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A Prospective Study of Incidence and Severity of Surgical Site Infections in Emergency Abdominal Surgeries

[1]Gajula Vinod Reddy, [2]B.V. Sharath, [3]P.T. Sushanth and [4]Maheboob Pasha

[1-4]Department of General Surgery Basaveshwara Medical College and Hospital, Chitradurga, Karnataka, India

ABSTRACT

Surgical Site Infections (SSI) is the third most commonly reported nosocomial infection which has an unpropitius impact on the hospital as well as on the patient. Surgical site infections (SSIs) are defined as infections occurring up to 30 days after surgery. And affecting either the incision or deep tissue at the operation site. Despite improvements in surgical site infection prevention, SSIs inflict severe demands on healthcare resources remain a significant problem as they are associated with substantial morbidity and mortality. Nevertheless, the prevalence of healthcare associated infections (HAIs) continues to be significant, posing a considerable illness burden. The incidence of SSIs may be as high as 20%, depending on the surgical procedure, the surveillance criteria used and the quality of data collection. In many SSIs, the responsible pathogens originate from the patient's endogenous flora. The causative pathogens depend on the type of surgery., the most commonly isolated organisms are Staphylococcus aureus, coagulase-negative staphylococci, Enterococcus spp. and Escherichia coli. This study aimed to ascertain the incidence and severity of surgical site infections (SSI) in emergency abdominal surgeries. This study was conducted comprising 50 patients of undergoing emergency abdominal surgeries both male and female patients at Basaveshwara Medical college hospital and research center, Chitradurga in the period of July 2022 to December 2023. This study was a prospective observational study of incidence and severity of surgical site infection who went emergency abdominal surgeries between July 2022 to December 2023 emergency abdominal surgeries in Basaveshwara medical college. The incidence of surgical site infection in emergency abdominal surgeries is 30% and is more in the age group 45-60 which is 37.5% and least is 15-30 age group which is 20% and is more in males than female and incidence is more in the ruptured appendix/gall bladder and gastrointestinal perforation type of surgery which is 41.66% and 35.71% and incidence is more in the contaminated and dirty which is 41.6% and 40%. The 15 (30%) patients with these 4severity levels (disturbance of healing, minor, moderate and severe wound infection) of wound infection represent those with SSI. Out of 15 patient who developed ssi highest number of patients comes under the moderate and minor groups which is 5(10%) on both sides and only 3(6%) patients in the disturbance healing group and 2(4%) patients in severe group. The most common organism isolated is staph aureus and E.coli . Most common antibiotic detected on culture and sensitivity were imipenem or amikacin. knowledge of the incidence and severity is important to know for prevention and better understanding and treatment of the surgical site infection in emergency abdominal surgeries. SSI rate was found to be quite high in comparison to developed countries. The incidence of surgical site infection is 30% in emergency abdominal surgeries in this study and superficial SSI prevails over the other types and incidence is more compare to elective abdominal surgeries group and other type of surgeries in other studies. The incidence of surgical site infection is more in the age group 46-60 and >60 and incidence is more in male than females. The incidence is more in the gastrointestinal perforations than in other surgeries. The incidence is more in contaminated and dirty group compared to other type of surgeries. In this study the severity level of surgical site infection is more in emergency abdominal surgeries and the severity of surgical site infection is more in the age above 40 and more severity in age group above 60 and severity of the surgical site infection is more in female than in males according to this study but there are no other such studies to support this. Appropriate severity level assessment tools should be used to aid in the assessment and diagnosis of SSI in emergency abdominal surgeries and to help in reducing the rates of such infection.

