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Risk Factors for Wound Infection after Laparoscopic Cholecystectomy: A Single Centre Experience

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Abstract **Original Research Article**

Introduction: Elective Laparoscopic cholecystectomy is the operation of choice in treating symptomatic gallstone disease. The impact of patient-related risk factors on the incidence of postoperative infection after cholecystectomy is relatively unknown. Cholecystectomy is one of the world's most common abdominal surgical procedures. In most cases, it is performed without significant risk of severe complications, although bile leakage and intraoperative contamination may lead to surgical wound infection. The study aimed to find out the influence of different risk factors on the occurrence of WI after elective laparoscopic cholecystectomies. ***Methods:*** A retrospective observational study was carried out with patients diagnosed with cholelithiasis in regular follow-up at the department of surgery in Khulna Medical College and Hospital, Khulna, Bangladesh, from January 2020 to December 2021. ***Result:*** The risk factors; 34(80.95%) patients were females, and only 8(19.05%) were male. It shows that smoking and diabetes are the most common risk factors. The prophylactic antibiotic therapy used in the treatment was 95% of patients were given Cefazolin, only one patient was given Ceftriaxone + Metronidazole, 10(23.81%) patients were given ABP with no indication, and only one patient was not given any ABP. According to the statistical analysis of risk factors for the wound in faction, males are more likely to be infected than females. ***Conclusion:*** Patients who undergo e LC with certain risk factors do not benefit from using ABP. Antibiotics should be reserved for complex and urgent cases with a high risk of infection. More extensive studies with a control group to evaluate the effectiveness of antibiotic prophylaxis are needed to further support these recommendations.

Keywords: Cholecystectomy, Laparoscopic, Cholelithiasis & Wound Infection.

INTRODUCTION

Cholecystectomy is one of the world's most common abdominal surgical procedures. In most cases, it is performed without significant risk of severe complications, although bile leakage and intraoperative contamination may lead to surgical wound infection (SWI). Still, all risks must be taken into account when considering surgery. A meta-analysis of studies of perioperative antibiotics in laparoscopic cholecystectomy found an incidence of WI after cholecystectomy of 2.4% [1]. In elective cholecystectomy, the incidence of postoperative infection is low, so routine antibiotic prophylaxis (AP) is not recommended [2-4]. After cholecystectomy for acute cholecystitis, the risk is significantly higher [5]. In cholecystectomy has led to divergent routines regarding using AP in surgery for acute cholecystitis only for the lack of internationally accepted guidelines concerning AP. A better understanding of postoperative infection risk factors may help gain consensus on antibiotic guidelines. Risk factors related to the procedure are well known and thoroughly studied [6, 7]. On the other hand, the risk for postoperative wound infection related to comorbidity is not as well understood. Postoperative infection prolongs time in hospital and hurts recovery and healthcare costs. AP has not been shown to reduce the risk of postoperative infection in elective cholecystectomy, and a registry-based study on AP in acute cholecystectomy showed that it did not reduce risk even after adjustment for confounders [1, 5]. Other factors not yet identified may influence the risk for postoperative infection. Furthermore, we are not aware of any effective measures to prevent infection. A recent study showed, for example, that abdominal drainage does not prevent intra-abdominal complications after laparoscopic cholecystectomy for acute cholecystitis [8].The study aimed to find out the influence of different risk factors on the occurrence of WI after elective laparoscopic cholecystectomies.

METHODOLOGY & MATERIALS

A retrospective observational study was carried out with patients diagnosed with cholelithiasis in regular follow-up at the department of surgery in Khulna Medical College and Hospital, Khulna, Bangladesh, from January 2020 to December 2021. The study protocol was approved by the Ethics Committee of Khulna Medical College and Hospital. Clinical and laboratory data were taken from the patient's medical records, anesthesiology documents, and anatomopathological reports. Surgical occurrences were taken from the surgery reports.

Through evaluation of anaesthesia records, risk factors for infection among patients were identified. Surgical and medical records analyzed the length of surgery, length of hospital stay, use of cholangiography, bile duct injury, use of ABP, and gallbladder ruptures. Through follow-up registered in medical records, cases of WI and complications that could require reoperation were analyzed. Risk factors were deemed, as per literature, a BMI 25 kg/m2 or greater, an ASA score of 3 or higher, and surgery length >2 h1. Cases in which anatomopathological analysis indicated acute cholecystitis or gallbladder empyema, cases of incomplete medical records, loss of follow-up, or other procedures performed simultaneously to cholecystectomy unrelated to bile ducts were excluded.

Inclusion criteria:

- Patients aged between 18 and 70 years.
- Diagnosed with cholelithiasis and chronic cholecystitis.
- Patients underwent elective LC.

