



## Research Article

# PROSPECTIVE STUDY OF SURGICAL SITE INFECTIONS IN A SPINE SUPERSPECIALITY INSTITUTE- GOVERNMENT ORGANIZATION IN WESTERN INDIA

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**Abstract-** Background: Surgical Site Infections SSIs remain a major cause of morbidity and death among the operated patients and continue to represent about a fifth of all healthcare-associated infections. In the developed countries, SSI has been reported to affect from 5% to 15% of hospitalized patients. The study was aimed to find out SSI rate, its risk factors its aetiology and its antimicrobial susceptibility pattern. Methods: During daily rounds infection control nurse collects all the details from the post-operative patients. It is scrutinized for the signs and symptoms as per CDC criteria for confirmation SSI and pus or swab a sample are sent to Microbiology laboratory for isolation, identification and antimicrobial susceptibility testing. Results: The rate of SSI was in the present study. The most common bacteria were *E. coli* followed by *K. pneumoniae*, *S. aureus* and *P. aeruginosa* in the present study. Conclusion: The present study showed that active Surveillance of surgical site infections with feedback to surgeons would be desirable to reduce SSI rates also if strict infection control practices and SSI care bundle are observed it is possible to reduce the rates of SSI. This study showed moderate to high resistance in pathogens which is a concern for all.

**Keywords-** Surgical Site Infections SSIs, Health Care Associated Infection HAI, Risk Factors, Multidrug Resistant Organism-MDRO

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## Introduction

SSIs represents about a fifth of all healthcare-associated infections and remains a major cause of morbidity and death among the operated patients [1]. Instrument sterilization methods, better surgical technique and the best efforts of infection prevention strategies, surgical site infections remain a major cause of hospital [2]. In many countries, even basic life-saving operations such as cesarean sections and appendectomies are associated with high infection rates and mortality [3] and the magnitude of the problem remains largely underestimated [4]. 5% to 15% of SSI are reported in developed countries and the rates are more in ICUs up to 50%. SSI rate ranges from 2.5% to 41.9% [5]. SSI causing pathogens are acquired either endogenously from the patient's own flora or exogenously from contact with operative room personnel or the environment. However, the period of greatest risk remains the time between opening and closing the operating site [6].

## Materials and Methods

This was a prospective study undertaken in the Superspeciality Hospital to find out SSI rate, its risk factors its aetiology and its antimicrobial susceptibility pattern Total 678 surgery was performed January 2019 to September 2019. All patients who underwent various surgeries namely Cervical Procedure-Anterior and posterior Decompression-Fusion & fixation, Discectomy, Laminectomy, Osteotomy + Bone Grafting + Plating, T.K.R (Total knee replacement) B/L or U/L, T.H.R.(Total Hip replacement)B/L or U/L, C.V.Junction (Cervical posterior fixation), TLIF (Trans Lumbar interbody Fusion ), implant removal (Mosmiyami posterior screw), Plating of any limb, Plastic surgery and Flap Surgery were included in this study. During daily rounds infection control nurse collects all the details from the postoperative patients.

It is scrutinized for the signs and symptoms as per CDC criteria for confirmation SSI like fever and swelling, pain tenderness and pus discharge from the incision site [7] and pus or swab a sample are sent to Microbiology laboratory for isolation, identification and antimicrobial susceptibility testing. The samples were processed as per standard microbiological techniques and antimicrobial susceptibility was done by the disc diffusion test as recommended by CLSI guidelines [8-11]. The postoperative surveillance of the cases was done even after the discharge of the cases till 90 days during their follow-up visits and making feedback calls to the patients. The SSI care bundle implementation helps in reducing the rates which included preoperative, intraoperative and postoperative measures.

## Preoperative

Avoid hair removal at the surgical site. if hair must be removed use single-patient use clippers and not razors. Wash the patient or make sure that the patient has showered (or bathed/ washed if unable to shower) on day of or day before surgery. Use the right drug at the right time for the right duration for antibiotic prophylaxis. Right drug prescribes antibiotic prophylaxis according to local antimicrobial prescribing guidelines. Right time: Ensure that the antibiotic is given at induction- within 30-60 minutes of skin incision. In surgery where a tourniquet is to be applied, a 15 minutes period is required between the end of antibiotic administration and tourniquet application. Right duration: single dose only, unless otherwise indicated.

## Intraoperative

Use 2% chlorhexidine gluconate in 70% isopropyl alcohol solution for skin preparation. if the patient is sensitive or allergic use povidone-iodine.

Make sure that the patient's body temperature is maintained above 36°C during the perioperative period (excludes cardiac patients), the patient's oxygen saturation is maintained above 95%, or as high as possible if there is underlying respiratory insufficiency, if the patient is diabetic, that the glucose level  $\leq 110$  mg/dL is kept at throughout the operation. Give an additional dose of antibiotic if the surgical procedure is prolonged more than 4 hours or there is major intra-operative blood loss ( $>1.5$  litres in adults or 25ml/kg in children)-otherwise the duration of surgical prophylaxis should be a single dose. Cover the surgical site (wound) with a sterile dressing prior to removal of drapes at the end of surgery. Adherence to wound closure guidelines. Sterile wound dressing with sticker dressing change instructions.