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Key Words

Surgical site infections, (HAIs), surgery, healthcare, pathogens

Corresponding Author

Gajula Vinod Reddy,
Department of General Surgery Basaveshwara Medical College and Hospital, Chitradurga, Karnataka, India
vinodreddy1235@gmail.com

Author Designation

[1,4]PG Student
[2]Professor and HOD
[3]Associate Professor

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INTRODUCTION

Prior to the mid-19th century, the majority of wounds would often become infected until Ignaz Semmelweis and Joseph Lister emerged as the trailblazers of infection control through the implementation of antiseptic surgery. For instances of profound or widespread illness, the outcome was a mortality rate ranging from 70-8%. Subsequently, some noteworthy advancements, specifically in the realm of microbiology, have enhanced the safety of surgical procedures. Nevertheless, the prevalence of healthcare associated infections (HAIs) continues to be significant, posing a considerable illness burden[1-4]. Surgical site infections (SSI) are the second most common nosocomial infection after urinary tract infections (UTI) among surgical patients. They often result in illness and death among hospitalized individuals and are the primary cause of adverse events related to operations. Even hospitals with advanced facilities and standard protocols for preoperative preparation and antibiotic prophylaxis still face significant challenges in addressing this issue[5-10]. Patients who experience surgical site infections (SSIs) are strongly associated with extended hospital stays, delayed wound healing, pain, discomfort, long-term impairment, and even mortality. SSI (surgical site infection) is influenced by a multitude of risk variables, with a complex relationship as surgery, patients, microbial and environment related factors. Surgical site infections (SSIs) continue to be a significant contributor to illness and death, even though infection control methods and surgical procedures have improved. Additionally, SSIs place significant strain on healthcare resources. Surgical site infections (SSI) can be caused by pathogens that are either acquired endogenously from the patient's own flora or exogenously from contact with operative room personnel or the surroundings. Nevertheless, the most critical period for potential hazards persists over the duration between the commencement and conclusion of the operational location[11-15]. Typically, the causative pathogens in most SSIs come from the patient's own naturally occurring bacteria. The organisms most frequently found include S. aureus, coagulase-negative staphylococci, Enterococcus spp. and Escherichia coli. In order to address the challenges posed by SSIs in healthcare management, it is important to accurately identify the specific factors that may increase the risk of infection for individual patients. Additionally, it is crucial to identify any gaps in the current prevention options available. By doing so, we can reduce the negative impact on patients' health, decrease mortality rates and lower healthcare costs associated with SSIs. Despite progress in infection control measures such as enhanced operating room ventilation, sterilizing techniques, barriers, surgical procedures and the use of antibiotic prophylaxis, surgical site infections (SSIs) continue to be a significant cause of illness, extended hospital stays and death. According to reports, Surgical Site Infections (SSI) account for 20% of all Healthcare-related Infections (HAIs) and are linked to a 2-11 times higher risk of mortality. Additionally, 75% of fatalities related with SSI can be directly attributed to them. This study aimed to ascertain the frequency and intensity of surgical site infections (SSI) in emergency abdominalsurgeries[5].

MATERIALS AND METHODS

Source of Data: This study was conducted comprising 50 patients of undergoing emergency abdominal surgeries both male and female patients at Basaveshwara Medical college hospital and research centre, Chitradurga in the period of JULY 2022 to DECEMBER 2023.

Type of Study: This study was a prospective observational study of incidence and severity of surgical site infection who went emergency abdominal surgeries between July 2022 to December 2023 emergency abdominal surgeries in Basaveshwara medical college.

Study Population: 50 patients who underwent emergency abdominal surgeries in Basaveshwara hospital.

Inclusion Criteria: All the patients who were undergoing emergency abdominal surgeries in basaveshwara medical college and hospital, chitradurga, Karnataka.

Exclusion Criteria:

- Patients who have been diagnosed as immunocompromised and are undergoing steroid therapy.
- Individuals who are younger than 12 years old.
- Individuals who have had prosthetic limb replacement.
- Patients who are undergoing a second surgery (relaparotomy) for any cause other than infections at the operative site.
- Patients who are unwilling to engage in the research.

