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Original Research Article

Surgical Site Infection in Abdominal Wall Surgeries

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Abstract

Background: Even in hospitals with the most up-to-date equipment and established pre-operative preparation and antibiotic prophylaxis protocols, surgical site infections (SSI) continue to be a serious issue. SSI are to blame for the rising cost, morbidity, and mortality associated with surgical procedures.

The purpose of this study was to ascertain the prevalence of SSI following abdominal procedures and to identify the risk variables that contribute to the development of SSI.

Settings and Design: Patients who had abdominal surgeries in the departments of General Surgery and were included in this Descriptive Cross sectional study.

Materials and Methods: The study included, all surgeries involving abdominal wall opening.

Depending on the level of intraoperative contamination, wound classes were classified as clean, clean contaminated, contaminated, and unclean. Along with the patient's demographic information, data was gathered on the timing of antimicrobial prophylaxis, surgical wound infections, types of surgeries (emergency and elective surgeries), and wound classes were noted.

Results: 13.7% of surgical wounds were infected overall. Compared to elective surgery (7.6%), the infection rate was higher with emergency surgery (25.2%). As the risk index score grew from 0 to 3, the rate of surgical site infection rose. SSI was less common with early surgical and postsurgical prophylaxis. The frequency of wound infections and the timing of prophylaxis showed a clear link.

Analytical Statistics: The chi-square test was used, with a 5% level of significance.

Conclusion: Wound infection is greatly predisposed by a pre-existing medical condition, extended operating time, the wound class, emergency surgeries, and wound contamination. For a variety of surgical procedures, antimicrobial prophylaxis is beneficial in lowering the incidence of post-operative wound infections, although timing of treatment is crucial.

Keywords: Surgical site infections, Abdominal surgeries, wound infection.

Introduction

Surgical site infections (SSI) continue to be a serious issue in all areas of surgery in hospitals, despite improvements in asepsis, antimicrobial medications, sterilization, and surgical methods [1]. They have contributed to the rising expense, morbidity and death associated with surgical procedures, and they still do, even in hospitals with the most advanced equipment and established preoperative preparation and antibiotic programs prophylaxis. Most antibiotics prescribed in hospital settings (30%–50%) are used for surgical prophylaxis to avoid post-operative infections of a wound. The comfort of patients and the usage of medical resources could both significantly improve with a minor drop in infection rates [2].

The purpose of this study was to estimate the prevalence of SSI following abdominal operations and to identify risk factors connected to the SSI development.

Material and Methods

The Pacific Institute of Medical Sciences, a tertiary care facility, conducted this retrospective observational study. All 160 abdominal procedures performed in the departments of general surgery throughout the course of 18 months, or from March 2021 to September 2022, were taken into consideration for the study. 160 cases were selected as the sample size for statistical analysis.

Before the study began, ethical approval was acquired from our institution's ethical committee. All the study, abdominal hysterectomy, tubectomy, and caesarean sections that involved opening the abdominal wall were all taken for then study.

Individuals who were receiving antibiotics were excluded from the study.Serous or non-purulent discharge from the wound, pus discharge from the wound, and/or serous or non-purulent discharge from the wound were all considered signs of wound infection. The lesion that exhibits symptoms of inflammation (oedema, redness, warmth, elevated local temperature, fever > 38°C, soreness, induration), as well as the wound that the surgeon purposefully opened up because of a localised collection (serous/purulent). The absence of stitch abscesses were excluded from the research. According to National Research Council classification criteria the classification of wounds was divided into four categories: clean, clean contaminated, contaminated, and dirty. The classification is based on intraoperative contamination[4].

Prophylactic antibiotic administration was classified as early operative if it occurred more than 2 hours prior to incision, pre-operative if it occurred less than 2 hours prior to incision, peri-operative if it occurred during surgery, and post-operative if it occurred following surgery. The risk index for the National Nosocomial Infections Surveillance (NNIS) was calculated.

For which three independent risk variables were taken into account: a dirty or infected surgical wound, operation lasting more than two hours, and poor clinical condition of the patient (equivalent to levels 3, 4, or 5 of the ASA classification [4], Above the 75th percentile, which is the cut-off point established for the procedure type conducted, are all given a score of 1. Patients are divided into four groups based on the sum of their scores, which range from 0 to 3 [4].

