ORIGINAL RESEARCH

Role of preoperative antibiotic prophylaxis in prevention of surgical site infections

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ABSTRACT

Background: this study was conducted to evaluate the role of preoperative antibiotic prophylaxis in prevention of surgical site infections. **Material and methods**: The chi-squared and Fisher's exact tests were used to collect and analyse the patient's data while keeping its confidentially, and the student's t-test was used to determine whether there was a difference in means. **Results**: The types of surgical procedures that were performed in Group A patients included 30 laparoscopic cholecystectomies, 30 open appendectomies, and 20 laparoscopic appendectomies. Group B included 20 patients who never received prophylactic and were not on preoperative antibiotics, of whom 10 had open appendectomies, 2 had laparoscopic appendectomies, and 8 had laparoscopic cholecystectomies. Surgical site infection developed in 2 out of 80 patients in Group A (2.5%), which is significantly lower than the number reported in 1 out of 20 patients (5%) in Group B ($P \leq 0.05$). **Conclusion**: Preoperative prophylactic antibiotic usage considerably shortens hospital stays and decreases the occurrence of surgical site infections. The recommendations of both national and international guidelines are applicable to a number of antibacterial medications that were used prophylactically in surgical practise.

INTRODUCTION

Surgical site infections (SSIs) are a common cause of health care-associated infection.[1,2] SSIs are the most common and the costliest health care-associated infections.[3,4] Among surgical patients, SSIs account for 38 percent of nosocomial infections. It is estimated that SSIs develop in 2 to 5 percent of the more than 30 million patients undergoing surgical procedures each year (ie, 1 in 24 patients who undergo inpatient surgery in the United States has a postoperative SSI).[5,6]

In the US, SSIs were identified in ~1.9% of 849,659 surgical procedures in 43 states from 2006 to 2008.[7] The economic burden of SSIs should be taken into account in the use of prophylactic antibiotics. In the US in 2010, more than 16 million surgical procedures were performed.[8] The annual costs of SSIs amounted to approximately US$3 billion in 2012, having increased from an estimated US$1.6 billion cost attributable to SSIs in 2005.[9,10] In low-and middle-income countries, SSI rates doubled from 5.6 to 11.8 in 100 surgical patients between 1995 and 2008.[11] The reporting of cost and effectiveness in infectious disease presents a crucial topic, ideally supported by updated antimicrobial resistance data.

Hence, this study was conducted to evaluate the role of preoperative antibiotic prophylaxis in prevention of surgical site infections.

MATERIAL AND METHODS

The subjects were located in the computerised hospital administration registration system of two governmental hospitals for this retrospective chart review and database investigation. 100 patients met the requirements for inclusion. Patients who underwent clean-contaminated operations and whose files were complete—including information on the procedure type, the prophylactic antibiotic administered, postoperative follow-up information, and length of hospital stay—met the inclusion criteria. SPSS software was used for the statistical analysis. The chi-squared test, Fisher's exact test, and student's t-test were used to analyse group differences and test for mean differences, respectively. The significance threshold was set at P 0.05.

RESULTS

Table 1: Gender-wise distribution of subjects.

Gender	Number of subjects	Percentage
Males	25	25%
Females	75	75%

Total	100	100%

The total number of patients enrolled in this study was 100, 25 of whom were males and 75 were females.

Table 2: prevalence of prophylactic antibiotics received by subjects.

Prevalence	Number of subjects	Percentage
Received (Group A)	80	80%
Not received (Group B)	20	20%
Total	100	100%

They were divided into two groups according to whether they received prophylactic antibiotics preoperatively (Group A), which included 80 patients, or had not received prophylactic antibiotics (Group B), which were 20 patients.

30 laparoscopic cholecystectomies, 30 open appendectomies, and 20 laparoscopic appendectomies were among the surgical operations carried out on the patients in Group A. Twenty patients made up Group B, of whom 10 underwent open appendectomies, 2 underwent laparoscopic appendectomies, and 8 underwent laparoscopic cholecystectomies. These patients never got prophylaxis and were not on preoperative antibiotics. Two out of 80 patients in Group A (2.5%) experienced surgical site infection, which is considerably less than the one out of 20 patients in Group B (5%) who experienced it (P 0.05).

Patients who received preoperative prophylaxis reported significantly shorter lengths of stay (P0.05) following all types of procedures. Additionally, the combination of metronidazole and cephazolin seemed to work best in patients who underwent laparoscopic cholecystectomy, correlating with a duration of stay of 29.8±4.1 hours. The greatest outcomes were seen in patients who underwent open appendectomy and received metronidazole and ceftriaxone at 33.2±8.4 hours. Patients who underwent laparoscopic appendectomy procedures had better outcomes when given metronidazole and cefuroxime with a 25.4±7.2 hours length of stay. The reported hours in Group B were substantially more than the overall mean hospital stay in Group A (P-value = 0.041).