### Postoperative

Do not leave OR in scrubs and OT Dress, Discontinuation of antibiotic in 24hours, Foleys catheter removal by post op day 2, Post-operative glucose control, Post-operative normothermia, Do not tamper with or remove the wound dressing for 48 hours post-op unless clinically indicated, Use aseptic (no touch) technique for wound inspection and/or wound dressing changes, Hand hygiene is mandatory before and after every time the wound is inspected or the dressing is changed, Dressing change by sterile technique., Frequency of dressing should be kept to minimum and dressing should be opened, 48hr after the operation unless infection is suspected, The longer a wound is open and the longer it is drained the greater risk of contamination, Wound review by surgeon before discharge, Post discharge monitoring of SSI as per SSI surveillance[12].

### Results

Out of 678 surgeries, 11 developed SSI. The overall incidence was 1.5%. The SSI was found in patient above 50 years of age and sex wise distribution of catheterized patients is shown in [Fig-1]. Male patients were more than the female patients.

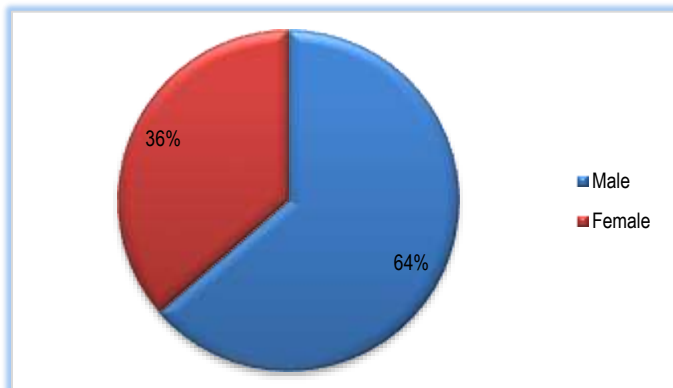


Fig-1 Sex Wise Distribution

Table-1 Month-wise rate of Surgical Site Infections-SSI

Year 2019	Number of surgeries in month	No of infections	SSI Rate
January	68	2	2.9
February	72	1	1.3
March	84	3	3.5
April	89	1	1.1
May	78	2	2.5
June	69	1	1.4
July	72	0	0
August	64	1	1.5
September	78	0	0
Total	674	11	1.5

All the 678 cases received the antibiotic prophylaxis before 60 minutes of the skin incision as per the institutional antibiotic policy. Duration of the surgery was more than 4 hours in all SSI cases and the postoperative stay was more than 10 days. The month wise rate of SSI shown in [Table-1]. The SSI rate was low as all the surgeries performed were clean. Except for the months of January, March, May and July the rates were low due to implementation of the SSI care bundles and the vigorous training and on site monitoring the rates reduced.

Table-2 Risk factors associated among cases of Surgical Site Infections-SSI

Risk Factors	No of cases among SSI
ASA score more than 2	4
Anaemia	3
Diabetes	3
Oxygen Saturation less than 95	2
Blood loss more than 1.5 litres	2
Smoking	3

The most common bacteria were *Escherichia coli* (55.6%), and *Klebsiella pneumoniae* (21.2%), *Staphylococcus aureus* (13.4%) and *Pseudomonas aeruginosa* (9.8%) from the cases of SSI. Isolated bacteria were resistant to multidrug. Among gram negative bacteria Imipenem, Amikacin, Levofloxacin Cotrimoxazole, Tetracycline, Doxycycline, Tigecycline and Colistin were drug of choice. Among gram positive bacteria Ampicillin Sulbactam, Amikacin, Cotrimoxazole, Levofloxacin Tetracycline, Doxycycline, Tigecycline, Vancomycin, Teicoplanin, Linezolid were the drug of choice