The information gathered includes information about the timing of antibiotic prophylaxis, surgical wound infection, types of surgeries (emergency and elective surgeries), the wound classes, haemoglobin percentage, and other factors. The following indicators were used to analyse the results:

1. Antimicrobial prophylaxis is administered at various stages before, during, after, and early after surgery.
2. Rate of surgical site infection by type and class of wound operations, prophylaxis timing, and NNIS risk index.

Chi-square test was used to determine whether there was a statistically significant relationship between the variables, with a level of significance set at 5%.

Results

One hundred sixty different kinds of abdominal surgical operations were covered in the current study. Appendicectomy, caesarean section, abdominal hysterectomy, and herniorraphy accounted for 61.2% of the total surgical procedures out of a total of 17 different types of abdominal procedures.Overall 15% (24 cases) of surgical wounds were infected. In this study the incidence of patients with Herniotomy and herniorrhaphy were maximum (20%) and lowest were Appenticeectomy& peritoneal toileting (10%). (Table 1)Majority of patients were with mid line incision (30%) and prone to surgical site infection. (Table 2) Out of 160 cases (48%) were clean cases, 42 were clean-contaminated 42 were contaminated and 14 were dirty.

Out of 24 cases infected cases clean cases had 4% infection, clean-contaminated had incidence of 31% contaminated cases had 23% and in dirty cases incidence was 14%.(Table- 3) As a result, there was a definite connection between the rate of wound infection and the wound's pollution. The procedures were divided between elective and emergency surgery. When compared to elective surgery [5/90 (5%)], the infection rate was higher with emergency surgery [19/70 (12%)]. The overall observed rate of SSI in this study, 16%, was greater than the SSI rate in anaemic patients (21%), hypoproteinemic patients (13%), diabetic patients (28%), and hypertensive patients (12%).(Table-4)78 cases had operation time <1.5 hours with incidence of infection 6.4%, 42 of cases had operation time of >1.5 hours with an incidence of infection 47.6%. Incidence was more in surgeries having duration of >1.5 hours**.** Thus as the duration of surgery increases surgical site infection also more. Klebsiella and Staphylococcus were the most common isolated organisms.

Table 1: Distribution of infected patients by type of surgery

	Status SSI		Total	Yes %
Type of operations	Yes	No		
Appendicectomy	5	40	45	11
Adhesiolysis or resection & Anastomosis	5	38	43	13
Repair of ilealperforration/ Ileostomy and through peritoneal toileting	8	24	32	25
Appendiceectomy with peritoneal toileting	2	17	19	10
Resection of volvulus of sigmoid colon and primary anastomosis / Hart-mans procedure	3	13	16	18
Herniotomy and herniorrhaphy	1	4	5	20
Total	24	136	160	

Table 2: SSI distribution based on different types of incision

Status of SSI					
S.No.	**Type of Inscision**	**Yes**	**No**	**Total**	**Yes %**
1.	Extended lower midline	2	22	24	8
2.	Mid line	8	20	26	30
3.	Lower right para-median	4	17	21	23
4.	Rutherford Morison	3	18	21	14
5.	Upper midline	2	25	27	8
6.	Extended upper midline	4	26	30	13
7.	Grid Iron	0	1	2	-
8.	Lanz	0	2	3	-
9.	Inguinal	1	5	6	20
	Total	24	136	160	15

Table 3: SSI distribution based on different types of wounds

	SSI status		**No. of cases**	**Yes (%)**
Types of wound	Yes	No	Total	
Clean	2	46	48	4
Clean contaminated	10	32	42	31
Contaminated	8	34	42	23
Dirty	4	24	28	14
Total	24	136	160	15

Table 4: Shows incidence of infection in Co-morbidities

Risk factors	**No. of cases**	**Infected cases**	**Total**	**Percentage (%)**
Anemia	14	3	17	21
Hypoproteinemia	15	2	17	13
Diabetes mellitus	25	7	32	28
Hypertension	16	2	18	12
Total	70	14	84	17

Discussion

The location of the surgery, the amount of bacteria present in the tissue or blood after surgery, and the strength of the host defences all affect the a etiology of surgical site infections [5]. Infection rates range from 2-5% overall for additional abdominal surgeries to roughly 20% for intravenous procedures.

