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**Original Research Article**

# Frequency of Surgical Site Infections Following Emergency Non-Traumatic Abdominal Operations- A Study in a Tertiary Care Hospital in Bangladesh

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**Abstract:** ***Background:*** Surgical site infections (SSIs) are a major concern in post-operative care, especially after emergency abdominal surgeries like those for appendicitis, bowel obstruction, or cholecystitis. These procedures carry a higher SSI risk due to urgent intervention and less optimal preoperative preparation. This study aimed to analyze the frequency of surgical site infections following emergency non-traumatic abdominal operations. ***Methods:*** This descriptive cross-sectional study was conducted at the Surgery Unit 1 of 250 Bedded General Hospital, Jamalpur, Bangladesh, from October 2023 to August 2024. The study involved 140 patients who were undergoing emergency non-traumatic abdominal operations, selected using a purposive sampling technique. Data analysis was performed using MS Office tools. ***Results:*** In this study, surgical site infections (SSIs) occurred in 17% of the participants. Males constituted the majority of SSI cases (66.7%), and cases with volvulus and extended lower midline incisions exhibited the highest SSI rate at 50.0%. Approximately 62.5% of the SSI cases involved wounds classified as dirty. Of those with SSIs, 45.8% were found to be malnourished. E. coli and Staphylococcus aureus were isolated in 45.5% and 37.5% of the infected patients, respectively. ***Conclusion:*** One in six emergency non-traumatic abdominal operations risks a surgical site infection (SSI), with a higher prevalence among males. Malnutrition is a common comorbidity, and E. coli and Staphylococcus aureus are the typical causative organisms.

**Keywords:** Abdominal operations, Antibiotic, Non-traumatic, prophylaxis, SSI, Surgical site infections.



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## INTRODUCTION

Surgical site infections (SSIs) are a major concern in postoperative care, especially following emergency abdominal surgeries that are non-traumatic. These infections contribute to greater patient morbidity, and longer hospital stays, and impose considerable costs on healthcare facilities [1]. Due to their urgent and unscheduled nature, emergency surgeries are performed on patients who may not be in optimal health, with limited opportunity for thorough preoperative preparations, thereby increasing the likelihood of SSIs [2]. The occurrence of SSIs in emergency procedures is alarming due to inherent risk factors associated with these operations. In contrast to elective procedures, emergency surgeries often do not allow adequate time for preoperative optimization, which can lead to compromises in surgical preparation and aseptic techniques [3]. Additionally, the physiological stress of acute surgical procedures can weaken immune responses, increasing the risk of infections [4]. Despite progress in surgical methods and infection control measures, SSIs persist as a widespread problem, underscoring the necessity for enhanced preventive strategies [5]. The risk factors that contribute to SSIs are complex and include elements such as the surgical setting, patient health status, and the practices of the surgical team [6]. Ensuring the operating room remains sterile is crucial, as any intraoperative contamination can markedly elevate the infection risk [4]. Although the importance of antibiotic prophylaxis is widely recognized, strict protocol adherence is necessary to effectively lower infection rates [7]. A recurring observation in the literature is the variability in SSI outcomes among healthcare facilities, highlighting the necessity for standardizing infection control protocols [8]. This variability suggests significant opportunities to enhance the implementation and adaptation of these protocols in emergencies [9]. Additionally, there is increasing awareness of the importance of surgical team training and interdisciplinary communication in reducing SSIs [10]. This study aims to assess the incidence of SSIs after emergency non-traumatic abdominal surgeries and to pinpoint potential risk factors that contribute to their development. By examining data from various healthcare environments, this research seeks to deliver practical insights that can guide the development of more effective SSI prevention strategies, ultimately improving patient outcomes and optimizing the use of healthcare resources [11].

