500058, India.*

<sup>2</sup>*Pharm-D Student, Deccan school of pharmacy, Darussalam, Aghapura, Hyderabad- 500001, India.*

<sup>3</sup>*Pharm- D Assistant professor, Department of pharmacy practice, Deccan school of pharmacy, Darussalam, Aghapura, Hyderabad- 500001, India.*

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### ABSTRACT

**Background:** Surgical site infections (SSI's) are the third most commonly reported nosocomial infections which have an adverse impact on the hospital as well as on the patient. A continuous surveillance is essential to find out the incidence of SSI's, risk factors implicated, organisms involved and their sensitivity patterns. **Objectives:** The aim of our study is to find out the incidence of SSI's, risk factors implicated, organisms involved and their sensitivity patterns. **Methodology:** A prospective observational study was conducted at Owaisi hospital and research center, for patients admitted to the Department of General Surgery and Surgical Gastroenterology for a period of six months. The demographic data, diagnostic criteria, associated risk factors and laboratory data including Gram stain, culture and antimicrobial susceptibility of swabs from the surgical sites were collected. **Results:** Out of 130 patients recruited in the study, 7 patients showed evidence of surgical site infections at a rate of 5.38%. Prolonged duration of surgery and prior stenting of biliary tract showed significantly higher rate of surgical site infection compared to their counterparts. The most commonly isolated bacteria was *Escherichia coli*. **Conclusion:** The incidence of SSI was 5.38% which was comparable to that reported in literature. *Escherichia coli* was the most commonly isolated bacteria. History of prior stenting of biliary tract and prolonged duration of surgery stand out as major risk factors for incidence of SSI's. Other comorbidities did not directly affect the rate of SSI in our study.



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## INTRODUCTION

**Surgical site infection** (SSI) previously termed postoperative wound infection is defined as an infection that occurs after surgery on the part of the body where the surgery took place. It presents up to 30 days after a surgical procedure if no prosthetic is placed and up to 1 year if a prosthetic is implanted in the patient.<sup>(1)</sup> The global data suggests the SSI incidence rate varies from 0.5 to 20% depending upon the type of operation and underlying patient status.<sup>(2,3)</sup> A recent surveillance by International Nosocomial Infection Control Consortium (INICC) across 82 hospitals of 66 cities in 30 limited-resource countries including India revealed an overall SSI rate of 2.9 as compared with the incidence rate of 2.0 for the US hospitals.<sup>(4)</sup> SSI's results in patient discomfort, prolonged length of hospital stay and increased cost.<sup>(1)</sup> The microbiology of SSI is related to the bacterial flora present in the exposed anatomic area of a particular procedure and has been relatively fixed during the last 30 years as shown by the National Nosocomial Infection Surveillance system (NNIS) established by the Centers for Disease Control and Prevention (CDC). This study has shown that *Staphylococcus aureus* remains the most common pathogen of SSI followed by Coagulase negative, *Enterococcus* and *Escherichia coli*.<sup>(5)</sup> The risk of developing SSI may be affected by various factors such as Wound class, (Clean, Clean contaminated, Contaminated and Dirty) microorganism, local wound and patient related factors like bacterial virulence, preoperative shaving of surgical site, duration of procedure, foreign bodies, immunosuppression, and other comorbidities like smoking, diabetes and obesity.<sup>(5)</sup>

The aim of our study is to find out the incidence of SSI's, risk factors implicated, organisms involved and their sensitivity patterns.

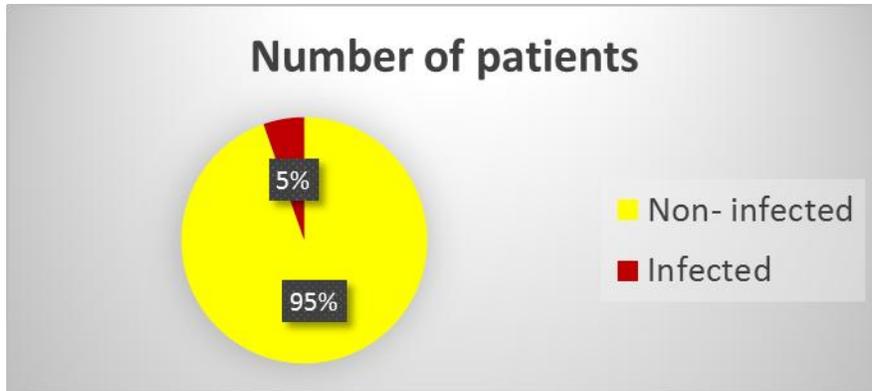
## MATERIALS AND METHODS

A Prospective, observational study was carried out for a period of 6 months (December 2016 - May 2017) in the Department of General Surgery and Surgical Gastroenterology at Owaisi Hospital and Research Centre. All the In-patients who were operated in the Department of General Surgery and Surgical Gastroenterology at Owaisi Hospital and Research Centre were included in the study. Patients operated on out-patient basis, not willing to participate in the study, having wound infection before surgery and those undergoing placement of implant were excluded from the study. The study was granted Institutional Review Board/ Institutional Ethical

Committee approval. For Data collection, a specially designed data collection form was developed to collect and analyze the patient data. Informed consent was taken from the patient to collect wound swab and send for culture and sensitivity. Antimicrobial sensitivity testing was carried out by modified Kirby Bauer disc diffusion method <sup>(6)</sup> and result was interpreted in accordance with Clinical Laboratory Standards Institute Guidelines (CLSI2015).<sup>(7)</sup> Statistical analysis for the categorical variables was performed by computing the frequency in each category. Frequency differences between groups were compared using Chi- Square test or Fisher exact test when appropriate. Student t-test was used for comparing continuous variables. All tests were two tailed; a P- value <0.05 was considered as significant. Statistical software SPSS version 16 (SPSS Inc., Chicago, IL) was used for the statistical analysis.

