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Original Article

Port Site Infection after Elective Laparoscopic Cholecystectomy with or without the Use of Prophylactic Antibiotics: A Comparative Cross-Sectional Study

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Abstract

Background

Laparoscopic surgery, a minimally invasive procedure, has gained popularity due to early recovery rate and minimal incision. Port site infection following laparoscopic surgery is an infrequent complication, increasing patient's morbidity, and also damaging surgeon's reputation. It depends on sterilization and surgical techniques, which have improved with time. The aim of this study is to evaluate the role of prophylactic antibiotics in preventing port site infection after laparoscopic cholecystectomy.

Materials and Methods

A comparative cross-sectional study on 200 patients undergoing elective laparoscopic cholecystectomy was conducted from November 2021 to February 2022 in tertiary care Hospital by using systematic random sampling.Among the 200 patients, 100 odd numbered patients were given antibiotics, and 100 even numbered patients were not. The outcome of the two groups was measured with regard to port site infection.

Results

The mean age in prophylactic antibiotic receiving group and not receiving group was 42.13 (SD = 14.41) and 42.71(SD = 14.29) years, respectively. The female: male ratio for total patients was 2.77.There were three cases of port site infection in total, in group receiving antibiotics (Cefotaxime), there was one case, whereas in placebo group, there were two. Simple logistic regression was utilized to compare the results of two groups ($p>0.05$). Similarly, Chi-square test was applied to histopathology diagnosis, which showed no statistically significant difference ($\chi 2 = 0.99$, $P = 0.80$).

Conclusion

Antibiotic prophylaxis does not lower the rate of infectious in patients undergoing elective laparoscopic cholecystectomy.

Keywords: *Antibiotics, Antibiotic Resistance, Laparoscopic Cholecystectomy*

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Introduction

Hospital-acquired infections continue to be a major clinical issue, resulting in considerable morbidity and mortality as well as higher healthcare costs [1]. Surgical site infections are now the most common of all healthcare-associated infections (HAIs) among hospitalized patients, according to recent statistics from the Center for Disease Control (CDC) [2]. Overall, the surgical site infection rate in Dhulikhel Hospital, Kathmandu University Hospital, has been reported to be 2.6% [3]. Despite improvements in antibacterial agents, sterilizing methods, surgical procedures, and operating room ventilation, post-surgical infections (PSIs) continue to be dominant [4]. Therefore, many studies recommend the use of prophylactic antibiotics, especially in simple cholecystectomy, Transabdo-minal Preperitoneal Procedure (TAPP), and other non-infected laparoscopic cases [5-6].

Globally, there has been debate on whether prophylactic antibiotics are necessary due to the low chance of infection in laparoscopic surgeries. Many randomized controlled trials (RCTs) have failed to demonstrate any advantage of prophylactic antibiotics in preventing port site infection (PSI) [2]. The use of antibiotics in minimally invasive surgery is contributing to the development of antibiotic resistance [7]. Likewise, there is no significant reduction in overall infection [8]. However, a few studies suggest that there is a reduction in the length of hospital stays [8].

Laparoscopic surgeries are a minimally invasive approach for performing cholecystectomy, appendectomy, Transabdominal Preperitoneal (TAPP) repair, and many more [2]. Since 1990, laparoscopic cholecystectomy (LC) has been the preferred method of treating gallstone symptoms [9]. It has been linked with reduced postoperative pain, shorter hospitalizations, better cosmetic results, and a low rate of postoperative infection, thereby making it preferable [9]. Surgical site infection (SSI) is an uncommon event following laparoscopic cholecystectomy in comparison to open cholecystectomy, but with acute cholecystitis and obstruction, the incidence of SSI is higher even in laparoscopic surgeries [7]. With this study, we aim to evaluate the effectiveness of prophylactic antibiotics in preventing port site infection after undergoing laparoscopic cholecystectomy. This study can help establish the use or disregard for the use of prophylactic antibiotics in laparoscopic cholecystectomy.

Materials and Methods

A comparative cross-sectional study was conducted in the department of surgery of a tertiary hospital in Nepal, on patients who underwent elective laparoscopic cholecystectomy from November 2021 to February 2022. All the data of the procedure and patient information were taken from the hospital software after proper consent from the patients and the concerned authority from the hospital, and clinical manifestations and complications were analyzed retrospectively. As per inclusion criteria, all the patients who underwent laparoscopic cholecystectomy for symptomatic cholecystitis, biliary colic, or chronic calculus cholecystitis in the department of surgery at Dhulikhel Hospital during the study period were enrolled. The exclusion criteria for this study were patients with comorbidities like Diabetes Mellitus, laparoscopic surgery converted to open cholecystectomy, acute cholecystitis, cholangitis, or empyema gallbladder. Ethical approval was obtained from IRC KUSMS with reference number 78/2021. Written consent was obtained from patients. As incidence of surgical site infection following cholecystectomy varies between 0.3% to 8.4%, taking 8% the sample size was 114 [3-7]. The sample was selected by using systematic random sampling among patients who underwent laparoscopic cholecystectomy at Dhulikhel Hospital. All odd numbered patients were given antibiotics, and even numbered patients were not. A total of 200 patients enrolled in the study, of which 100 were given prophylactic antibiotics and 100 were not provided antibiotics.

