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Original Research Article

Study on the Pattern of Surgical Site Infections at a Tertiary Care Hospital

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Abstract:

Background: Surgical site infections (SSI) are a major concern even in hospitals with the most up-to-date facilities and established protocols of pre-operative preparation and antibiotic prophylaxis. SSI have been linked to increased costs, morbidity, and death associated with surgical operations. The purpose of this study is to identify the trends in surgical site infections in a tertiary care hospital's general surgical ward.

Methods: For two years, from March 2010 to February 2011, the Department of General Surgery at Darbhanga Medical College and Hospital in Laheriasarai, Bihar, undertook this analytical cross-sectional study. All of the patients, who were either elective or emergency admissions to the surgical ward with a range of surgical issues and later acquired wound infections, were included in the research. Excluded were cases of diabetic foot, abscesses, and wound infections treated elsewhere. Age, gender, primary diagnosis, method of admission, comorbid variables, operation type and duration, surgeon expertise, antibiotic use, and length of hospital stay were among the data gathered. From the third post-operative day onward, the wound was checked for signs of infection. A bacteriological analysis was submitted for any discharge. We monitored the wounds till they healed.

Results: A total of 1915 patients had surgery, with 983 (51.5%) of those cases being elective and 932 (48.5%) being emergency cases. With 165 cases of postoperative wound infections, the total incidence of infection was 8.6%. Compared to emergency patients (12.7%), the infection rate in elective cases was lower (4.6%). A mild infection or suture abscess developed in 61 patients (37%) and a frank suppuration necessitating wound incision and drainage occurred in 104 patients (63%). A deep-seated intra-abdominal space infection occurred in 5 cases (3%). The most common bacteria responsible for wound infections was E. coli (39%).

Conclusion: The risk of infection in surgical wounds was 8.6%. The most prevalent pathogen to cause infection was E. coli, and the infection rate was significantly higher in patients who had emergency surgery.

Keywords: Surgical Site Infections, Surgical Wound Infections, Bacterial Infections, Antibiotic Prophylaxis.

Introduction

Nosocomial or hospital acquired infections are those that appear longer than 48 hours after admission [1]. With 150,000 deaths annually, they rank as the sixth most common cause of mortality in the United States; their incidence ranges from 5 to 10%. [2]. Nosocomial infections are a major contributor to avoidable morbidity and mortality, extending hospital stays by an average of eight days [3].

At the same time, they significantly raise treatment costs and workloads for healthcare facilities. Surgical site infections (SSIs) occur for 16% to 38% of all nosocomial infections among surgical patients, making them one of the most frequently reported nosocomial infections [5]. SSIs have the potential to cripple individuals and significantly raise medical expenses [6]. They can result in complications such delayed wound healing and revision surgery [7], are a major cause of readmissions, and increase the risk of hospital acquired infections in patients who stay longer than necessary. [8]

Three categories of wound infections are included in the CDC's definitions for surgical site infection surveillance: superficial, deep incisional SSI, and organ/space SSI [9]. Since ancient times, wound infections have significantly worsened surgical patient outcomes. Despite being mainly avoidable, they continue to be a significant cause of morbidity [10]. Controlling the four primary sources of infection people, equipment, environment, and patient risk factors is crucial to establishing a safe environment and reducing postoperative surgical wound infection [11]. Comprehending particular

SSI risk factors is crucial for formulating a customized SSI risk stratification index [12] and devising tactics to limit the infection rate. Since prevention is easier, less expensive, and more satisfying for patients at least one-third of all illnesses might be avoided with basic precautions it is the optimal course of action [13]. As a result, every hospital must set up an infection control system. Hospital infections and disease outbreaks are caused by a lack of awareness and a failure to implement infection control procedures. However, research indicates that after infection control treatments, there was a notable decline in the rates of SSIs [14].

Material and Methods

This analytical cross-sectional study was conducted in the department of general surgery, Darbhanga Medical College and Hospital, Laheriasarai, Bihar over two years from March 2010 to February 2011.

The study examined all adult cases admitted to the surgical unit, whether they were emergencies or elective cases. Excluded cases included individuals with diabetic foot illness, wound infections, previous surgeries, and abscess incision and drainage procedures. Every case that underwent surgery during the research period had its wounds monitored for the emergence of infections. Patients who required repeated admissions or surgeries due to complications were only counted once.

