

**ORIGINAL RESEARCH**

# Study of Evaluation of Incidence and Risk Factors of Surgical Site Infections (SSI) at a Tertiary Care Centre

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**ABSTRACT**

**Background:** Surgical site infections (SSIs) are responsible for about 20% of all healthcare-associated infections (HAIs) and at least 5% of patients undergoing a surgical procedure develop a surgical site infection. Hence, the present study was conducted for evaluating incidence and risk factors surgical site infections. **Materials & Methods:** A total of 500 subjects who underwent surgical procedures were enrolled. Complete demographic and clinical details of all the patients were obtained. Follow-up of all the patients was done and incidence of surgical site infection was evaluated. The definition of SSI used for the diagnosis of infection by the medical team responsible for patient follow-up during hospitalization is the National Healthcare Safety Network (NHSN) definition. Logistic regression model was used to analyze the association between the independent variables with SSI. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software. **Results:** SSI was found to be present in 17.2 percent of the patients. Age of more than 60 years, Mean duration of surgery of more than 120 minutes, Length of hospital stay of more than 48 hours, ASA grade of more than II, operated under general anesthesia and Emergency surgery were found to be significant risk factors for occurrence of SSI. **Conclusion:** Early identification of SSI risk is crucial for patients undergoing general surgery, since it enables the adoption of preventative interventions aimed at lowering infection rates.

**Key words:** Surgical Site Infection, Methicillin-Resistant Staphylococcus Aureus.

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**INTRODUCTION**

Surgical site infections (SSIs) are responsible for about 20% of all healthcare-associated infections (HAIs) and at least 5% of patients undergoing a surgical procedure develop a surgical site infection. The incidence of SSIs is 2–5% in patients undergoing inpatient surgery; however, the number of SSIs is likely to be underestimated given that approximately 50% of SSIs become evident after the patient has been discharged. A surgical site infection is defined as a surgical wound with local signs and symptoms of an infection, with systemic signs of fever or leukocytosis in severe cases.<sup>1-3</sup>

In the majority of SSI cases, the pathogen source is the native flora of the patient's skin, mucous

membranes, or hollow viscera. When skin is incised, underlying tissue is exposed to overlying endogenous flora. Most typically, aerobic gram-positive cocci such as Staphylococcus serve as the contaminant, with resistant pathogens such as methicillin-resistant S aureus (MRSA) representing an increasing proportion of such infections in recent years.<sup>4,5</sup>

It is a preventable complication of surgery that can be achieved by practicing the recommended basic principles of infection prevention strategies like complete adherence to WHO surgical safety checklists, surgical hand washing practices, utilization of skin antisepsis over the operation field, and providing antibiotic prophylaxis before starting the procedure as well shortening the duration of the

surgery and improving ventilation system. Despite of improvements in operating room practices, sterilization techniques, and the best efforts of infection prevention strategies applied even in the best and well-equipped health facilities; the incidences, complications, and the burden of SSI in terms of patient morbidity, treatment costs, and mortality rates are still significantly rising.<sup>6, 7</sup> Hence; the present study was conducted for evaluating incidence and risk factors surgical site infections.

## MATERIALS & METHODS

The present study was conducted for evaluating incidence and risk factors surgical site infections. A total of 500 subjects who underwent surgical procedures were enrolled. Complete demographic and clinical details of all the patients were obtained. Follow-up of all the patients was done and incidence of surgical site infection was evaluated. The definition of SSI used for the diagnosis of infection by the medical team responsible for patient follow-up during hospitalization is the National Healthcare Safety Network (NHSN) definition.<sup>6</sup> According to this definition, an infection is defined as something that

affects skin, tissue, organs, and space that happens within 30 days following an NHSN surgical operation, or up to a year if implants are used. The presence or absence of SSI was considered as a dependent variable. Logistic regression model was used to analyze the association between the independent variables with SSI. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software.

## RESULTS

A total of 500 subjects who underwent surgical procedures were analyzed. The mean age of the patients was 49.3 years. Out of 500 subjects 291 subjects were males while the remaining 209 subjects were females. Majority proportion of subjects were of urban residence. Mean BMI of the subjects was 28.3 Kg/m<sup>2</sup>. SSI was found to be present in 17.2 percent of the patients. Age of more than 60 years, Mean duration of surgery of more than 120 minutes, Length of hospital stay of more than 48 hours, ASA grade of more than II, operated under general anesthesia and Emergency surgery were found to be significant risk factors for occurrence of SSI.