Collection of Data: A regular, daily evaluation of the patient's overall state and a thorough inspection of the laparotomy incision were performed to determine if there was a surgical site infection or not. Patients with

surgical site infections (SSIs) were categorized based on the ASEPSIS wound grading system and the Southampton wound evaluation scale. The specific kind of SSI was further recorded for each patient. Additional variables, such as the length of hospitalization, microbiological characteristics and conducted interventions, were also documented. Patients diagnosed with surgical site infections (SSI) had a thorough examination including wound culture and sensitivity testing, full blood count analysis and abdominal ultrasound and/or computed tomography (CT) scans, if needed based on the severity of the infection. Additionally, tests were conducted to assess the functioning of the kidneys and liver.

Identifying Surgical Site Infections: The prevailing definition of infection, generally accepted in both the USA and Europe, is the one formulated by Horan and colleagues and endorsed by the CDC. Surgical site infections are categorized into three groups: superficial and deep incisional SSIs, as well as organ-space SSIs. The classification is based on the location and severity of the infection. According to the CDC classification, only infections that happen within 30 days after surgery (or within a year for implants) should be categorized as surgical site infections (SSIs). There is currently no universally accepted approach expressly developed to assist in the evaluation and treatment of surgical wounds. The CDC classification, which is widely used, applies rigorous criteria to categorize infections. There are other wound grading systems available and two well regarded ones are ASEPSIS and the Southampton Wound Assessment Scale. Using sterile cotton swabs, two wound swabs were aseptically collected from each patient who was suspected of having a surgical site infection. Gram-stained preparations were made from a single swab to offer an initial diagnosis. The second swab was subjected to culture on 5% C sheep blood agar (BA) and Mac Conkey agar (MA) plates. The culture was then incubated at a temperature of 37°C for a duration of 48 hours. Following the incubation period, no microbial development was seen, suggesting that the sample was devoid of any microorganisms. Growth on culture plates was identified by assessing the features of the colonies and conducting a series of standardized biochemical tests. The antimicrobial sensitivity testing (AST) was performed using the modified Kirby Bauer disc diffusion method on Muller Hinton agar. The data were analysed in accordance with the guidelines established by the Clinical Laboratory Standards Institute.

RESULTS AND DISCUSSIONS

Incidence of Surgical Site Infection in Emergency Abdominal Surgeries:

Table 1: Overall Incidence of Surgical Site Infection in Emergency Abdominal Surgeries

Wound	Frequency	Percentage
Infected	15	30
Not infected	35	70
Total	50	100

The overall incidence of surgical site infection in emergency abdominal surgery is in 15 cases out of 50 cases and 35 cases are not infected and the incidence rate of surgical site infection is 30%(Table 1).

Table 2: Incidence of Surgical Site Infection in Emergency Abdominal Surgeries According to Age

Age	No. of patients	SSIS	non SSI	P-Value
15-30	10(20%)	2(20%)	8	0.8
31-45	14(28%)	4(28.5%)	10	
46-60	16(32%)	6(37.5%)	10	
>60	10(20%)	3(30%)	7	
TOTAL	50	15	35	

Of the 50 patients enrolled in the study ,the age of the patients ranged from 15(minimum included age) to above 60 years of age (mean age of 45.96 and standard deviation 17.4) ,majority of the patients are in the group 46-60 which is 16 (32%) followed by group 31-45 which is 14(28%), group 15-30 which is 10(20%) and in group >60 which is 10(20%). Out of 50 patients the incidence of surgical site infection in emergency abdominal surgeries is 30%, incidence of SSI in more from 46-60 years age group which is 6 (37.54%), followed by 31-45 years age group which is 4 (28.5%), >60 years age group 3(30%),15-30 years age group which is 2 (20%) (Table 2).

