

PREVALENCE OF SURGICAL SITE INFECTION AMONG BILE SPILLAGE AND NON-SPILLAGE PATIENTS UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY: A CROSS-SECTIONAL STUDY

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ABSTRACT

Introduction

Laparoscopic cholecystectomy (LC), a common procedure is not without complications, and bile spillage can cause surgical site infection (SSI). There is no local evidence in our hospital setting.

Objective

The objective of this study was to find the prevalence of SSI among bile spillage and non-spillage patients following laparoscopic cholecystectomy.

Methodology

A hospital-based cross-sectional study was conducted from 25 February 2021 to 25 August 2021 at the Department of Surgery. We enrolled 120 patients through the total enumeration technique who underwent laparoscopic cholecystectomy. We enrolled all the eligible study participants who were more than 18 years; excluding patients with age >75 years, acute calculous cholecystitis, evidence of cholangitis and/or obstructive jaundice, previous biliary tract surgery, or previous Endoscopic retrograde cholangiopancreatography, uncontrolled diabetes mellitus and patients taking immunosuppressive drugs and immunosuppressed conditions like HIV/AIDS. Clinical assessment for SSI of patient was done during the hospital stay and follow up done on 5 th and 7 th post operative day in OPD. Patient were kept in regular follow up till 30 days. The primary outcome was prevalence of SSI in bile spillage and non spillage.

Result

Among 120 patients undergoing laparoscopic cholecystectomy, the majority were female 92(76.7%) and 40-50 years age group was - 65 (54.2%) patients. Bile spillage was found in 27(22.5%) patients. The prevalence of surgical site infection (SSI) was found to be 7.5% which was more in the bile spillage group compared to non spillage (25.9% vs. 2.2%) group. The odds of having SSI among the spillage group was 15.9 times more than the non-spillage group and was statistically significant ($p < 0.05$). The predominant organism seen in pus culture was *Staphylococcus aureus* 6(66.7%) followed by *Escherichia coli* 3(33.3%). The common indications of laparoscopic cholecystectomy were symptomatic cholelithiasis 95(79.1%) followed by chronic calculus cholecystitis 15(12.5%), gall bladder polyp 8(6.7%) and gall stone pancreatitis 2(1.7%).

Conclusion

Almost two out of ten patients with LC had bile spillage and those with bile spillage had increase chances of SSI. A significantly higher number of SSI among the spillage group should be a concern of surgeons. We need to be extra cautious to avoid spillage during LC.

KEYWORDS

Cholecystitis, cholelithiasis, laparoscopic, outcomes, teaching hospital



INTRODUCTION

Surgical site infections (SSIs) are defined as infections occurring up to 30 days after surgery (or up to one year after surgery in patients receiving implants) and affecting either the incision or deep tissue at the operation site. Despite improvements in prevention, SSIs remain a significant clinical problem as they are associated with substantial mortality and morbidity and impose severe demands on healthcare resources. The Centers for Disease Control and Prevention guidelines for the prevention of SSIs emphasize the importance of good patient preparation, aseptic practice, and attention to surgical technique; antimicrobial prophylaxis is also indicated in specific circumstances. Surgical site infection (SSI) originating in surgical wounds or the organs/spaces opened or manipulated during an operative procedure is the most common postoperative complication and a major contributing factor for morbidity and mortality.^{1,2} Laparoscopic cholecystectomy is widely practiced for acute or chronic cholecystitis, symptomatic cholelithiasis, biliary dyskinesia, acalculous cholecystitis, gallstone pancreatitis and gallbladder masses or polyps.³ Port site infection is an infrequent complication that has considerable influence on the overall outcome.⁴ Spillage of bile during laparoscopic cholecystectomy is encountered in our institution but we have no such scientific evidence of the occurrence of surgical site infection in bile spillage and non-spillage groups at our hospital setting. The scientific evidence of surgical site infection would be very much beneficial for clinical decision making. So, we conducted this study to find the prevalence of surgical site infection among bile spillage and non-spillage patients undergoing laparoscopic cholecystectomy.