**Table 1: Demographic details**

Demographic details	Number
Male	291
female	209
Mean BMI	28.3 Kg/m <sup>2</sup>
Mean duration of Surgery	>120 minutes
Length of Hospital Stay	>48 hours

**Table 2: Incidence of SSI**

SSI	Number	Percentage
Present	86	17.2
Absent	414	82.8
Total	500	100

**Table 3: Logistic analysis for assessment of risk factors of SSI**

Risk factors of SSI	Odd ratio	p-value
Age of more than 60 years	1.225	0.001 (Significant)
Male gender	0.712	0.982
Mean duration of surgery of more than 120 minutes	-0.931	0.000 (Significant)
Length of hospital stay of more than 48 hours	-0.726	0.011 (Significant)
ASA grade of more than II	2.462	0.008 (Significant)
Operated under general anesthesia	1.621	0.048 (Significant)
Emergency surgery	-1.841	0.036 (Significant)

## DISCUSSION

Surgical site infections (SSIs) are among the most common and most costly health care-associated infections, leading to adverse patient outcomes and death. Wound contamination occurs with each incision, but proven strategies exist to decrease the risk of SSI. In particular, improved adherence to evidence-based preventive measures related to appropriate antimicrobial prophylaxis can decrease the rate of SSI. Aggressive surgical debridement and

effective antimicrobial therapy are needed to optimize the treatment of SSI.<sup>10</sup> Hence; the present study was conducted for evaluating surgical site infections.

A total of 500 subjects who underwent surgical procedures were analyzed. The mean age of the patients was 49.3 years. Out of 500 subjects 291 subjects were males while the remaining 209 subjects were females. Majority proportion of subjects were of urban residence. Mean BMI of the subjects was 28.3 Kg/m<sup>2</sup>. SSI was found to be present in 17.2 percent of

the patients. Cheadle WG et al evaluated the risk factors of SSI. Important patient-related factors for SSI include existing infection, low serum albumin concentration, older age, obesity, smoking, diabetes mellitus, and ischemia secondary to vascular disease or irradiation. Surgical risk factors include prolonged procedures and inadequacies in either the surgical scrub or the antiseptic preparation of the skin. Physiological states that increase the risk of SSI include trauma, shock, blood transfusion, hypothermia, hypoxia, and hyperglycemia. Parameters that may be associated independently with an increased risk of SSI, and that may predict infection, include abdominal surgery, a contaminated or dirty operation, and more than three diagnoses at the time of discharge. The major sources of infection are microorganisms on the patient's skin and, less often, the alimentary tract or female genital tract.<sup>11</sup>

Age of more than 60 years, Mean duration of surgery of more than 120 minutes, Length of hospital stay of more than 48 hours, ASA grade of more than II, operated under general anesthesia and Emergency surgery were found to be significant risk factors for occurrence of SSI. Shahane V et al studied the incidence of SSI in a known population. They conducted a one-year study of SSI in our hospital. 300 cases of Surgery and Obstetrics and Gynaecology were included in the study. Prolonged surgery (>2hours) and insertion of drain were found to be significantly associated with occurrence of SSI and the clean surgeries showed minimum risk of infection. *Escherichia coli* (31.25%) was the most common pathogen, followed by *Pseudomonas aeruginosa* (25%) and *Staphylococcus aureus* 22%. The incidence of SSI in our set up is 6%. The outcome of the SSI surveillance in our hospital revealed that in order to decrease the incidence of SSI we would have to: a) decrease the duration of the surgeries performed b) focus on regular and intensive drain care c) identify poor risk patients and ensure their proper management d) conduct periodic surveillance to keep a check on SSI.<sup>12</sup> Ghimire P et al assessed the prevalence of postoperative surgical site infections in the Department of General Surgery of a tertiary care centre. A descriptive cross-sectional study on a total of 384 post-operative patients of abdominal surgery was conducted. Post-operative patients fulfilling the inclusion and exclusion criteria were included in the study. Among 384 patients, the prevalence of surgical site infection was found to be 65 (16.92%). The patients had a mean age of 42.06±21.92 years. The prevalence of surgical site infection was higher in their study in comparison to other similar studies conducted in similar settings.<sup>13</sup> Hassan RSE et al determined the prevalence, associated factors, and causing microorganisms of SSIs among patients undergoing gastrointestinal tract surgeries. A total of 80 participants were included in the study. The mean age was 51 +/- 16 years and most of the patients (67.5%) did not have any chronic illness prior to the

surgical operation. Most of them (46.3%) of them underwent large bowel surgery. Twenty-two patients (27.5%) developed SSI post operatively and superficial SSI was the most common type of SSIs (81.8%). Occurrence of SSI was found to be associated with long operation time ( $p > .001$ ), malignant nature of the disease ( $p > .001$ ), intra-operative blood loss ( $p > .001$ ), and intra-operative hypotension ( $p = .013$ ). The most prevalent microorganism isolated from SSI patients was *E coli* (47.8%), followed by *Enterococcus fecalis* (13.0%) and combined *Pseudomonas aeruginosa* + *E coli* infection (13.0%). The results showed a high prevalence of SSIs among patients attending the gastrointestinal tract surgical unit and the most prevalent microorganism isolated from them was *E coli*.<sup>14</sup>

## CONCLUSION

Early identification of SSI risk is crucial for patients undergoing general surgery, since it enables the adoption of preventative interventions aimed at lowering infection rates.

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