All the patients were strictly asked to take a bath on the same day, and surgeries were performed by surgeons with a minimum of five years' experience in laparoscopic surgery, who have been working in the department of Surgery at Dhulikhel Hospital, Kathmandu University Hospital. Once the patient was given general anesthesia, painting and draping were done with chlorhexidine solution and waited till it dried, and the patient was then draped with sterile surgical drapes following aseptic technique. For the antibiotic group, one gram of Cefotaxime was given intravenously thirty minutes before the incision. After this, a pneumoperitoneum was created with the help of Verses techniques, and the first port was placed in the umbilical site. Besides this 10 mm epigastric and rest port, two 5 mm ports were placed under vision. Once the surgery was completed, the umbilical as well as epigastric (both

10 mm) ports were closed in two layers, and the rest (5 mm) ports were closed in a single layer after being cleaned with povidone-iodine. The absorbable suture (poliglecaprone) material was used for closing all the ports.

Statistical analysis was done using SPSS version 16. The data was evaluated after 200 patients (100 per group) had been enrolled, where Group A received prophylactic antibiotics and Group B didn't. The descriptive statistics, along with simple logistic regression and the Chi-square test, were utilized. The statistical test was considered significant if the p value was less than 0.05.

Results

A total of 200 patients who underwent laparoscopic cholecystectomy were enrolled in the study during the time frame mentioned. Among them, 100 patients were given prophylactic antibiotics (Cefotaxime, one gram) intravenously thirty minutes before the incision. The female: male ratio for the total 200 patients was 2.77. The mean age in Group A was 42.13 years and in Group B was 42.71; with SD = 14.41 and SD = 14.29 in groups A and B, respectively. The mean BMI was 28.96 in the group who received antibiotics vs. 28.31 in the group of patients who didn't receive antibiotics (Table 1).

There were only three cases of postoperative infection. In the group receiving antibiotics (Cefotaxime), there was one case of port site infection. In the placebo group, there were two port site infections. Bile spillage was noted in 11 and 13 patients who received and did not receive antibiotics, respectively. The results were compared with those of 100 other patients who were not given antibiotics (Table 2).

Likewise, bile and stone spillage were noted in 4 and 1 patients who received and did not receive antibiotics, respectively. In the case of bile spillage as well as bile and stone spillage, a thorough wash was done with normal saline, and the stone was taken out and kept in a glove bag through the epigastric port. In the postoperative period as well as in the follow up period, no pneumonia, Urinary tract infection, or any other infectious complications were noted in either of the groups.

Among 200 patients, histopathology reports showed the majority of cases undergoing surgery had chronic calculous cholecystitis, followed by acute superimposed on chronic calculous cholecystitis, acute calculous cholecystitis, and Gallbladder polyp (Table 3).

A chi-square test was applied to prophylaxis antibiotic groups A and B with the histopathology diagnosis and showed that there was no statistically significant difference ($\chi 2 = 0.99$, $P = 0.80$) (Table 4).

Table 1: Demographic Profile of Patients undergoing Laparoscopic Cholecystectomy

Factors	Group A (Antibiotics Received)	Group B (Antibiotics not received)
Age		
Mean (SD)	42.13 (14.41)	42.71 (14.29)
Median (Min: Max)	41 (16:78)	40.5 (19:78)
Gender		
Male	28 (52.83)	25 (47.17)
Female	72 (48.98)	75 (51.02)
BMI		
Mean (SD)	28.96 (7.39)	28.31 (6.29)
Median (Min: Max)	27.68 (18.73:55.37)	26.93 (18.40:55.55)
Port site infection		
No	98 (49.75)	99 (50.25)
Yes	2 (66.67)	1 (33.33)

Table 2: Factors associated with antibiotic use among Laparoscopic Cholecystectomy cases

Factors	Group A (Antibiotics Received)	Group B (Antibiotics not received)	Crude OR	95% CI	P Value
Age					**0.912**
<30	23 (51.11)	22 (48.89)	1	1	
30-50	43 (48.31)	46 (51.69)	0.89	0.43-1.83	
=50	34 (51.52)	32 (48.48)	1.01	0.47-2.1	
Gender					**0.63**
Male	28 (52.83)	25 (47.17)	1	1	
Female	72 (48.98)	75 (51.02)	0.85	0.45-1.61	
BMI					
<26	39 (52.00)	36 (48.00)	1	1	
=26	61 (48.80)	64 (51.20)	1.08	0.68-1.70	
Gallbladder Perforation					
None	85 (50.00)	85 (50.00)	1	1	
Bile spillage	11 (45.83)	13 (54.17)	0.84	0.36-1.99	
Bile and stone spillage	4 (66.67)	2 (33.33)	2	0.35-11.21	
Port site infection					
No	98 (49.75)	99 (50.25)	1	1	
Yes	2 (66.67)	1 (33.33)	2.0	0.18-22.64	