## METHODOLOGY

This descriptive cross-sectional study was carried out at the Surgery Unit-1 of 250 Bedded General Hospital, Jamalpur, Bangladesh, from October 2023 to August 2024. The study enrolled 140 patients undergoing emergency non-traumatic abdominal operations, selected using a purposive sampling technique. Data collected included the patients' registration information, details of the operations, and post-operative data. Swabs from wound discharges were inoculated to identify the organisms likely responsible for infections, and their antibiotic sensitivities were determined. The study was approved by the ethical committee of the mentioned hospital, and written consent was obtained from all participants before data collection. The inclusion criteria consisted of patients undergoing emergency non-traumatic abdominal operations, specifically those carried out in Surgery Unit-1 of 250 Bedded General Hospital, Jamalpur, Bangladesh. Conversely, patients who had experienced trauma were excluded from the study. Data analysis was performed using MS Office programs.

## RESULT

Most of our patients (89.29 %) were in between 10 and 49 years. Regarding the gender distribution, 63.57 % of participants were male and 36.43 % were female. The male-female ratio was 1.7:1. In this study, the frequency of surgical site infections among the total participants was 17%. The rate of SSI in different age groups was as follows: 16.13% in 10-19 years, 6.67% in 20-29 years, 16.67% in 30-39 years, 26.47% in 40-49 years, 22.23% in 50-59 years, and 16.67% in 60-69 years. The highest rate, 26.47%, was observed in the 40-49 years age group. Most of the SSI cases were male (66.7%). The operative procedure distribution indicates that volvulus cases had the highest SSI rate at 50.00%, whereas obstructed hernia operations had the lowest. The rate of SSI varied based on the type of incision used. Extended lower midline incisions had the highest SSI rate at 50.0%. This was followed by mid midline incisions with a rate of 42.1%, lower right para-median with 33.3%, Rutherford Morison with 20.0%, upper midline with 13.3%, extended upper midline also with 13.3% and gridiron incisions with the lowest rate of 5.0%. Analysis of SSI distribution by wound contamination revealed that nearly two-thirds of cases (62.5%) were classified as dirty. Additionally, 20.8% of cases were clean-contaminated, and 12.5% were contaminated. Among the total SSI cases, 45.8% were with malnutrition. Among SSI cases, in 45.5% and 37.5% of patients, isolation of E. Coli, and Staphylococcus Aureus was found respectively.

**Table 1: Age distribution of participants**

| Age (Years) | n | % |
|---|---|---|
| 10-19 | 31 | 22.1% |
| 20-29 | 30 | 21.4% |
| 30-39 | 30 | 21.4% |
| 40-49 | 34 | 24.3% |
| 50-59 | 9 | 6.4% |
| 60-69 | 6 | 4.3% |
| **Total** | **140** | **100%** |

