

# Abdominal Surgical Site Infection Occurrence and Risk Factors in Krishna Institute of Medical Science, Karad

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## Abstract

**Introduction:** Surgical site infections (SSI) tend to be the most common problem following an operation and the third most frequently reported nosocomial infections.

**Objective:** The current study was undertaken to identify the occurrence of SSI and the risk factors associated with it, and the common organism isolated and its antibiotic sensitivity and resistance.

**Materials and Methods:** This proposed study was carried out as a prospective, randomized clinical trial in 100 patients. Infected samples from patients were collected by following all aseptic precautions and are processed without delay by the standard microbiological techniques.

**Results and Conclusions:** 14% was the total infection rate. The SSI rate was the highest in dirty surgeries (40%). Male patients were affected more (18.2%) than the female patients (5.9%). The SSI rate increased with increasing age and it also increased significantly with the increasing duration of pre-operative hospitalization. The SSI rate was higher in emergency surgeries as compared to the elective. With increase in the time of surgery, the risk of infection increased. The most commonly isolated organism from SSIs was *Pseudomonas* (42.85%), followed by *Klebsiella* sp. (28.5%) and other bacteria. Among the organisms that were isolated, the most of them were multidrug resistant.

**Key words:** Abdominal surgical site infections, Risk factors for surgical site infections, Antibiotic sensitivity and resistance, Nosocomial infection

## INTRODUCTION

Our skin is filled with landmines, little bacterial bombs just lying in wait for the right moment to explode into action. As long as we are healthy it is thwarted; a person who is ill, however, may have a compromised immune system incapable of raising a defense. A surgical incision is all that bacteria needs for the battle to begin. Surgical infections are the result of

any surgical procedure. These infections are associated with greater morbidity, mortality, and healthcare cost.<sup>1</sup>

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.<sup>2</sup>

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## METHODOLOGY

### Source of Data

The material for the present study is obtained from patient's undergone abdominal surgery in Department of General Surgery, Krishna Institute of Medical Science, Karad, from

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1<sup>st</sup> November 2013 to 1<sup>st</sup> November 2015. 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. 100 patients who fulfilled the inclusion criteria were included in the study.

### Inclusion Criteria

1. Only those who have undergone abdominal surgeries in Krishna Institute of Medical Science Hospital, Karad 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 1<sup>st</sup> 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 100 patients who underwent abdominal surgery, out of which 14 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  $\pm 11.15$ . The incidence of infection among emergency surgery is 26.3% and among elective is 6.5%.