Table 3: Distribution of patients based on histopathological diagnosis

Histopathology Diagnosis	Frequency (%)
Acute Calculous cholecystitis	28(14%)
Chronic Calculous Cholecystitis	128(64%)
Acute on Chronic Calculous Cholecystitis	37 (18.5%)
Gallbladder Polyp	7(3.5%)

Table 4: Cross-tabulation of antibiotic prophylaxis to port site infection with histopathology diagnosis

Diagnosis	Antibiotic Count (%) Received (A)	Not Received (B)	Total
Acute calculous Cholecystitis	13(13%)	15(15%)	28(14%)
Chronic Calculous Cholecystitis	63 (63%)	65(65%)	128(64%)
Acute on Chronic Calculous Cholecystitis	21 (21%)	16(16%)	37(18.5%)
Gallbladder Polyp	3 (3%)	4(4%)	7(3.5%)
X^2,p value: 0.99, 0.80			

Discussion

Globally, antibiotic resistance has been on the rise, with an estimated 4.95 million deaths associated with bacterial antibiotic resistance in 2019, including 1.25 million deaths attributable directly to bacterial antibiotic resistance [10]. Antibiotic prophylaxis can also contribute to the development of antibiotic resistance [11]. Even a short course of antibiotics has been implicated in the development of antibiotic resistance in some studies [12]. Antibiotic prophylaxis plays a crucial role in mitigating the risk of surgical site infection [13]. But due to emerging antibiotic resistance, careful optimization of surgical antibiotic prophylaxis is required to effectively prevent surgical site infection and maintain antibiotic stewardship [13]. This injudicious use of prophylactic antibiotics could be a major contributing factor in developing antibiotic resistance, medical expenditures, toxic epidermal necrolysis (TENS), and rising rates of antibiotic-associated (pseudomembranous) colitis due to Clostridium difficile [10-14]. In this light, the use of antibiotics in MIS should be dealt with utmost care, striking a balance between the prevention of port site infection and the use of antimicrobials, leading to antimicrobial resistance and the unavailability of sensitive antimicrobials for future use [8-11].

Hospital-acquired infections result in considerable morbidity and mortality as well as higher healthcare costs[12]. Surgical site infection (SSI) following laparoscopic surgery ranges from 0.3% to 3.4%, while SSI following open cholecystectomy ranges from 1.1% to 8.4% [2-15]. Independent risk factors for SSI include age ≥ 60, males, and ASA ≥3 [1-16]. The role of prophylactic antibiotics in minimally invasive surgery (MIS) like laparoscopic cholecystectomy is considered of little use[8-17-18]. Despite the low incidence of port site infection (PSI) in laparoscopic surgery, if present, it is linked with significant morbidity[11-19]. Moreover, it also hampers the well-being of the patient and raises questions about the capability of the surgeon with regard to the antiseptic and sterilization techniques used [2]. But the role of antibiotics to prevent port site infection has been controversial.

In our study, the prevalence of port site infection was low in both the groups that received and didn't receive the antibiotic. Some studies show no significant reduction in the risk of surgical wound infection after antibiotic prophylaxis for laparoscopic cholecystectomy in low-risk patients[10-13]. Similarly, another study by Sarkut et al. concluded no use of prophylactic antibiotics in elective laparoscopic cholecystectomy as there was no statistical difference between the two groups, a result consistent with our study [11-20]. In contrast, a randomized control study conducted in 2014 showed results suggesting a reduced risk of infection and postoperative hospital stay after antibiotic prophylaxis [21]. Symptomatic individuals with gallstone spillage have high morbidity issues that usually necessitate major surgical operations" [22]. Morbidly obese patients have higher chances of developing postoperative wound infections [1-23]. The use of sterilized instruments and proper surgical technique is more important to reduce the prevalence of surgical site infection [2]. In our study, no malignant lesions were discovered on histopathological examinations, and the majority of the patients with benign lesions had chronic calculous cholecystitis. The correlation between histopathological findings and port site infection was found to be non-significant, consistent with the study done by Shankar LM et al [7].

Conclusion

There is a low prevalence of Port site infection (PSI) after laparoscopic cholecystectomy with or without the use of antibiotics. Antibiotic prophylaxis does not lower the rate of infectious complications, and it has no obvious benefit over the non-administration of prophylactic antibiotics. The adoption of appropriate sterilization methods for cleaning surgical instruments, thorough irrigation of the port site before closure of the skin, use of a leak proof Endo bag for retrieval of specimens during surgery, and strict measures to avoid sharing instruments used in Laparoscopic cholecystectomy with urological or gynecological surgeries could further minimize the incidence of port site infection.

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Conflict of interest

All authors declare that they have no conflicts of

interest.

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