Surgical wound infection rates varied from surgeon to surgeon, hospital to hospital, procedure to procedure, and even from one patient to another patient [5]. In our analysis, the total surgical wound infection rate was 15%. Numerous studies from India conducted in various locations have revealed that the SSI rate ranges from 8.96- 20 % [1, 3, 6, 7].

The high infection rate in certain surgical operations, like cholecystectomy and transvesical prostatectomy, is a result of the small sample size used in those surgeries. Compared to other countries, Indian hospitals have a substantially higher infection rate, countries; for example, it is 2.8% in the USA and 2 5% in European nations [1]. The inadequate design of our hospitals and the disregard for the most basic infection control procedures may be to blame for the increased infection rate in Indian hospitals.

From clean to unclean wounds, the rate of surgical site infection increased. Identical outcomes were seen in further investigations as well [2, 8, 9]. Regardless of the type of lesion, Garibaldi et al. [10] discovered that 30 or more colony-forming units (CFU) of bacteria cultivated from a wound was predictive of wound infection.

Additionally, a prospective analysis of 190 patients undergoing colorectal surgery revealed that peritoneal fluid bacteria concentrations of 5 CFU per millilitre or greater are predictive of wound infection [2].

Compared to elective surgery (7.6%), the infection rate was higher with emergency surgery (25.2%). Inadequate pre-operative planning, underlying illnesses that predisposed to the infection, and emergency procedures' high infection rates, emergency surgery and the increased incidence of infected or filthy wounds [1].The number of the specific operation on the OT list that day, the sequence of the operation, and the length of the operation were all found to be statistically significantly correlated with the rate of SSIs.

The rate of SSIs rose along with the operation's order and duration. The incriminating aspects were the advent of weariness, which led to a deterioration in aseptic procedures and an increase in pollution in the operating room with time [3,11]. In such cases, the wound infection rate was 21.8% (12/55)

patients with haemoglobin levels below 9% as opposed to 13.2 (125/945) in healthy people. Awan MS [12] reported similar findings. Anaemia is not a known risk factor for SSI, albeit [12].

The risk index score increased along with the rate of surgical wound infection, increased. Similar findings were made by Raka L et al [13], who found that the SSI rate rose with risk indexes of 2 and 3. The NNIS System risk index and the onset of SSI were found to be highly correlated.

Prophylaxis was confirmed to be related with a greater SSI rate when administered more than 2 hours before surgery or afterward (Table/Fig-7). Similar findings were reported by Platon E. M. et al.'s study [14]. The intra-operative contamination's microbial burden was lowered by antibiotic prophylaxis to a level below which the host defences could not be overpowered. the prior Operative antibiotic prophylaxis has been shown to reduce post-operative morbidity, shorten hospital stays, and lower overall expenditures associated with infection [15]. Period of Management is important. Ideally, the medication should be given within 30 minutes, but it must be given within two hours of the incision [16].

Always provide the first dose prior to making the skin incision. Readministration of medication during longer processes. The medicine is recommended (with the same dose) at intervals that are one or two times its half-life [17]. This guarantees sufficient tissue levels throughout the entire treatment. An appropriate tissue level of the antibiotic must remain in the body for no longer than the operating time.

Only in exceptional situations, such as extreme contamination following a torn viscus or severe trauma, is the time of administration prolonged. The information at hand offers no proof in such situations, for the effectiveness of extending coverage to 24 to 48 hours [18]. The costs of prophylaxis, hospital stays, and—most importantly—the emergence of drug-resistant microorganisms are all drawbacks of long-term prophylaxis. 81.8% of procedures involve post-operative prophylaxis, which could Most likely as a result of more procedures for clean wounds [Table/Fig-5].

In situations with filthy wounds, which are less common in our study, preoperative prophylaxis is typically carefully planned and adhered to for the majority of gastrointestinal procedures, prophylaxis is advised.