All data were presented in a suitable table or graph according to their affinity. A description of each table and graph was given to understand them clearly. All statistical analysis was performed using the statistical package for social science (SPSS) program, and Windows. Continuous parameters were expressed as mean ±SD and categorical parameters as frequency and percentage. The significance of the results as determined by a value of $P<0.05$ was considered to be statistically significant.

RESULT

It is a retrospective observational study; 42 patients were enrolled and underwent an elective laparoscopic cholecystectomy operation. Table 1 shows the clinical characteristics of the study population; the median age is 46.2 under the range of (36.2-56.8), the BMI median is 29.14 under the range of (25.71-32.38), and patients needed to stay at the hospital for around 1-10 days and the length of surgery around 85-155 minutes. Table 2 describes the risk factors; 34(80.95%) patients were females, and only 8(19.05%) were male. It shows that smoking and diabetes are the most common risk factors. The prophylactic antibiotic therapy used in the treatment was described in figure-1; 95% of patients were given Cefazolin, and only one patient was given Ceftriaxone + Metronidazole, 10(23.81%) patients were given ABP with no indication, and only one patient was not given any ABP. According to the statistical analysis of risk factors for the wound in faction, males are more likely to be infected than females (Table-4).

Table-1: Clinical characteristics of the study populations

Variables	Median	Min-Max
Age (Years)	46.2	(36.2–56.8)
BMI (kg/m2)	29.14	(25.71–32.38)
Length of hospital stay (Day)	1	(1–10)
Length of surgery (Minutes)	100	(85–115)

Table-2: Descriptive analysis and analyzed risk factors

Variables	Frequency	Percentage
Gender		
Male	8	19.05
Female	34	80.95
Risk factors		
Smoking	6	14.29
Diabetes	3	7.14

Variables	Frequency	Percentage
Jaundice	1	2.38
Previous surgeries	1	2.38
Previous infection	1	2.38
Immunosuppression	1	2.38
Pancreatitis	1	2.38
ASA ≥3	2	4.76
Cholangiography	1	2.38
Gallbladder rupture	2	4.76
Bile duct injury	1	2.38
WI	1	2.38

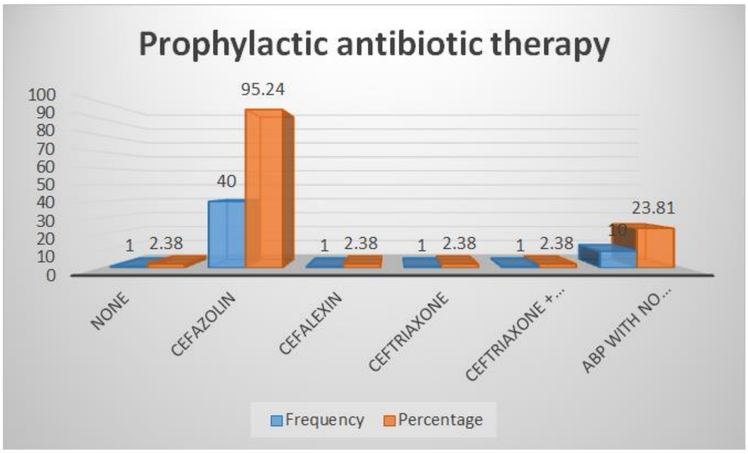

Figure-1: Prophylactic antibiotic therapy used in the analyzed sample

Table-4: Statistical analysis of risk factors for WI

Variables	With WI		Without WI		Total
	N	%	N	%	
Male	2	22.22	7	77.78	9
Female	1	2.94	33	97.06	34
Smoking	0	0.00	6	100.00	6
Diabetes	0	0.00	3	100.00	3
Jaundice	0	0.00	1	100.00	1
Immunosuppression	0	0.00	2	100.00	2
Pancreatitis	0	0.00	1	100.00	1
Previous surgery	0	0.00	2	100.00	2
Previous infection	0	0.00	1	100.00	1
ASA ≥ 3	0	0.00	2	100.00	2
Cholangiography	0	0.00	1	100.00	1
Gallbladder rupture	0	0.00	2	100.00	2
Lesion	1	100.00	0	1.00	1
With ABP	2	5.13	37	94.87	39
Without ABP	0	0.00	1	100.00	1

