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Incidence Rate and Risk Factors of Surgical Wound Infection in Surgery Patients

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ABSTRACT

Health care systems view hospital-acquired infections (HAIs) as a major problem. Surgical wound infection is one of the main HAIs, contributing significantly to increased morbidity and mortality. Therefore, the purpose of this study was to identify the prevalence and risk factors of postoperative wound infection in patients undergoing general surgery. Between 2021 and 2022, 253 patients receiving general surgery at an Indian hospital were the subject of this cross-sectional study. Bacterial isolates, antibiotic susceptibility patterns, how the antibiotics were administered and what kind, how long an operation took, how urgent it was, who changed the patient's dressings, how long the patient stayed in the hospital, and how much haemoglobin, albumin, and white blood cells were in the patient's blood after the operation were all evaluated. We assessed the prevalence of surgical wound infection and its relationship to patient characteristics and laboratory findings. The data analysis was done using the SPSS software (version 16.0, SPSS Inc., Chicago, IL, USA). Mean (standard deviation) and number (percentage) were used to portray quantitative and qualitative variables. 4.7% (12 cases) of patients with a mean age of 59.34 (SD = 14.61) years experienced surgical wound infection. Surgery-related wound infection incidence was correlated with preoperative (>3 days) and postoperative (>7 days) hospitalization, history of immunodeficiency (P 0.001), and interns in charge of changing dressings (P = 0.021). Pre- and postoperative antibiotic use were significantly related with 9.5% and 4.4% of surgical wound infection

cases, respectively.

Keywords

General surgery, Incidence, Risk factors, Surgical wound infection

Introduction

Hospital-acquired infections (HAIs) are regarded as a significant global concern for healthcare systems and have been linked to higher mortality, unfavourable conditions, length of hospitalization, high expenditures of care, inappropriate use of medications, and antibiotic resistance [1]. HAIs are infections that appear within 48–72 hours of admission or up to 6 weeks after discharge [2]. In addition, illnesses contracted directly from hospital personnel or infections in newborns are also categorized as HAIs. [3] According to estimates, the prevalence of HAIs in 2019 ranged from 5.7% to 17%, and 64% of all HAIs were pneumonia, urinary tract infections (UTIs), and surgical wound infections. [4] Additionally, it was discovered that surgical wound infections and infections brought on by devices accounted for 21.8 and 25.6% of all infections [5].

Currently, there are more surgeries being done every day in the world. Contrarily, patients undergoing surgery frequently have a number of comorbidities. Infections from surgical wounds continue to be a major issue, particularly in middle- and low-income nations.[6] Infections from surgical wounds result in extended hospital stays and a rise in HAI-related morbidity and mortality.[7] According to a study by Colas-Ruiz et al. (2018), Escherichia coli (42.3%), Enterococcus faecalis (15.4%), and Proteus mirabilis (11.5%) were the most frequent germs causing surgical wound infections.[8] One of the most frequently reported HAIs in Europe, accounting for 19.6% of all HAI cases, is surgical wound infection.[9]

Infections from surgical wounds can occur anywhere between 6.8% and 26% of the time in Africa.[10] In Ethiopia, postoperative patients still have a significant (12.3%) rate of surgical wound infection. Previous surgeries, clean incisions with infections, and preoperative hospital stays longer than seven days are all risk factors for surgical wound infections.[11] Because of the detrimental effects on patients' clinical results, surgical wound infections following colorectal surgery continue to be a major issue. [12,13] The risk of surgical wound infections is increased by factors relating to the patient and the surgical treatment.[14]

An infection at or near a surgical incision that appears within 30 days of surgery, or up to 1 year in implant recipients, is referred to as a surgical wound infection.[15] Hospital, patient, and surgery-related factors are risk factors for surgical wound infections and may have a significant impact on the development of these infections.[16] Many different things can lead to surgical wound infections, and patients having gastrointestinal procedures are more likely to get bacterial infections. The majority of surgical wound infection cases (86.8%) were found after hospitalization, according to research by Hassan et al. [17]. The outcomes always influence the treatment's results. The administration of antibiotics prior to wound closure at the surgical site, intravenous antimicrobial prophylaxis, enhanced cleanliness, surgical aseptic procedures, microbiological screening, and decolonization are recent and current therapies and tactics for preventing surgical wound infection. [18,19]