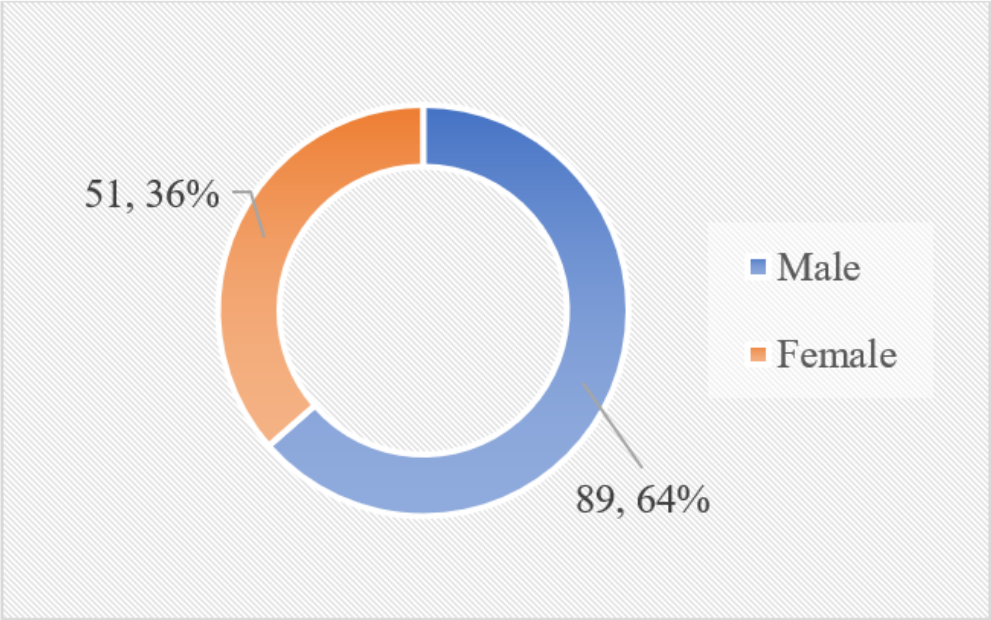



**Figure I: Gender distribution**

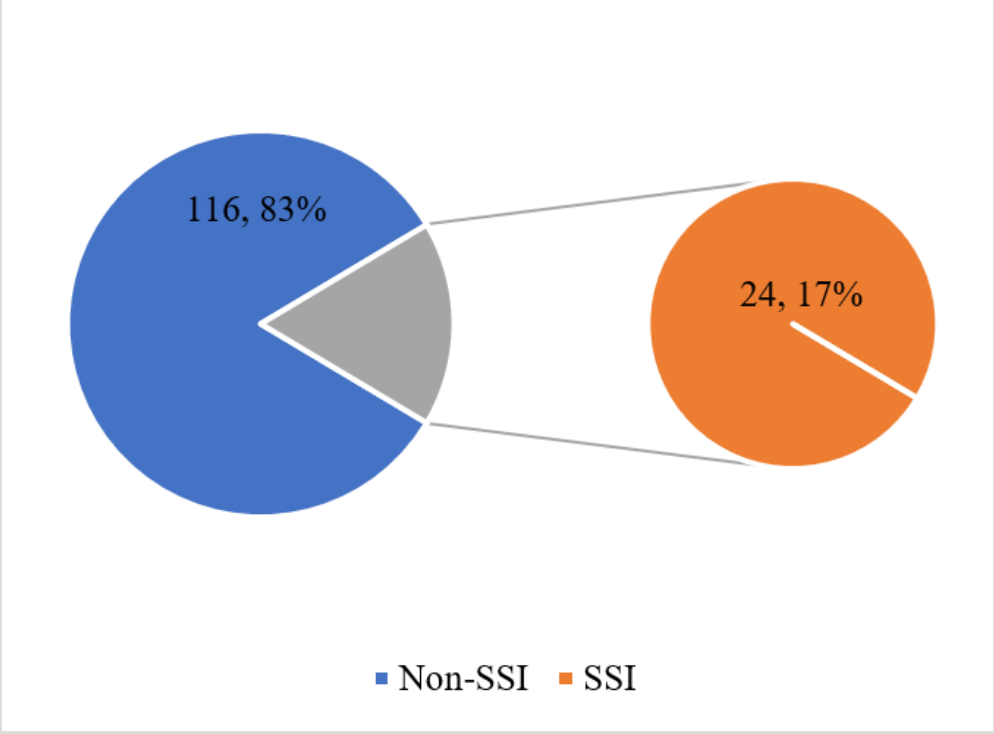



**Figure II: Frequency of SSI among total participants**

**Table 2: Rate of SSI in different age groups**

| Age (Years) | n | % |
|---|---|---|
| 10-19 | 5 | 20.8% |
| 20-29 | 2 | 8.3% |
| 30-39 | 5 | 20.8% |
| 40-49 | 9 | 37.5% |
| 50-59 | 2 | 8.3% |
| 60-69 | 1 | 4.2% |
| **Total** | **24** | **100%** |