METHODOLOGY

A hospital-based cross-sectional study was conducted from 25 February 2021 to 25 August 2021 at the Department of Surgery. We enrolled 120 patients through the total enumeration technique who underwent laparoscopic cholecystectomy. Ethical clearance was taken from the institutional review committee (Ref: IRC-PA-099/2077-78) and informed written consent was taken from each study participant. We enrolled all the eligible study participants who were more than 18 years. We excluded patients with age >75 years, acute calculous cholecystitis, evidence of cholangitis and/or obstructive jaundice, previous biliary tract surgery, or previous Endoscopic retrograde cholangiopancreatography, evidence of uncontrolled diabetes mellitus and patients taking immunosuppressive drugs and immunosuppressed conditions like HIV/AIDS as these patients were having high morbidity. Laparoscopic cholecystectomy was done by standard 4 port technique by experienced Laparoscopic surgeons with more than 6 years of experience. Each surgeon had experience of doing more than 300 cases. Injection Ceftriaxone 1 gram was given as a

prophylactic antibiotic to all patients 30 minutes before the surgery. A 10 mm Umbilical port, 12mm epigastric port and two 5mm ports in the right upper quadrant was used. For pneumoperitoneum Carbon Dioxide was used. Patient positioning was done as head elevation 45 degrees and right side elevation. The average intra abdominal pressure was kept 12 mm of Hg. After a critical view of safety was achieved, the cystic duct was clipped with hemolock and cystic artery with ligaclips. Hemostasis was secured properly, post site observation and closed after removal of gallbladder from the epigastric port. Retrieval bag was not used for removal of the gall bladder.

Patient kept in the Post operative ward for 12 hours for observation. Vitals were regularly observed. All patients started sips to liquid diet after 8 hours. And the patients were discharged on the next day. Only analgesics and proton pump inhibitors were given to all patients for 3 to 5 days.

Regular clinical assessment for ports site SSI of the patient was done during hospital stay. The Patient were also followed on 5 th and 7th postoperative day and assessed in OPD for SSI. They were continuously followed up for 30 days on OPD or by telephonic followup for those whose wound gets infected. Pus was collected with the cotton swab for the surgical site infection. The collected pus swab was sent for culture and sensitivity testing. Centers for Disease Control and Prevention (CDC) defined Surgical site infection (SSI) as a wound infection that occurs within 30 days of an operative procedure or within a year if an implant is left in place and the infection is thought to be secondary to surgery. Specifically designed proforma was used to collect the patient data. Each collected data was checked for completeness. Any incomplete data was completed before entering Microsoft excel. The primary outcome of this study was prevalence of SSI in patients with bile spillage.

Collected data were entered in Microsoft Excel version 2016 and analyzed by statistical package for social sciences (SPSS) version 23. Anonymity and confidentiality data was maintained. The codes were used for the verification process. We had calculated frequency and percentage for univariate analysis. The findings were shown in table. The association between two variables was assessed by chi-square test, a bivariate analysis method. The statistical significance was set at a 95% of confidence interval and having a p-value less than 0.05 only.

RESULTS

Among 120 patients undergoing laparoscopic cholecystectomy, the majority were female n=32 (53.3%). The common age group was 40-50 years 65(54.2%) followed by 30-40 Years 21(17.5%). The most common indication for laparoscopic cholecystectomy was symptomatic cholelithiasis (79.1%) followed by Chronic calculus cholecystitis (12.5%), Gall bladder polyp (6.7%) and Gall stone Pancreatitis (1.7%). (table 1).



Table 1: Baseline characteristic of participants (n=120)

Characteristics	n (%)
Sex	
Male	28 (23.3)
Female	92 (76.7)
Age group (In Years)	
<30	6 (5.0)
30-40	21 (17.5)
40-50	65 (54.2)
50-60	19 (15.8)
>60	9 (7.5)
Common indication of laparoscopic cholecystectomy	
Symptomatic cholelithiasis	95 (79.1)
Chronic calculus cholecystitis	15 (12.5)
Gall bladder polyp	8 (6.7)
Gall stone pancreatitis	2 (1.7)

We found 27(22.5%) had bile spillage; and 9(7.5%) out of 27 patients had SSI following bile spillage. SSI was more in bile spillage-7(25.9%) than non-spillage group 2(2.1%). The odds of having SSI among the bile spillage was 15.9 times higher than the non-spillage group and was found to be statistically significant ($P < 0.05$) (Table 2).

Table 2: Bile spillage and surgical site infection of participants (n=120)

		Surgical site infection			OR	p-Value
		Yes n(%)	No n(%)	Total n(%)		
Bile spillage	Yes	7 (25.9)	20 (74.1)	27 (100)	15.9	<0.05*
	No	2 (2.1)	91 (97.9)	93 (100)		
	Total	9 (7.5)	111 (92.5)	120 (100)		

*statistically significant difference

Staphylococcus aureus-6(66.7%) was the predominant organism found in the pus culture from SSI followed by *Escherichia coli*-3(33.3%)(Table 3).