DISCUSSION

Laparoscopic cholecystectomy is considered a safe procedure compared to clean procedures, particularly in elective cases and patients with no risk factors [9]. Most studies indicate that cholecystectomy can be performed simultaneously with other procedures without increasing the risk of infection [10]. The occurrence of infection is around 0.71–8.7% [11-17]. A growing number of results do not demonstrate a significant correlation between ABP in low-risk procedures and a reduction in infection rates. However, some studies point to a protective effect of antibiotics, leading to uncertainty [18-22]. In this study, the incidence of wound infection was 1(2.83%), which is consistent with other known literature. The risk factors evaluated were chosen from the international guidelines and studies that found a significant correlation to WI [12-15, 18, 23]. In this study, the predominant epidemiological profile was consistent with the literature, with a prevalence given to female patients aged between 30 to 50 years. A most common infection risk, i.e., a high BMI, was prevalent in our study group (median 29.14 kg/m2), and it can be expected as this is also a known risk factor for the development of gallstones [24]. Among the risk factors analyzed, we could not find any significant statistical correlation was found between WI and BMI, surgery length, hospital stay, or age. The lack of correlation may be due to the non-normal representation of these factors, as there is insufficient variation among such factors to show different outcomes where the relevance of these data has already been demonstrated. No correlation was found for smoking, diabetes, pancreatitis, immunosuppression, prior infection or surgery, and jaundice or an ASA score of ≥3. Some of these factors are recognized in the literature as risk factors for WI, but these are not available in sufficient numbers for adequate statistical analysis [18, 23, 25]. The incidence of gallbladder perforation was 2.73%. This value is in line with the lowest rates reported in the literature, which shows a significant variation ranging between 1.5 and 35.1% [11, 12, 14-17]. There is a possibility of underreporting, as it is a common occurrence with this procedure and may not be included in the medical records by the surgeon [26]. According to other studies, there was no statistically significant correlation between bile spillage and WI in cases of cholelithiasis with no acute cholecystitis [11, 14, 15, 26]. This finding is important when considering the recommendation for ABP, where the rupture of the gallbladder is a factor that cannot be predicted before the procedure, which could justify ABP usage in all cholecystectomies. A characteristic of some studies that did demonstrate a statistical correlation between perforation and infection is the inclusion of cases with acute inflammation and complicated cases with conversion for open surgery [27, 28]. These same studies, in turn, showed above-average infection rates. It indicates that the risk factor may not necessarily be the bile itself but its infection so that a more inflamed and, therefore, more fragment-able and rupture-prone gallbladder is just an indicator of an already complicated case [16]. As for the asymptomatic colonization of the gallbladder, there are still conflicting results regarding its role in infectious risks [15, 28]. A worthy point out that there was a case of an injured bile duct that presented a WI, which can be explained by the more aggressive intervention that may have caused the injury; however, a single isolated case cannot define a statistical correlation. There was no significant correlation between WI and the use of ABP, as already demonstrated in the bibliography. The use of ABP has already been evaluated in several meta-analyses, demonstrating no benefit with such practice [29-32]. Even in studies in which gallbladder rupture significantly increased the incidence of WI, prophylaxis had no protective effect [12, 26]. However, the unnecessary use of antibiotics is commonplace. A study showed that 94.5% of professionals used ABP in elective LCs [33]. In our study, about a quarter of the evaluated patients received ABP, despite having no risk factors that justified this approach. Infection by Clostridium difficile can represent up to 10% of surgical infections, and using ABP can increase the risk of this type of infection [9]. As it is an infection, which is more severe and more resistant to antibiotics, the rational use of these drugs should be emphasized. A significant risk factor related to WI was sex. According to the studies in the literature, male patients have a higher probability of having complications in surgery and getting infected [12,16 & 28]. Possible explanations for this correlation involve a more excellent inflammatory pattern of cholecystitis in males, variations in male anatomy that make the surgical procedure difficult, and a predisposition of male patients to seek health services less frequently than females, therefore receiving medical care in a much more advanced clinical stage [16].

Limitations of the study

There is some limitation to this study. The low number of WI cases, a rare phenomenon, makes statistical analysis difficult and hinders the study of discrete variables. Moreover, the more significant number of patients with ABP, compared to the group without ABP, precludes the presence of an adequate control group to assess ABP's effectiveness accurately. Another reason, particularly regarding gallbladder perforation, is that its incidence may be reduced by underreporting, as it depends entirely on the surgeon's inclusion of the event in the surgical report.

CONCLUSION AND RECOMMENDATIONS

The present study shows that comorbidity, in particular Smoking, Diabetes and Jaundice, is important risk factor for SSI and septicaemia following cholecystectomy. Even if the risk factors investigated in the present study did not have as much impact as that seen with other risk factors, such as the presence of acute cholecystitis, conversion to open surgery, perioperative bleeding or bile leakage and patient-related factors should be taken into account when planning the procedure and when deciding on AP.

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