All of the patients who became infected gave their consent so that the study could proceed. A specially created proforma was used to record all the data gathered, which included the patient's history, physical examination, co-morbid conditions, and results of any investigations carried out while they were hospitalized. The type of procedure, length of the operation, whether consultants or residents performed the surgery, and the application of preventative antibiotics were all noted during the operation. From the third postoperative day onward, the wounds were checked for infections. According to WHO recommendations, a surgical site infection was recognized at 30 days post-op with redness, inflammation, local heat, pain, temperature of 380C or above, and septic discharge from the incision site15. The reason for the discharge was sensitivity to culture. The infections were treated using conventional practice, which included changing the antibiotic based on culture and sensitivity reports, draining pus if necessary, and applying repeated dressings based on the situation. Hospital stays before and after surgery was recorded. Throughout follow-up, infected wounds were routinely examined until they healed. The information was entered in computer and data was analyzed using SPSS version 12.0. Various frequencies and percentages were calculated; the results are displayed in tabulated or graphic forms.

Results

A total of 2108 cases were registered in the surgical ward throughout the research period, of which 1915 had surgery. 983 patients (51.3%) had planned or elective surgery, whereas 932 patients (48.7%) had emergency surgery. The majority, 1167 (61%) were men. The majority of 1417 people (74%) were under 50 years old, with a median age of 42.7 years (range: 16–82 years). A little over 58% of men become infected. With 165 cases of postoperative infection, the overall incidence of infection was 8.6%.

Out of the 165 patients who experienced a wound infection, 69 (42%) had an age above 50. According to Table 1, the prevalence of infections was highest in filthy cases and least common in clean operations (20.1%). 46 patients (4.6%) out of 983 cases that were operated on as elective cases experienced infection.

Infection struck 119 patients (12.7%) out of 932 instances who were operated on in an emergency room.

Table 1: Infection rate in different procedures

Type of procedure	Total cases (n=1915)		Infected cases (n=165)	
	Number	Percentage	Number	Percentage
Clean	976	51%	20	2.1%
Clean-contaminated	421	22%	19	4.5%
Contaminated	173	9%	28	16.2%
Dirty	343	18%	98	28.5%
Operative Setting	**No. of cases**		**Percentage**	
Elective surgery (n=983)	46		4.6%	
Emergency surgery (n=932)	119		12.7%	

The surgery took an average of 109 minutes, with a range of 35 minutes to 7 hours and 20 minutes. In clean instances (first generation cephalosporins) and clean-contaminated cases (third generation cephalosporins), antibiotic prophylaxis was administered. Rather than providing prophylaxis, frequent usage of antibiotics was utilized in contaminated or unclean situations, depending on the circumstance.

The average length of stay in the hospital following surgery was 7.4 days (with a range of 1-110 days), whereas the average length of stay before to surgery was 1.8 days (with a range of 10 hours to 13 days). Despite the fact that infected cases required lengthier hospital stays, this aspect was not thoroughly investigated. A senior registrar or a surgeon of higher status conducted the surgery in 948 cases (49%); 76 cases (8.0%) in this group experienced wound infections. 967 cases (51%) had procedures carried out by residents under senior surgeon supervision; 9.2% of these cases experienced wound infections. As a result, the two groups' infection rates did not differ much. Anemia, defined as hemoglobin levels below 10 g/dl, was the most prevalent co-morbid condition. Before surgery, in elective cases, it was fixed; nevertheless, in emergency circumstances, a blood transfusion was administered as part of the procedure. Table 2 displays additional co-morbid variables for 165 patients.

Table 2: Distribution of co-morbid factors (n=165)

Co-morbid factor observed	No. of cases	Percentage
Anemia (Hemoglobin <10 gm/dl)	63	38%
Malnutrition (Loss of >6 kg body weight)	41	25%
Smoking (>10 cigarettes/day)	26	16%
Diabetes mellitus	19	11.5%
Hypertension and/or ischemic heart disease	19	11.5%
Obesity (>10% of ideal body weight)	8	5%
Compensated chronic liver disease	3	2%

Infection of the surgical wound occurred in 165 instances. The majority, 99 (60%) had open suppuration requiring the wound to be opened and drained (Figure-3). In 110 cases (67%), wound infection was found within 3–5 days, in 41 cases (25%), and in 13 cases (8%), it was found between 6–8 days. A case of infection emerged ten months following incisional hernia mesh surgery.

