

A PROSPECTIVE STUDY OF OCCURRENCE AND RISK FACTORS IN SURGICAL SITE INFECTIONS

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Abstract:

Introduction: Surgical Site Infections [SSIs] have plagued surgeons since time immemorial. Infection is encountered by all the surgeons; by nature of their craft, they invariably impair the first line of host defences, the cutaneous or the mucosal barrier. The entrance of microbes into the host tissues is the initial requirement for infection.

Materials and Methods: The material for the present study is obtained from patient's undergone abdominal surgery in Department of General Surgery, Apollo Institute of Medical Sciences and Research, Chittoor from January 2022 to December 2022. The surgical site was considered as infected according to the definition by nosocomial infection surveillance. The wounds are classified according to the wound contamination class system. 200 patients who fulfilled the inclusion criteria were included in the study. A detailed history of the patients about the presentation of the wound, type of surgery, emergency or elective, pre-operative preparation, and post-operative management was done until the patient is discharged from the hospital, and then followed up the patient on outpatient department basis for any signs of wound infection.

Results: This study included 200 patients who underwent abdominal surgery, out of which 28 were infected. So, the occurrence is 14%. The incidence of infection among males is 18.2%, whereas the incidence of infection among females is 5.9%. SSI is more commonly found in the age group 0 above 61-year-old patients with an incidence of 28.6%. Mean age being 58.29 years with standard deviation of ± 11.15 . The incidence of infection among emergency surgery is 26.3% and among elective is 6.5%.

Conclusion: The SSI rate was higher in the middle-age group, emergency surgeries as compared to the elective. Anemia, diabetes mellitus, hypoproteinemia, and obesity are associated with SSI. With increase in the time of surgery, the risk of infection increased. The most commonly isolated organism from SSI was *Pseudomonas* (42.85%). Among the organisms that were isolated, the most of them were multidrug resistant.

Key Words: Surgical Site Infections, abdominal surgery, Anemia, diabetes mellitus, hypoproteinemia.

INTRODUCTION

Surgical Site Infections [SSIs] have plagued surgeons since time immemorial. Infection is encountered by all the surgeons; by nature of their craft, they invariably impair the first line of host defences, the cutaneous or the mucosal barrier. The entrance of microbes into the host tissues is the initial requirement for infection.¹

SSIs are the second most common cause of nosocomial infections. It has been estimated that SSI develops in at least 2% of hospitalized patients undergoing operative procedures, although this is a likely underestimate because of incomplete post discharge data, other data indicate that SSIs develop following 3-20% of certain procedures.²

The Centres for Disease Control and Prevention (CDC) has proposed specific criteria for diagnosis of SSI. This splits SSI into 3 groups- Superficial incisional, Deep incisional and Organ space infections depending on the site and the extent of infection.³

Surgical site infections (SSI) can double the length of time a patient stays in hospital and thereby increase the costs of health care. The healthcare costs are due to re-operation, extra nursing care and interventions, and drug treatment. The factors which influence SSI are characteristics of the patient, operation, personnel, and hospital.⁴

Sources of SSIs can include the patient's own normal flora or organisms present in the hospital environment. The common organisms encountered in post-operative wound infections are Staphylococcus aureus, Coagulase-Negative Staphylococci, Enterococci, Proteus, Pseudomonas, Escherichia coli and Klebsiella species. In case of wound infections following appendectomy or other lower bowel surgery, indigenous flora of the lower gastrointestinal tract are involved like Escherichia coli.⁵

Before the routine use of prophylactic antibiotics, infection rates in the four surgical classifications (Clean, clean-contaminated, contaminated and dirty wounds) were 1-2% or less for clean wounds, 6-9% for clean-contaminated wounds, 13-20% for contaminated wounds and about 40% for dirty wounds. Since the introduction of routine prophylactic antibiotic use, infection rates in the most contaminated groups have reduced drastically.

MATERIALS AND METHODS

Study design: A Prospective study.

Study location: Department of General Surgery, Apollo Institute of Medical Sciences and Research, Chittoor.

Study duration: January 2022 to December 2022

Sample Size: 200 patients.

The material for the present study is obtained from patient's undergone abdominal surgery in Department of General Surgery, Apollo Institute of Medical Sciences and Research, Chittoor from January 2022 to December 2022. The surgical site was considered as infected according to the definition by nosocomial infection surveillance. The wounds are classified according to the wound contamination class system. 200 patients who fulfilled the inclusion criteria were included in the study.

Inclusion Criteria: Only those who have undergone abdominal surgeries in Apollo Institute of Medical Sciences and Research, Chittoor were included.

Exclusion Criteria

1. Patient with previous abdominal surgery
2. Wound site previously infected
3. Stitch abscess cases.

Method of Collection of Data

A detailed history of the patients about the presentation of the wound, type of surgery, emergency or elective, pre-operative preparation, and post-operative management was done until the patient is discharged from the hospital, and then followed up the patient on outpatient department basis for any signs of wound infection.