**Figure 1: Infected post-operative wound with pus discharge**

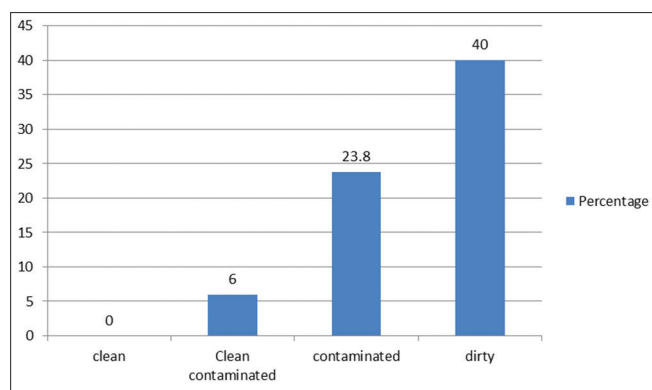


**Figure 2: Wound dehiscence**

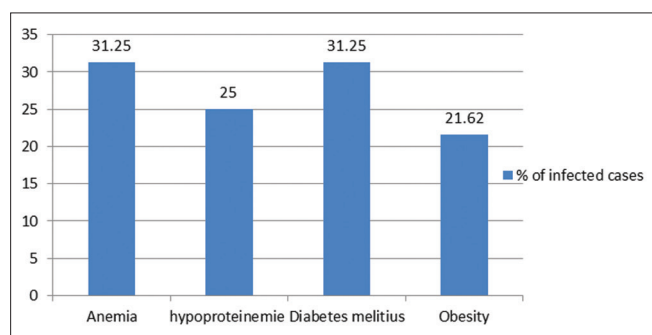
Out of 100 cases, 14 were clean cases with no infection, 50 were clean contaminated with 6% incidence of infection, 21 were contaminated that had 23.8% SSI, and 15 were dirty cases, wherein the infection rate was 40% as shown in Graph 1. Most of the patients had body mass index (BMI) of 20.1-25, followed by 25-30. The incidence of infection was more in an extreme of the BMI that is 31.25% in >30 BMI group and 7.69% in <20 BMI group. The infection rate in patients with anemia is 31.25%, hypoproteinemia is 25% and in patients with diabetes mellitus is 31.25%, shown Graph 2. The most common risk factor for infection in elective cases is obesity and in emergency cases is the dirty type of SSI.

Acute/chronic appendicitis and duodenal perforation were the most common operations performed. SSI was more among patients with acute necrotizing pancreatitis, duodenal perforation, carcinoma caecum, and chronic cholecystitis. The incidence of infection in the cases with a duration of surgery <1.5 h is 5.1% and with 1.5-4 h is 26.8%. The incidence of infection increased with the duration of the procedure.

In most cases, wound infection was seen on the 5<sup>th</sup> post-operative day. Out of 14 infected cases, 6 cases had



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

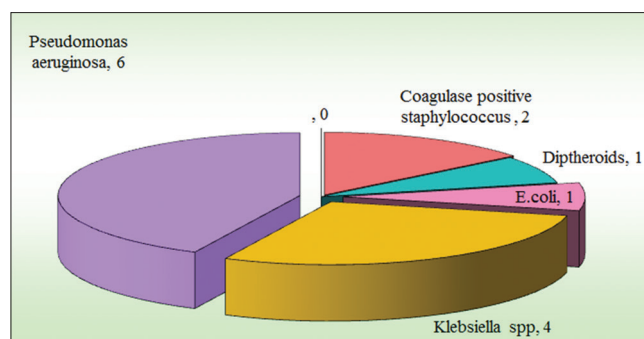


**Graph 2: Percentage of incidence in relation to risk factors**

*Pseudomonas* infection, 4 had *Klebsiella*, 2 had coagulase positive staphylococci, 1 had *Escherichia coli*, and 1 had diphtheroid infection as shown in Pie Chart 1. *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

100 cases are included in this study; the SSI incidence was 14%, which is well above the 14-16% reported in other studies.<sup>3</sup> The Indian hospitals have much higher rate of infection than other countries such as USA (2.8%) and European countries (2-5%).<sup>4</sup> 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.<sup>5</sup> SSI is not related to sex,<sup>6</sup> in agreement with previous findings. The literature shows that SSI increases with obesity. In this study, it is found that both



**Pie Chart 1: Number of organisms isolated from wound swab culture**

low (15.4%) and high (25%). BMI are associated with increased incidence of infection, due to decrease in blood circulation in fat tissues.<sup>7</sup> Malnutrition is another factor predisposing to SSI.<sup>6</sup>

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. The findings supported the literature by showing that administration of prophylactic antibiotic  $\frac{1}{2}$  h before the operation would bring about the best results and the lowest SSI.<sup>8</sup> The studies show that with the duration of above 1.5 h, the risk of SSI increases.<sup>5</sup> 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.<sup>9,10</sup>

The source of SSI is the patient's endogenous microorganisms.<sup>11,12</sup> The rates of SSIs between the clean and the clean contaminated wounds differed due to endogenous contamination and between the clean contaminated and the dirty wounds, it is the effect of exogenous contamination. The endogenous flora is responsible for infection in most cases. The opening of the gastrointestinal tract increases the likelihood of Gram-negative bacilli that was our finding in this study. This group of organisms tends to be endemic in the hospital environment due to easy transfer from object to object; they also tend to be resistant to antiseptics and are difficult to eradicate in the long term. This group of organisms is

increasingly playing a greater role in the many hospitals acquired infections.

The conditions responsible for SSI other than included in this study are - personal hygiene, immunological disorders, smoking, techniques of surgery, duration of surgical scrub, pre-operative skin preparation, failure to obliterate dead space, and inadequate sterilization of instruments.

## 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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