Table 3: Types of infection

Infections	No. of cases	Percentage
Superficial incisional infections	61	36.97%
Deep incisional infections	99	60.0%
Organ/space infections	5	3.03%

In all cases, the wound's discharge was sent for bacterial culture. Twenty three cases (14%) exhibited mixed development, 121 cases (73%), a single organism's growth, and 21 cases (13%), no growth. In 64 instances (39%), E. Coli was the most often cultivated bacteria, followed by Klebsiella spp. in 37 cases (22%), Pseudomonas aeruginosa in 25 cases (15%), and Styphylococcus aureus in 18 cases (11%), which included methicillin-resistant S. aureus (MRSA).

Table 4: Organisms grown on culture

Organisms	No. of cases	Percentage
E. coli	64	39%
Klebsiella spp.	37	22%
Pseudomonas aeruginosa	25	15%
Styphylococcus aureus+MRSA	18	11%
No growth	21	13%

Discussion

8.6% of the cases in the current study had surgical site infections, with the majority of those instances requiring emergency surgery. The prevalence of social security illness (SSI) varies by country; it is 4.4% in Taiwan [16], 5% in the US [17], and 5.2% in Japan [18]. A study conducted in Brazil found a significantly lower frequency of 1.8% [19]. The likelihood of developing SSI is significant (4%–30%) in India. [20] Infections can be caused by a number of things, including the patients themselves (particularly if they are contaminated by bacteria in the digestive tract), other patients, hospital staff, food, infected surgical instruments, bandages, and even medications and injections [21]. One significant host-related risk factor is advanced age [9,21] because of a higher prevalence of comorbid illnesses, weakened immune systems, individual neglect, etc. Nonetheless, gender is not a major factor, as other people have noted [21,22].

The type of operation has a direct bearing on the likelihood of getting a wound infection. It is determined by the amount of bacterial burden and any possible bacterial contamination of the tissues during surgery. Along with what other workers [21] have reported, our study also demonstrated the relationship between the type of operation and infection rate. The length of surgery also affects wound infection, and longer procedures (more than two hours) are linked to higher infection rates [23].

This is because longer surgical procedures expose tissues to the theatre environment, hypothermia [24], and the need for blood transfusions all of which are potential risk factors for surgical site infections (SSI25). According to a Lahore study, the length of the surgical process was directly correlated with the nearly two-fold increase in wound infection rates in instances that took longer than two hours [23].

This was also observed in our study where most of the cases that got infected took longer than 100 minutes. Operative settings (elective or emergency) also play a significant role in determining infection rates. Emergency room cases are more likely to get infected because to poor planning, sterilisation errors, pre-existing infections, and weakened patient immunity.

The current study found that the infection rate in emergency cases (12.7% versus 4.6%) was nearly three times greater than that in elective cases. Other employees have also noticed this. Research from Lahore indicates that the infection rate in emergency situations is between 2.5 and 4 times higher. Extended hospital stays, particularly during the postoperative phase, are linked to a significant rise in wound infection rates (Wood Infection Rates, 2021). The risk also rises with the length of stay. However, a longer stay in the hospital prior to surgery also raises the risk of infection [9]. This might be connected to resistant hospital flora colonizing on the skin and nail beds of the patients.

According to several experts, a surgeon's level of expertise may have an impact on the rate of wound infection [23]. There was no discernible variation in the infection rate between cases handled by younger and senior operators. Both the length of the procedure and the frequency of postoperative wound infection are reduced when resident staff members receive direct supervision and improve their surgical skills and techniques [23].

The most frequent type of bacteria found in our investigation was E. Coli, which was followed by MRSA, Pseudomonas aeruginosa, Klebsiella pneumoniae, and Styphylococcus aureus. A similar pattern has also been reported from Hyderabad [24]. However, this is not consistent with the literature, which reports that the most prevalent bacteria that is resistant to commonly used antibiotics is Styphylococcus aureus [20,25-27].

Conclusion

The risk of infection in surgical wounds was 8.6%. The most prevalent pathogen to cause infection was E. coli, and the infection rate was considerably greater in patients who had emergency surgery.

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