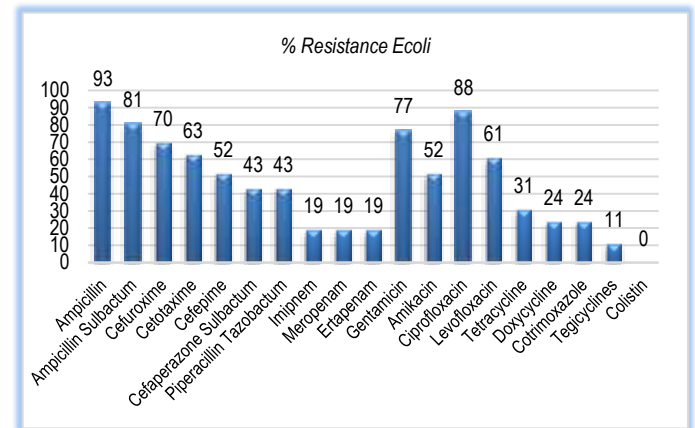


Fig-2 % Resistance pattern of *Escherichia coli*

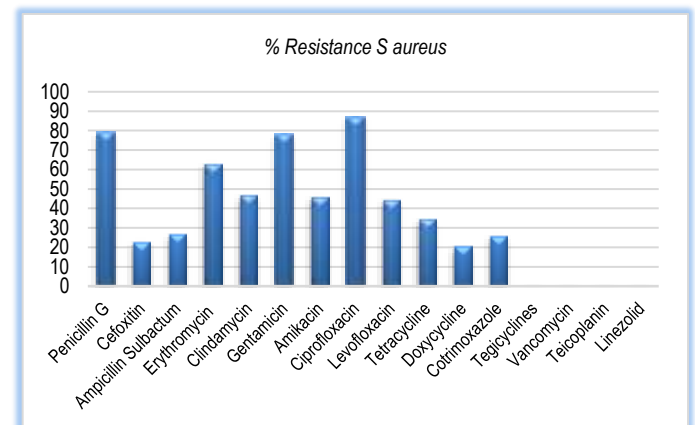


Fig-3 % Resistance pattern of *S aureus*

### Discussion

The incidence of SSI in our set up was 1.5 %. The rate is quite low as compared to other studies [13, 14]. SSI rate has varied from a low of 2.5% to a high of 41.9% [5]. The associated risk factors are ASA grade more than 2, anemia, prolonged surgery, prolonged hospitalization diabetes, smoking, intraoperative oxygen saturation less than 95 and sometimes blood loss [12,14]. In our study many risk factors were found among SSI cases. As all the surgeries are clean and the rates were comparable with other studies like In Aurangabad 10.6 % and 4% in clean contaminated and clean cases respectively, [13], Mumbai [14] 22.4% and 3.0% respectively and in England [15] 10.8% and 3.0% respectively. To keep low incidence of SSI strict infection prevention practices are needed to be observed, also compliance to the SSI care bundles preoperatively, intraoperatively and postoperatively which can be achieved by frequent visits by infection control team members daily to monitor the preventive bundles meticulously [12].

The active surveillance of surgical site infections with feedback to surgeons would be desirable to reduce SSI rates. The surveillance must include the post discharge surveillance as per CDC guidelines [7]. The bacteria isolated from SSI cases were found to be Multidrug Resistant Organisms-MDROs. These findings correlate with various other studies [13-15] where multidrug resistant bacteria were isolated. In the present study the most resistant bacteria were *Escherichia coli*, *Klebsiella pneumoniae*, *Staphylococcus aureus* and *Pseudomonas aeruginosa*. which showed the high resistance to multiple antibiotics including imipenem and meropenem. Increase in the antibiotic resistance amongst the bacteria indicates that they are hospital acquired and thus difficult to treat. Among gram negative bacteria Imipenem, Amikacin, Levofloxacin Cotrimoxazole, Tetracycline, Doxycycline, Tigecycline and Colistin were drug of choice. Among gram positive bacteria Ampicillin Sulbactam, Amikacin, Cotrimoxazole, Levofloxacin Tetracycline, Doxycycline, Tigecycline, Vancomycin, Teicoplanin, Linezolid were the drug of choice. The chances of transmission of these multi drug resistant are high if health care workers do not follow preventive practices meticulously.

### Conclusion

SSIs represents about a fifth of all healthcare-associated infections and remains a major cause of morbidity and death among the operated patients [1]. At least 5% of patients develop an SSI after surgery [2]. The emergence of Multidrug Resistant Organisms-MDRO is an important problem identified as there is change in microbiological and antibiotic sensitivity pattern of the pathogens isolated from SSI cases. In the initial months the rate of SSI was high in the present study but after implementation of SSI care bundles the SSI rate was reduced by 1.5 %. The active Surveillance of surgical site infections with feedback to surgeons would be desirable to reduce SSI rates also. The surveillance must include the post discharge surveillance as per CDC guidelines. To keep low incidence of SSI strict infection prevention practices are needed also strict compliance to the SSI care bundles and the hand hygiene is recommended.

**Application of research:** This study helped to know the rate of SSI in a superspeciality setting and the implementation of the strict infection prevention and control practices and reduce the rate of SSI. It also enlightened us with the various available therapeutic options

**Research Category:** Medical Microbiology

### Abbreviations:

SSI- Surgical Site Infections  
 ASA- American Society of Anesthesiologists  
 HAI- Health Care Associated Infection  
 MDRO- Multidrug Resistant Organism  
 T.K.R- Total knee replacement-  
 T.H.R- Total Hip replacement  
 TLIF -Trans Lumbar Interbody Fusion

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**Study area / Sample Collection:** Government Spine Institute Ahmedabad

**Conflict of Interest:** None declared

**Ethical approval:** The study was approved by Ethics Committee of Government Spine Institute Ahmedabad and study number was GSI-EC-11-1-2019.  
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