## RESULTS

During the study period, 150 patients from the Department of General Surgery and Surgical Gastroenterology were taken into study out of which 20 patients were excluded as they underwent placement of mesh and thus have to be followed for 1 year to document SSI as per CDC definition. Out of 130 patients, 7 patients had shown frank clinical infection which needed drainage of pus and frequent dressing. The overall infection rate in our study was found to be 5.38% and the uninfected rate about 94.62% as shown in figure-1. The incidence of infection was predominantly more in males (5.79%) than females (4.91%). The rate of SSI was higher in patients with age group greater than 60 years of age (11.11%). There was no significant difference in occurrence of postoperative wound infection in patients undergoing emergency or elective surgeries. The rate of SSI was significantly higher in patients with prolonged surgery lasting two hours or longer than those who had shorter surgery time (P= 0.0006). The incidence of SSI was found only in patients who underwent abdominal surgeries. The rate of SSI, was higher in clean contaminated and contaminated wounds (6.25%) when compared to clean and dirty wounds (0%). The incidence of SSI was significantly more in patient who underwent preoperative biliary stenting (P=0.0001). Other factors like history of previous surgery and smoking did not affect the incidence of SSI. Statistical analysis of results has been shown in table-1. The most commonly isolated bacteria were *Escherichia coli* (6/7) and *Klebsiella pneumonia* (1/7).



**Figure-1: Overall incidence of surgical site infection**



**Table-1: Statistical analysis of results**

Characteristics		SSI/Total	SSI%	P- value
Gender	Male	4/69	5.79%	1.0
	Female	3/61	4.91%	
Age (years)	1-19	0/30	0%	0.688
	20-29	2/31	6.45%	
	30-39	1/20	5%	
	40-49	1/18	5.55%	
	50-59	1/13	7.69%	
	>60	2/18	11.11%	
Operation category	Emergency	1/19	5.26%	1.0
	Elective	6/111	5.40%	
Site of operation	Abdomen	7/107	6.54%	0.811
	Neck	0/5	0%	
	Back	0/3	0%	
	Thorax	0/0	0%	
	Perineal	0/0	0%	
	Breast & axilla	0/8	0%	
	Limbs	0/7	0%	
Type of operation	Clean	0/16	0%	1.0
	Clean-contaminated	4/64	6.25%	
	Contaminated	3/48	6.25%	
	Dirty	0/2	0%	
Duration of surgery	<2hrs	1/100	1%	0.0006*
	>2hrs	6/30	20%	
Associated risk factors	H/o previous surgery	2/31	13.51%	0.6712
	Diabetics	0/12	0%	-
	Hypertensive	0/20	0%	-
	Tobacco chewer	0/10	0%	-
	Asthma	0/3	0%	-
	Alcohol consumers	0/11	0%	-
	Smokers	1/11	9.09%	0.4697
	Biliary stenting	3/3	100%	0.0001*

## DISCUSSION

- The incidence of SSI in our study was 5.38%. Incidence of SSI is less when compared to study by Patel *et al.* (16%) but more when compared to study by Reddy *et al* (3.63%).<sup>(8)</sup>
- There is a marginal preponderance of male patients developing SSI (5.79%) over female patients with SSI (4.91%) which is not statistically significant (Table:1). However, it has been known that sex is not a pre determinant of the risk of SSI.<sup>(9)</sup>
- Prolonged duration of operation results in increased exposure of operation site to air, prolonged trauma, stress of prolonged anesthesia and sometimes blood loss.<sup>(9)</sup>
- Our study reveals a clear cut increase in the incidence of SSI i.e. 20% where surgery has been prolonged for  $\geq 2$  hours. In fact, this correlation has been established since 1964 by the Public health laboratory services (PHLS) in England and Wales.<sup>(9)</sup>
- The incidence of SSI was less in clean wounds i.e. 0% when compared to clean contaminated and contaminated wounds i.e. 6.25%. This is an expected observation.
- The incidence of SSI was less in dirty wounds when compared to clean contaminated and contaminated wounds. This is likely due to less number of surgeries with dirty wounds during the study period.
- SSI's have occurred more in elective surgeries (5.40%), than in emergency surgeries (5.26%) (Table: 1). This observation may seem very surprising, as emergency cases have known to land up in SSI more than the elective ones.<sup>(10)</sup> However, in our study, there have been number of elective cases over this time period than emergency cases.
- All SSI's occurred in patients who underwent abdominal surgeries probably due to contamination of surgical site with endogenous flora.
- Incidence of SSI was high in patients undergoing preoperative stenting of the biliary tract.
- *Escherichia coli* was the most common organism isolated. This finding is consistent with study by Patel *et al.* <sup>(8)</sup>.

## CONCLUSION

The incidence of surgical site infection was 5.38% in our study. *Escherichia coli* was the most common organism isolated. History of prior stenting of biliary tract and prolonged surgery stand out as major risk factors for incidence of surgical site infections.

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