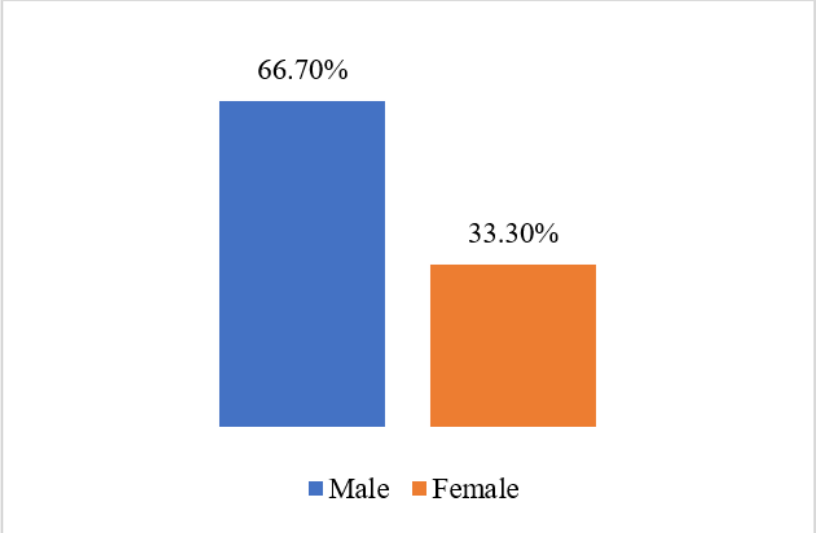



**Figure III: Rate of SSI as per gender**

**Table 3: Rate of SSI as per operations category**

| Types of operations | n | % |
|---|---|---|
| Appendicectomy | 5 | 20.8% |
| Adhesiolysis or resection and anastomosis | 3 | 12.5% |
| Repair of ileal perforation / Ileostomy and thorough peritoneal toileting | 8 | 33.3% |
| Repair of duodenal ulcer perforation and thorough peritoneal toileting | 3 | 12.5% |
| Appendicectomy with peritoneal toileting | 4 | 16.7% |
| Resection of Volvulus of the sigmoid colon and primary anastomosis | 1 | 4.2% |

**Figure 4: Operative procedure (Image 1)**

**Figure 5: Operative procedure (Image-2)**

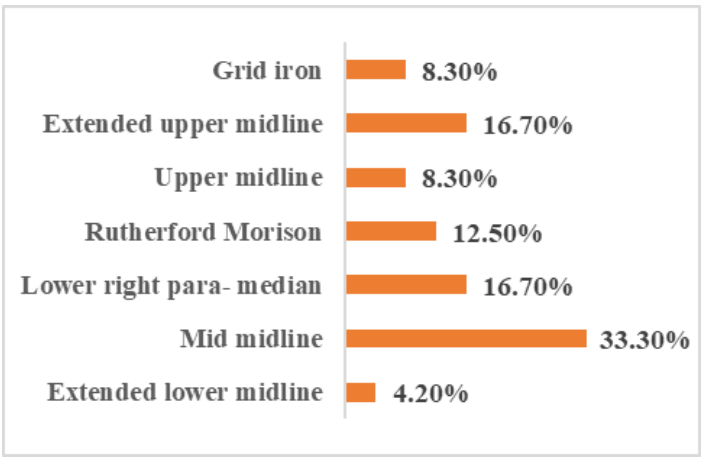
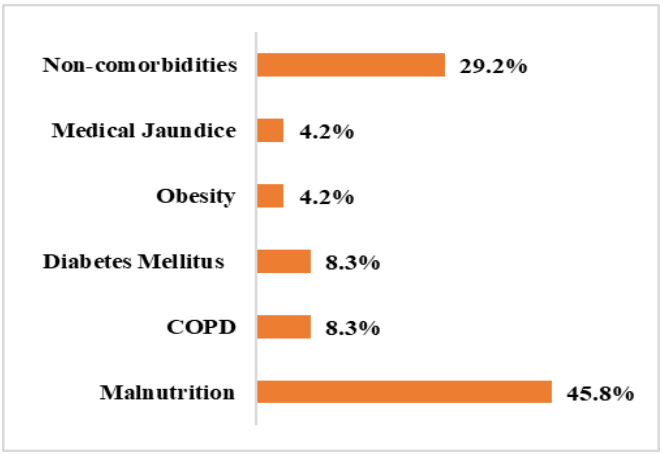



**Table 6: SSI distribution as per incision**

**Table 4: SSI distribution based on types of wounds by the degree of contamination**

| Types of wounds | n | % |
|---|---|---|
| Clean | 1 | 4.2% |
| Clean contaminated | 5 | 20.8% |
| Contaminated | 3 | 12.5% |
| Dirty | 15 | 62.5% |
| Total | 24 | 100.% |