The advice depends on the area of the gastrointestinal tract entered during the procedure because the quantity of organisms and the fraction of anaerobic organisms gradually rise along the gastrointestinal tract [19]. There is no regular recommendation for prophylaxis because the intrinsic risk of infection associated with procedures entering the duodenum, stomach, and proximal small bowel is so minimal. However, the prevalence of clinical practise entails unique situations that change this advice. Any situation where gastric acidity is reduced is linked to a significant rise in bacterial population and risk of wound infection [19]. Therefore, the patient is eligible for prophylaxis if they have ever used antacids, histamine blockers, or proton pump inhibitors. Procedures to treat upper gastrointestinal bleeding also require prophylaxis. In treatments to remove blockage, prophylaxis is advised since stasis also raises bacterial counts. Additionally, the intrinsic risk of infection in individuals with advanced cancer and morbid obesity is significant enough to recommend prophylaxis in these circumstances. Cefazolin is the suggested medication even if these patients have altered local flora since it provides appropriate prevention. A strong prescription for prophylaxis is warranted because to the extremely high intrinsic risk of infection associated with colorectal operations. Gram-negative aerobes and anaerobic bacteria should be the targets of antibiotic spectrum.

Since our study was retrospective in nature, certain factors were excluded, including blood glucose levels at the time of operation. Another drawback of our study was that it only included SSIs that occurred inside the hospital; patients that might have acquired SSIs after release within 30 days were excluded since our institution did not practise post-discharge surveillance of wound infections. A prospective research that included post-discharge monitoring for up to 30 days would therefore provide more data.

Despite the rarity of severe sepsis, prophylactic antibiotic therapy is necessary anytime (1) the effects of wound infection are uniformly devastating. (2) Even while wound infections happen frequently, life is rarely in danger. (3) The patient's severe host defence system weakness makes any infection, no matter how mild, likely to become systemic and ultimately fatal [5]. If necessary precautions are taken, it is possible to prevent the 30% of cases of SSI that are predominantly attributable to hospital care procedures [4]. To lower the surgical site infection rate, it would be preferable to implement a sound antibiotic policy, shorten procedures by providing staff with adequate training in proper surgical techniques, implement appropriate intra-operative infection control measures, and provide surgeons with the necessary data regarding SSIs [1, 3, 13]. A preventive antibiotic programme has the potential to reduce both morbidity and mortality. The preservation of hospital bed space and the potential for significant financial savings to be increased for individualised patient care are further benefits [5].

A wound surveillance cell is available in the majority of western hospitals, where the wound infection nurse is the data manager collecting information from charts and tabulating the wound infection rate by surgical speciality. For this type of monitoring, the observation time is 30 days. Telephone calls to patients or follow-up questionnaires sent by mail have been suggested as some of the methods for enhancing the capture of late wound infections in such institutions [21, 22]. The concept of wound surveillance is still in its infancy in India, and every hospital urgently needs such a system.

Conclusion

According to the findings of study microbes that are naturally found in our bodies are primarily responsible for surgery site infections (SSI). In addition to environmental factors like the state of the wounds, the length of the operation, the prolonged exposure of the peritoneal cavity to the environment, the prophylactic use of antibiotics, and factors related to surgery like the type of incision, the type of operation, and the operating surgeon's experience, many host factors, such as malnutrition, obesity, patients' knowledge of hygiene, the presence of co-morbidity, etc. also play a significant role in the development of SSI. In order to control SSI, it is crucial to provide quality surgical care, which includes quick patient assessment, resuscitative procedures, sufficient patient preparation, and an aseptic environment.

Surgical site infection can be reduced by

- Regular surveillance of SSI followed by auditing and feedback of results to the surgeons on regular basis.
- Reducing the pre-operative stay to minimum.
- Minimizing the duration of operation through adequate training of staff on proper surgical techniques.
- Avoiding wound drains. If this is not possible, using a closed drainage system and removal of drains as soon as possible.
- Ensuring that the patient is as fit as possible.
- Proper intra-operative infection control measures by implementing strict antiseptic and aseptic methods.
- Encouraging efforts in reducing the known risk factors to a bare minimum in elderly patients.
- Proper collection and transport of samples from the surgical site, immediately on suspicion of infection.
- Awaiting antibiotic sensitivity test results for appropriate antibiotic therapy, to avoid emergence of resistant strains.

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Declarations

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