Table 3: Incidence and Distribution of Infections According to Type of Surgery

Type of surgery	No. of patients	SSIs	No SSI	P-Value
Penetrating abdominal trauma	0	0	0	0.2
Ruptured appendix/gall bladder	12(24%)	5(41.66%)	7	
Gastrointestinal perforation	14(28%)	5(35.71%)	9	
Blunt abdominal trauma	6(16%)	1(16.6%)	5	
Intestinal obstruction	17(34%)	3(17.64)	14	
Obstructed hernia	1(2%)	1(100%)	0	
Total	50	15	35	

The highest number of surgeries are seen in the intestinal obstruction group which is 17(34%), followed by gastro intestinal perforations which is 14(28%), ruptured appendix/gall bladder is 12(24%),blunt trauma abdomen 6(16%) and obstructed hernia which is 1(2%). The incidence of surgical site infection according to type of surgery is highest obstructed hernia 100% (1 out of 1) ruptured appendix or gall bladder which is 41.66% (5 out of 12) ,followed by gastro intestinal perforations which is 35.71% (5 out of

14) , intestinal obstruction which is 17.64% (3 out of 17),blunt trauma abdomen which is 16.6% (1 out of 6), obstructed hernia 100% (1 out of 1) (Table 3).

Table 4: Severity of SSI In Emergency Abdominal Surgeries Asepsis Scoring System

Asepsis score	Severity level	Total
0-10	Satisfactory Healing	35(70%)
11-20	disturbance of Healing	3(6%)
21-30	Minor wound Infection	5(10%)
31-40	Moderate Wound Infection	5(10%)
>40	Severe Wound Infection	2(4%)
	Total	50

The severity of surgical site infection was assessed using the ASEPSIS wound scoring scale. The results in (Table 4) show that most (n=35., 70%) of the patients had satisfactory healing and these were patients without SSI., only 3(6%) patients shows disturbance of healing. Only 5(10%) shows minor wound Infection and 5(10%) people shows moderate wound infection, respectively. The 15 (30%) patients with these 4severity levels (disturbance of healing, minor, moderate and severe wound infection) of wound infection represent those with SSI.

Table 5: Distribution of Organisms Causing SSI in Emergency Abdomial Surgeries

Organism	No of organisms Isolated	Percentage
ECOLI	3	(27%)
Staph aureus	5	(46%)
Pseudomonas	1	(9%)
Proteus	1	(9%)
Nitrobacter	1	(9%)

A total of 15 wound swab were obtained out of which 11 specimen showed growth and 4 samples were sterile. Staph aureus was found in 46% of the samples followed by escherichia coli in 27%,pseudomonas in 9%, proteus 9%, Nitrobacter 9% .staph aureus was found to be present in the largest number of infected wound swabs (Table 5).

CONCLUSION

Understanding the prevalence and severity of surgical site infections is crucial for preventing and effectively treating these complications in emergency abdominal procedures, which remain a significant challenge for surgeons. The SSI rate was significantly higher as compared to industrialized nations. In this study, the occurrence of surgical site infection in emergency abdominal operations is 30%. Superficial SSI is the most prevalent form, with a higher incidence compared to the elective abdominal surgeries group and other types of surgeries in prior studies. The prevalence of surgical site infection is higher in the age groups 46-60 and above 60 and it is more common in males than females. Gastrointestinal perforations have a higher incidence rate compared to other types of operations. The occurrence is higher in the group that is contaminated and filthy as compared to other types of procedures. This study found that the severity of surgical site infection is higher in emergency abdominal surgeries. Additionally, the severity of surgical site infection is greater in individuals above the age of 40, particularly those above the age of 60. Furthermore, this study suggests that the severity of surgical site infection is higher in females compared to males. However, it is important to note that there is a lack of supporting studies on this topic. Utilizing suitable techniques for assessing severity levels is crucial in diagnosing and evaluating SSI in emergency abdominal procedures, with the aim of decreasing infection rates. Both gram-positive and gram-negative organisms were implicated, with Staphylococcus aureus being the predominant organism in this hospital environment, which might be mitigated with antibiotic prophylaxis. The predominant antibiotics identified through culture and sensitivity testing were imipenem and amikacin. It is thus advisable to design more advanced surveillance technologies. Additionally, it is necessary to update hospital protocols on the administration of antibiotics to surgical patients, taking into account the most often identified causal organism.

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