Either alone or in conjunction with another antibiotic, the prophylactic antibodies were administered. In 32 cases, metronidazole, cefuroxime, cefazolin, and ceftriaxone were the most frequently utilised antibiotics. Cefotaxime, amoxicillin/clavulanic acid, cephalexin, and amoxicillin were some of the additional antimicrobials. Empirically determined doses were used.

DISCUSSION

Surgical site infections (SSIs) reflect an important complication in modern healthcare. As the surgical site is a potential port entry for exogenous organisms, it poses an immediate threat to the body and infections lead to prolonged wound healing.[12] The preoperative phase is considered the most crucial period of a surgical procedure in which the goal is to reduce the bacterial load surrounding the incision area. Using antibiotics prior to surgical incision is considered to be effective in preventing SSIs, which are among the most common preventable post-surgery complications involving healthcare-associated infections (HAIs).[12,13] A parenteral prophylaxis agent spectrum with corresponding potential bacteria on particular sites of surgery has been recommended recently to reduce SSI rates efficiently.[1] In contrast, some preoperative procedures, such as hair removal and mechanical bowel preparation are considered today to be inefficient at reducing SSIs.[14,15]

Hence, this study was conducted to evaluate the role of preoperative antibiotic prophylaxis in prevention of surgical site infections.

The total number of patients enrolled in this study was 100, 25 of whom were males and 75 were females. They were divided into two groups according to whether they received prophylactic antibiotics preoperatively (Group A), which included 80 patients, or had not received prophylactic antibiotics (Group B), which were 20 patients.

The types of surgical procedures that were performed in Group A patients included 30 laparoscopic cholecystectomies, 30 open appendectomies, and 20 laparoscopic appendectomies. Group B included 20 patients who never received prophylactic and were not on preoperative antibiotics, of whom 10 had open appendectomies, 2 had laparoscopic appendectomies, and 8 had laparoscopic cholecystectomies. Surgical site infection developed in 2 out of 80 patients in Group A (2.5%), which is significantly lower than the number reported in 1 out of 20 patients (5%) in Group B (P≤ 0.05)

The prophylactic antibodies were either given alone or in combination with another antibiotic. The most commonly used were metronidazole in 32 cases, cefuroxime in 14 cases, cefazolin in 10 cases, and ceftriaxone in 9 cases. Other antimicrobials included cefotaxime, amoxicillin/clavulanic acid, cephalexin, and amoxicillin. The doses were determined empirically.

In all types of surgeries, the length of stay was reported as significantly shorter (P≤0.05) in patients who had preoperative prophylaxis. Moreover, in patients who had a laparoscopic cholecystectomy, the combination of metronidazole and cephazolin appeared to have the best effect corresponding with a length of stay of 29.8±4.1 hours. Those who underwent open appendectomy had the best results with the combination of metronidazole and ceftriaxone at 33.2±8.4 hours. The patients who underwent a laparoscopic appendectomy showed better results with the combination of metronidazole and cefuroxime with a length of stay of 25.4±7.2 hours. The total mean hospital stay in Group A was

significantly shorter than the reported hours in Group B (P-value = 0.041).

The diversity in definition of SSIs in terms of the period to identify the SSIs potentially generates under-reporting of the diseases' occurrence. Despite the definition from the CDC (Horan et al., 1992)[16], other definitions were addressed by Peel and Taylor[17] (1991) from the Surgical Infections Society Study Group (SIGS) and Ayliffe et al.[18] (1993) from the National Prevalence Survey (NPS) which considered grouping wound infection based on the cause of infection, the time of appearance, and the severity of infection. For the time of the appearance of infection, they divided this into three categories, namely early, intermediate, and late based on whether the infection appeared in a 30-day period, in a period of between 1 and 3 months, and over 3 months post-surgery, respectively. By these definitions, the reimbursement for the cost be accurately predicted especially in the extensive financial evaluation of late-occurrence SSIs. Twelve included studies (60%) defined the time for the appearance of SSIs within diverse follow-up intervals for trial-based studies and time horizons for model-based studies.

The desired economic impacts of the proper use of prophylactic antibiotics in SSIs prevention are shorter lengths of stay, lower resistance rates, and ultimately, the reduction of costs. Some evidence showed a positive relationship between the infection rate and length of stay, and the reason given was that inpatients are at a high risk of infection by nosocomial and often antibiotic- and multi-resistant microorganisms.[19-23] Costs for a day of hospital stay and re-hospitalizations especially in the short-term are virtually fully fixed (Roberts et al., 2009).[24] For instance, a prospective study with a hospital perspective included direct medical costs by calculation based on length of hospital stay in nosocomial infections after head and neck cancer surgery (Penel et al., 2008).[25] Of the included studies 9(45%) included length of hospitalization in their evaluation.

CONCLUSION

In conclusion, it is demonstrated that the surgical practises in this study successfully used prophylactic antibiotics to avoid surgical wound infections and decrease hospital stays. Metronidazole, cefuroxime, cefazolin, as well as ceftriaxone were discovered to be the most frequently utilised preventive antibiotics.

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