MATERIALS AND METHODS

All patients receiving general surgery at an Indian hospital between 2021 and 2022 were examined in this cross-sectional study. All patients receiving general surgery at an Indian hospital met the inclusion criteria. Having an active infected wound and a history of immunodeficiency disease (using chemotherapy or immunosuppressive medications) were the two criteria for exclusion. The University of Medical Sciences approved the current study. The researchers only entered the hospital with permission from the management. The researchers collected samples in a private space, and they independently assessed each medical file.

White blood cell, albumin, creatinine, and haemoglobin levels were among the laboratory markers also noted. A complete blood count test was used to determine the levels of white blood cells and hemoglobin. A Hitachi 717 autoanalyzer was used to measure the amounts of albumin and creatinine. Using Jaffe's colorimetric approach without removing proteins, the creatinine levels in serum, plasma, and urine samples were measured using a creatinine diagnostic kit from Pars Company. For the manual and instrumental quantification of albumin, the Bionik Company's albumin colorimetric test kit (Bromocresol green method) was utilized.

If a wound was present at or near the surgical site, it was classified as clean, clean-infected, contaminated, or dirty. Patients' companions assisted us when patients refused to cooperate due to lower level of consciousness, intubation, memory issues, and other consciousness-related illnesses. Additionally, patterns of antibiotic susceptibility for bacterial isolates were evaluated. Patients were checked for potential infections after surgery. Patients were evaluated based on their postoperative use of antibiotics, the type of antibiotics used, the length of the procedure, the shift it was performed during (morning, evening, or night), whether it was an emergency or elective procedure, who changed their dressings (a nurse or an intern), how long they stayed in the hospital, and their postoperative hemoglobin, albumin, and white blood cell levels. The frequency of surgical wound infection (yes/no) and its correlation with patient characteristics and laboratory results were looked into at the study's conclusion.

The data analysis was done using the SPSS software (version 16.0, SPSS Inc., Chicago, IL, USA). Mean (standard deviation) and number (percentage) were used to portray quantitative and qualitative variables. The Shapiro-Wilk test was employed to assess the distribution's normality. Thus, Fisher's exact tests and the 2 test were utilized to assess the association between the variables. P-values under 0.05 were regarded as significant.

RESULTS

A total of 253 general surgery patients, as stated in Table 1, took part in this investigation. 59.49% of the participants were men. In addition, respective usage rates of cigarettes, alcohol, and drugs were 22.22%, 4.74%, and 10.71%. Infections from non-surgical wounds affected 6.32% of the patients. The majority of patients (67.39%) had no prior hospitalizations. 93.68% of patients spent more than 3 days in the hospital prior to surgery, while 85.77% of patients spent less than 7 days in the hospital following surgery. Additionally, 16.40% of patients reported having a history of immune system deficiencies, and 5.14 percent of patients were admitted to an intensive

care unit prior to surgery.

The length of pre- and postoperative hospitalization was substantially correlated with the incidence of surgical wound infection. A significant portion of patients who spent more than three and seven days in the hospital before and after surgery, respectively, acquired surgical wound infections. Additionally, patients with a history of immunodeficiency had a considerably higher incidence rate of surgical wound infection (P 0.001). The frequency of surgical wound infection was substantially correlated (P = 0.021) with the group of almost interns who were in charge of changing dressings (Table 1). There were only 5 patients undergoing surgery who were on immunosuppressive medications, and there were no occurrences of surgical wound infection in this group of patients. Preoperative antibiotic use (P = 0.006), postoperative antibiotic use (P = 0.039), and the type of preoperative antibiotics (P = 0.014) were all significantly correlated with the prevalence of surgical wound infection. Preoperative antibiotic usage was linked to 9.5% of surgical wound infection cases, and postoperative antibiotic use was linked to 4.4% (Table 2).