**COPD: Chronic obstructive pulmonary disease**

**Figure 7: Surgical site infection as per the presence of different co-morbidities**

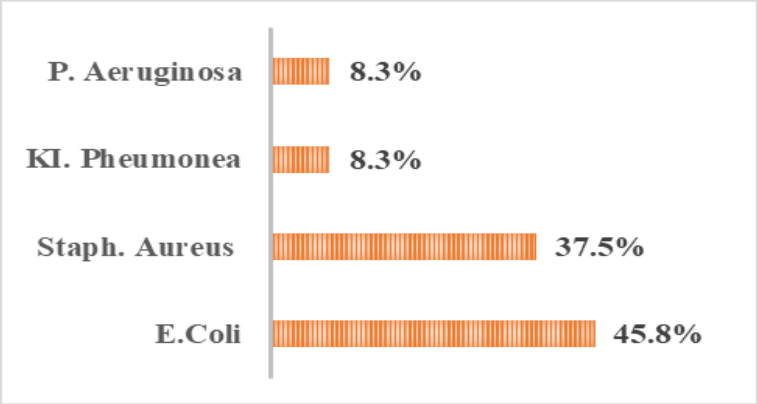



**Figure 8: Bacterial isolation among SSI cases**

## DISCUSSION

Most of the patients in this study (89.29%) were aged between 10 and 49 years, which aligns with the age range chosen in the study by Agrawal *et al.,* [12]. In terms of gender distribution, 63.57% were male and 36.43% were female, resulting in a male-to-female ratio of 1.7:1. Male predominance was similarly observed in another study [13], which reported SSIs in 16.66% of males and 18.2% of females. In the current study, the overall frequency of surgical site infections was 17%. The incidence of SSIs is strongly linked to infection rates noted in previous studies, which range from 6.09% to 38.7% [14,15]. In contrast, developed countries report lower rates, between 2.8% and 19.4% [16,17]. Our study found the highest SSI rate, 26.47%, among participants aged 40-49 years. However, a recent study reported a mean age of 63 years for SSI cases [18]. Consistent with previous research [13], the majority of SSI cases in our study were male. Regarding the types of surgeries, the highest SSI rate of 50.0% was observed in volvulus cases, while obstructed hernia operations had the lowest. The incidence of SSIs varied depending on the type of incision used in surgery. Extended lower midline incisions showed the highest SSI rate at 50.0%, followed by mid midline incisions at 42.1%, and lower right para-median incisions at 33.3%. Rutherford Morison incisions had an SSI rate of 20.0%, while both upper midline and extended upper midline incisions had rates of 13.3%. Gridiron incisions had the lowest SSI rate at 5.0%. Agrawal *et al.,* [12] suggested that reducing SSIs can be achieved through strategies such as minimizing preoperative hospital stays, implementing effective antibiotic administration policies, managing remote site infections before surgery, ensuring proper preoperative patient preparation, minimizing surgery duration, using drains judiciously, maintaining intraoperative asepsis, and adhering to operation theater protocols. In this study, the analysis of SSI distribution based on wound contamination categories showed that approximately 62.5% of the cases were classified as dirty. Furthermore, 20.8% were clean-contaminated, and 12.5% were contaminated. These findings are consistent with those reported in another study [19]. Among all SSI cases in our research, 45.8% involved patients with malnutrition. Additionally, E. coli was isolated in 45.5% of SSI cases, and Staphylococcus aureus in 37.5%. Similar reports from other studies [20,21] identify E. coli and Staphylococcus aureus as the predominant pathogens responsible for SSIs.

## CONCLUSION & RECOMMENDATION

Approximately one in six cases of emergency non-traumatic abdominal operations face the risk of developing a surgical site infection (SSI). The prevalence of SSIs is notably higher among male patients, highlighting a potential gender-related vulnerability. Malnutrition frequently accompanies these cases as a common comorbidity, potentially exacerbating the risk and severity of infections. Common causative organisms identified in these infections include E. coli and Staphylococcus aureus, underscoring the need for targeted prevention and treatment strategies. Addressing nutritional deficiencies and implementing effective infection control measures are essential steps in reducing SSI instances in these surgical scenarios.

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