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General Surgery

A PROSPECTIVE STUDY OF SURGICAL SITE INFECTION IN A TERTIARY CARE CENTER IN NORTH INDIA

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ABSTRACT **BACKGROUND:** Surgical Site Infections (SSI) is defined as an infection related to an operative procedure that occurs at or near the surgical incision within 30 days of the procedure, or within 90 days if prosthetic material is implanted at surgery—is among the most common preventable complication after surgery.

OBJECTIVES: To study the incidence and risk factors of SSI in our hospital and to find out the areas which need concern and methods to reduce SSI.

METHODOLOGY: Study was conducted over a period of 1 year. A total of 300 cases of General Surgery presented to our hospital were included in the study. A few host factors, wound factors and surgery related factors that cause SSI were studied. Swabs from infected surgical wounds were sent to the department of Microbiology for pus culture and sensitivity. Antibiotic sensitivity test was done by Kirby-Bauer disc diffusion method.

RESULTS: Certain associated factors such as increased duration of surgeries (>2hours) and prolonged drain placement were found to be significantly associated with occurrence of SSI and the surgeries with class 1 (clean) wound showed minimum risk of infection. *Escherichia coli* (28.75%) was the commonest pathogen, followed by *Pseudomonas aeruginosa* (27%) and *Staphylococcus aureus (*20%) .The incidence of SSI in the hospital is 7%.

CONCLUSIONS: The results of the study revealed that in order to decrease the incidence of SSI we need to: a) If possible try to reduce the duration of the surgeries performed b) should give emphasis on drain care c) co-morbidities should be looked for and managed prior to surgery d) a regular monitoring should be done in both emergency and elective operation theatres in order to reduce the risk of SSI.

KEYWORDS : Surgical site infection, Drug resistance,

INTRODUCTION:

A surgical site infection (SSI) is an infection that occurs in the incision created by an invasive surgical procedure.SSI is a leading cause of hospital morbidity, increasing ICU admission rates, doubling mortality rates, and increasing overall length of stay. Primary management is prevention through good surgical technique and patient optimisation.

The rates of SSI vary depending on the type of surgery, depending on the degree of contamination:

2.1 for every 1000 operations, for clean surgery
3.3 for every 1000 operations, for clean contaminated surgery
6.4 for every 1000 operations, for contaminated surgery
7.1 for every 1000 operations, for dirty surgery

SSIs occur in 2% to 4% of all patients undergoing inpatient surgical procedures. Although most infections are treatable with antibiotics, SSIs remain a significant cause of morbidity and mortality after surgery. They are the leading cause of readmissions to the hospital following surgery, and approximately 3% of patients who contract an SSI will die as a consequence. Although SSIs are less common following ambulatory surgery than after inpatient procedures, they are a frequent source of morbidity in these patients as well.

The aim of this study is to find out the incidence as well as risk factors of SSI in this hospital and how to minimize and effectively control the SSI.

BACKGROUND:

The risk of SSI caused by resistant bacteria has become a major concern for hospitals and healthcare professionals. “Resistance” is the term used to describe the ability of a microorganism to withstand the effects of an antimicrobial agent. Microorganisms acquire resistance through evolution and adaptation. In particular, there is concern about the rise in SSIs due to vancomycin-resistant enterococci (VRE), Methicillin-resistant Staphylococcus aureus (MRSA), third generation cephalosporin-resistant Escherichia coli, and imipenem- and quinolone-resistant Pseudomonas aeruginosa.

MATERIALAND METHODS:

The study was conducted at GSVM Medical College, Kanpur, Department of surgery over a period of 1 year. This was a prospective study and a total of 300 General surgery cases admitted to our hospital, both elective as well as emergency were taken into study.

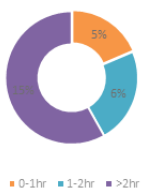
Certain risk factors like — type of surgical wound, elective or emergency surgery, antibiotic prophylaxis, duration of surgery, presence or absence of drain and any underlying or predisposing conditions were studied.

Swabs from infected surgical wounds were sent to the department of Microbiology for pus culture and sensitivity. Antibiotic sensitivity test was done by Kirby-Bauer disc diffusion method. Reporting was done according to *The Clinical and Laboratory Standards Institute*(CLSI) Guidelines.

DISCUSSION:

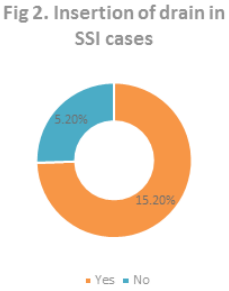
As per the study, incidence of SSI in our hospital was 7%. This correlates with the findings of similar studies done in India as well as abroad.[1,2] Some studies report higher incidence of 20% to even as high as 76.9%.[3,7] Increased intraoperative time leads to prolonged exposure of operation site to the environment, extensive trauma, stress of prolonged anaesthesia and rarely increased blood loss. In our study we found that there is increased number of SSI cases i.e 15% when intraoperative time was more than 2 hours.(Fig 1). Studies conducted on SSI in Aurangabad, Hyderabad, Orissa and Mumbai, have reported a similar observation. In fact, this correlation has been established since 1964 by the Public health laboratory services (PHLS) in England and Wales.