In history, presenting complaints, duration, associated diseases, and coexistent infections at a remote body site, personal history including diet, smoking, and history of alcohol consumption were noted. Pre-operative findings that include bathing and skin preparation, pre-operative abdominal skin culture, nasal swab for culture for commensals, and pre-operative antibiotics use. Operative findings include type of incision, wound contamination, drain used and its type, and duration of the operation.

Post-operative findings include the day of wound infection, the day of 1st dressing, and frequency of change of dressing. A condition of the wound on the day of diagnosis of wound infection is noted which included fever, erythema, discharge, type, and color shown Figures 1 and 2, and the exudates were collected from the depth of the wound using a sterile cotton swab and was sent to the microbiology department for culture and sensitivity.

RESULTS

This study included 200 patients who underwent abdominal surgery, out of which 28 were infected. So, the occurrence is 14%. The incidence of infection among males is 18.2%, whereas the incidence of infection among females is 5.9%. SSI is more commonly found in the age group

0 above 61-year-old patients with an incidence of 28.6%. Mean age being 58.29 years with standard deviation of ± 11.15 . The incidence of infection among emergency surgery is 26.3% and among elective is 6.5%.

| S.No | Parameter | Percentage |
|------|--------------------|------------|
| 1 | Clean | 0 |
| 2 | Clean contaminated | 7 |
| 3 | Contaminated | 24 |
| 4 | Dirty | 42 |

Table 1: Percentage of incidence in relation to type of surgical site infections

| S.No | Parameter | Percentage |
|------|-------------------|------------|
| 1 | Anemia | 32 |
| 2 | Hypoproteinemia | 25 |
| 3 | Diabetes mellitus | 32 |
| 4 | Obesity | 21 |

Table 2: Percentage of incidence in relation to risk factors

| S.No | Organism | Percentage |
|------|-----------------------------------|------------|
| 1 | Pseudomonas Aeruginosa | 6 |
| 2 | Coagulase Positive staphylococcus | 2 |
| 3 | E.Coli | 1 |
| 4 | Diphtheroids | 1 |
| 5 | Klebsiella spp | 4 |

Table 3: Number of organisms isolated from wound swab culture

In most cases, wound infection was seen on the 5th post-operative day. Out of 28 infected cases, 12 cases had Pseudomonas infection, 8 had Klebsiella, 4 had coagulase positive staphylococci, 2 had Escherichia coli, and 2 had diphtheroid infection as shown in table 3. Pseudomonas was the most common organism isolated. The most of the organisms were sensitive to cefoperazone/sulbactam (64.2%) and cefepime (57.1%) and were resistant to tigecycline (57.1%) antibiotic followed by piperacillin/ tazobactam, colistin, and amikacin.

DISCUSSION

SSI are the second most common type of adverse events occurring in hospitalized patients after surgery and one of the serious complications. The incidence of SSI differs from hospital to hospital and from one geographic location to another. 200 cases are included in this study; the SSI incidence was 14%, which is well above the 14-16% reported in other studies. The Indian hospitals have much higher rate of infection than other countries such as USA (2.8%) and European countries (2-5%).⁶ The higher infection rate in Indian hospitals may be due to the poor set up of our hospitals and also due to the lack of attention toward the basic infection control

measures. The infection rate is the highest (28.6%) in patients above 60 years. More the age, more are the chances for certain chronic conditions, malnutrition and decrease in immunological efficiency, leading to more SSI. SSI is not related to sex, in agreement with previous findings.⁷

The literature shows that SSI increases with obesity. In this study, it is found that both low (15.4%) and high (25%). BMI are associated with increased incidence of infection, due to decrease in blood circulation in fat tissues. Malnutrition is another factor predisposing to SSI.⁸

The findings of this study also proved the risk of SSI to be less in elective surgeries (6.5%) than the emergency (26.3%) surgeries like acute abdomen. Acute/chronic appendicitis and duodenal perforation were the most common procedures performed. SSI was more among acute necrotizing pancreatitis, duodenal perforation, hepatic abscess, carcinoma stomach, sigmoid volvulus, carcinoma caecum, and chronic cholecystitis.⁹

The findings supported the literature by showing that administration of prophylactic antibiotic ½h before the operation would bring about the best results and the lowest SSI. The studies show that with the duration of above 1.5 h, the risk of SSI increases. In this study, 59 cases with the duration of surgery, <1.5 h had an incidence of infection of 5.1%, 41 of cases with the duration of surgery of about 1.5-4 h had an infection rate of 26.8%. The incidence of SSI was more in longer duration procedures. The time of shaving when it approaches the operation and if done by Clippers, reduces the SSI risk.¹⁰

CONCLUSION

The SSI rate was higher in the middle-age group, emergency surgeries as compared to the elective. Anemia, diabetes mellitus, hypoproteinemia, and obesity are associated with SSI. With increase in the time of surgery, the risk of infection increased. The most commonly isolated organism from SSI was *Pseudomonas* (42.85%). Among the organisms that were isolated, the most of them were multidrug resistant.

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