Table 1: Frequency distribution of surgical wound infection in terms of patient characteristics.

Variables	Without surgical wound infection		With surgical wound infection		P value
Age					
< 18	2	100			0.999
18-65	153	95.3	7	4.7	
>65	86	95.1	5	4.9	
Gender					
Male	143	95	7	5	0.758
Female	98	95.6	5	4.4	
Weight					
<70	91	95.8	4	4.2	0.845
70-100	149	94.9	8	5.1	
>100	1	100			
Smoking					
Yes	54	96.4	2	3.6	0.509
No	187	94.9	10	5.1	
Alcohol					
Yes	12	100			0.620
No	229	95	12	5	
Non-surgical wound infection					0.057
Yes	12	87.5	2	12.5	
No	227	95.8	10	4.2	
Hospitalisation history					
Yes	75	90.9	7	9.1	0.001
No	166	97.4	5	2.6	

Table 2: Frequency distribution of surgical wound infection in terms of drug or antibiotic use

Variables	Without surgical wound infection		With surgical wound infection		P value
Immunosuppressed drugs					0.999
Yes	5	100			
No	236	95.2	12	4.8	
Pre operative antibiotic injection					
Yes	52	90.5	5	9.5	0.006
No	189	96.7	7	3.3	
Post operative antibiotic injection					
Yes	238	95.6	11	4.4	0.039
No	3	71.4	1	28.6	

DISCUSSION

One of the most frequent infections, surgical wound infection makes up 19.73% of all HAIs and is regarded as a global issue in healthcare systems. Although the prevalence of surgical wound infections has grown recently, precise statistics are lacking. A 2018 study found that the total incidence rate of surgical wound infection following rectal surgery was 11.9%. [8] The prevalence rate of surgical wound infections was calculated in the current study to be 4.7%, which is similar with the results of prior investigations. [20-23]

Recent research have concentrated on its incidence and related risk factors due to worries about the rising prevalence of surgical wound infection. The therapy and recovery process for patients may be improved by identifying related risk factors. This study's findings that surgical wound infection was associated with risk factors such as antibiotic use, laparotomy, emergency surgery lasting more than 2.5 hours, white blood cells >11 000 cells/L, creatinine level 0.8 mL/min, length of hospitalization, history of immunodeficiency, and people in charge of changing dressings are in line with those of other studies. [17] The results of the current study are consistent with those of previous recent studies. [12,21] To implement prompt therapeutic and preventive measures, it is critical to identify relevant risk factors and early diagnose surgical wound infection. [12] In a study by Carvalho et al., [24] factors such the amount of time spent in the hospital more than 24 hours before to surgery, the length of the procedure, and common bacteria (S. aureus and E. coli) were presented as risk factors for surgical wound infection. The length of the hospital stay and the length of the procedure were found to be risk factors for surgical wound infection in the current investigation.

A significant portion of patients who required more than 7 days in the hospital after surgery developed wound infections. According to the findings of several research, surgeries lasting more than three hours may potentially result in wound infection.[25] Long-lasting surgery may exacerbate tissue stress, increase wound

bacterial contact, and lower antibiotic levels. In the current study, the majority of patients had surgeries that lasted less than 2.5 hours, and there were comparatively few wound infections. The correlation between the frequency of surgical wound infection and the length of the procedure was also consistent with Koro et al.'s systematic evaluation. [26]

The study eliminated patients whose information was unavailable. Numerous variables affect the likelihood of infections. Even when statistics are maintained on a variety of variables, it might be difficult to ensure that all potential indicators of infection are recorded. The outcomes of this study may be less generalizable because it was carried out in a hospital.

CONCLUSION

In conclusion, the results of this study indicate that wound infections were not common among the patients who were the subject of the investigation. Overall, risk variables for surgical wound infection included the use of antibiotics, emergency surgery, the length of the procedure, and levels of white blood cells and creatinine. A structured approach to infection management for surgical wounds could benefit from the identification of key risk factors. The findings of this study allow healthcare professionals to identify the risk factors for surgical wound infection and seek to eliminate those variables.

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