Fig 1. Duration of surgery of SSI cases

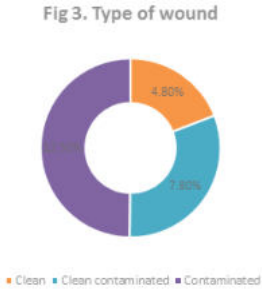


The use of drains, particularly the prolonged placement with poor

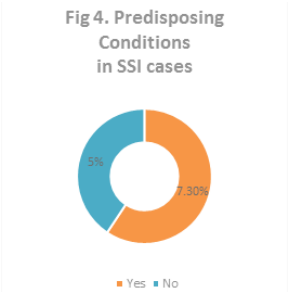
drain care contributed significantly as a risk factor in causing SSI in the study i.e 15.2%.(Fig 2) This could be due to the fact that they are more likely to be used in contaminated or dirty wounds and in emergency and prolonged operations which increases the probability of the wound getting infected.[8] Mumbai[2] has also observed 22.4% cases of drained and 3% undrained wounds getting infected while Aligarh [3] reported 30% and 11.6% respectively.



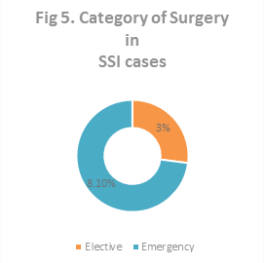
The rate of infection was highest in contaminated type of wounds 12.5%, followed by clean contaminated wounds-7.8% and least in clean wounds 4.2% (Fig 3). This is accordance with the other studies. In Aurangabad,[1] similar rates were noted i.e. percentage of infection rate was 10.6 % and 4% in clean contaminated and clean cases respectively, in Mumbai[2] 22.4% and 3.0% respectively and in England[8] 10.8% and 3.0% respectively. However, in Orissa,[5] the difference between the rate of infection in clean contaminated (25%) and in clean surgeries (30%) was not statistically significant.



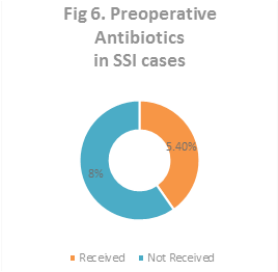
Certain co-morbidities like anaemia, diabetes, and associated risk factors like smoking may have adverse effect on the immune status thus significantly increasing the risk of SSI. They also contribute to increasing the pre operative stay of the patient which steeply increases the risk of SSI in such patients.[8] In our study, 7.3% of patients with SSI had some underlying conditions, anaemia and diabetes mellitus being the commonest (Fig 4). Each day of extra hospitalization adds to the risk of acquiring SSI and this has been confirmed by studies in Aurangabad,[1] Mumbai, [2] Hyderabad[4] and in Orissa.[5]



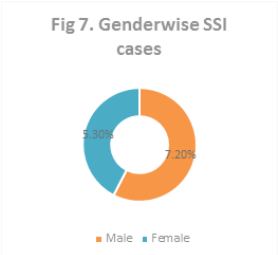
SSI have occurred less in elective surgeries-3.0%, than in emergency surgeries-8.1% (Fig 5). In our study, there were equal number of elective and emergency cases.



Pre operative antibiotics are known to decrease incidence of SSI cases.[9,1,7] thus the patients who did recieved the pre-operative antibiotic have shown to have less incidence of SSI.(Fig 6)



Also, there is a marginal preponderance of male patients developing SSI (7.2%) over female patients with SSI (5.3%) which is not statistically significant (Fig 7)). In our study male patients were more in number than female patients. Thus incidence is more in male patients.



In our study we found that the predominant micro-organism causing SSI are members of enterobacteracea family mainly *Escherichia coli*, *Pseudomonas aeruginosa*, and some gram positive cocci like *Staphylococcus aureus*. This trend of gram negative bacilli i.e. enterobacteriaceae dominating the gram positive cocci has been observed in Aurangabad,[1] Orissa[5] and Navi Mumbai[6] also. But in some studiest its been found that gram positive cocci were the predominant microorganism causing SSI.[2,3,4,7]. Drug resistance is a major problem especially the multidrug resistance in treating nosocomial infections. In our study we found that the gram negative orgainisms were sensitive to amikacin(70%), cephalosporins(18%) and fluoroquinolones(50%). Pseudomonas isolates showed good sensitivity to piperacilin-tazobactam, ceftazidime and imipenem (86%, 80% and 96% respectively). *Staphylococcus aureus* showed maximum sensitivity to linezolid (88%), gentamicin (98%), clindamycin (99%) vancomycin (100%). Unlike our study, Hyderabad study[4] has shown first generation cephalosporins to be very effective for both.Similar to our observation, vancomycin and linezolid have shown promise for *Staphylococcus aureus* in Navi Mumbai [6] too.

CONCLUSION:

To conclude, we have found that prolonged duration of surgery (> 2 hours), prolonged use of drains, and compromised immunity are responsible for SSI in our set up. Enterobacteriaceae (especially E.coli) and *S.aureus* are the predominant pathogens showing maximum sensitivity to amikacin and vancomycin.

Following measures can be taken to reduce the SSI cases in our hospital:

1. Prolonged duration of surgery contributes as a risk factor for SSI, thus minimising the intra op time can help a lot.
2. Proper drain care can significantly bring down the SSI cases.
3. Associated and underlying conditions like Diabetes mellitus, anaemia, immunocompromised states like patients on long term steroids adds as a risk factor to SSI. Thus a thorough examination and proper investigations can help in bringing down SSI cases.
4. Time to time fumigation of operation theatres and emphasis on sterile dresssing techiques can also reduce the number of SSI cases.

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