Table 3: Common Organisms isolated from pus from surgical site infection (n=9)

Organism	n(%)
<i>Staphylococcus aureus</i>	6 (66.7)
<i>Escherichia coli</i>	3 (33.3)

DISCUSSION

Gallbladder diseases are frequently encountered. Since the management is only operative intervention, it increases the cost of treatment. Late presentation associated with complications to the hospital might increase the cost of

treatment with hospital stay. Most of the asymptomatic cases are the result of incidental finding while screening for other purposes. The frequent use of ultrasonography for screening purposes increases the number of diagnosed cases of Cholelithiasis. Cholecystectomy is a common surgical procedure at the tertiary level hospital. There are different approaches for Cholecystectomy. They are Open method and laparoscopic method. Both methods are adopted by surgeons. Laparoscopic cholecystectomy is also not devoid of complications. Many complications such as common bile duct injury, bleeding, stone spillage, port site hernia and port site infection are encountered. In this study, among 120 patients undergoing laparoscopic cholecystectomy, the majority were female 53.3% and from the 40-50 years age group 54.2%. The most common indication for laparoscopic cholecystectomy was symptomatic cholelithiasis (79.1%) followed by Chronic calculus cholecystitis (12.5%), Gall bladder polyp (6.7%) and Gall stone Pancreatitis (1.7%). A study from central Nepal reported a similar finding, where symptomatic cholelithiasis accounts for 83%.⁵ Other studies from western world reported about 20% of symptomatic cholelithiasis.^{6,7} It is less than from our part of the world. The high proportion of symptomatic cholelithiasis in our study might be due to delayed health service seeking behavior of Nepalese patients.

We found 22.5% had bile spillage, which is almost similar to a study from central Nepal where it was 20.8%.⁵ But another study reported less proportion (11.6%) of bile spillage.⁸ The high proportion (59%) of bile spillage was reported by another study.⁹ Rice DC et al study reported 16.7% had bile spillage.¹⁰ These data suggested data iatrogenic bile spillage is common. It might have a number of factors responsible for bile spillage. Laparoscopic cholecystectomy done by resident surgeons, emergency operations are done for acute cholecystitis, obesity, instrumental error, surgeon skills are the possible factors for iatrogenic bile spillage. The bile spillage with gallstones is more prone to intra-abdominal abscess than only the bile spillage group.¹⁰

We found 7.5% had surgical site infection but a lower prevalence (4.4%) was reported by a study from central Nepal.⁵ The factors responsible for higher surgical infection needs to be studied. Further, we found surgical site infection was more in the bile spillage group (25.9%) than in the non-spillage group (2.1%). The odds of having SSI among the bile spillage group is 15.9 times higher than the non-spillage group and found to be statistically significant ($P < 0.05$). A study from Parajuli. A et al, central Nepal also found similar results where it was found 12.1% and 2.3% surgical site infection among bile-spillage and non-spillage groups respectively.⁵ Previous studies reported that bile spillage was associated with a higher surgical site infection rate (7.1% vs 2.4%, $p = 0.001$).⁹ Studies suggested that intraperitoneal spillage of gallbladder contents during laparoscopic cholecystectomy is associated with an increased risk of intra-abdominal abscess. We need to irrigate the operative field to evacuate spilled bile and to retrieve all gallstones spilled during the operative procedure.¹⁰ The bile spillage might be a risk factor for surgical site infection as well as an



intra-abdominal abscess. This should be taken extra care of. In contrast to this study, a study demonstrates no clinically relevant difference in surgical site infection rates after intraoperative bile spillage.¹¹

We found *Staphylococcus aureus* 66.7% as the predominant organism in the pus culture from surgical site infection followed by *Escherichia coli*. A similar result was reported by another study where *Staphylococcus aureus* was the predominant isolate followed by *Escherichia coli*.¹²

Other studies reported that intraoperative bile spillage, increasing age, increased duration of surgery, laparoscopic cholecystectomy done by resident surgeons, increased intraoperative blood loss, emergent operations done for acute cholecystitis, etc., were associated with higher rates of SSI.¹³ Further another study suggested that the independent risk factors for surgical site infection included male gender, preoperative chronic anaemia, diabetes, drug abuse, malnutrition/weight loss, obesity, smoking-related diseases, previous *Staphylococcus aureus* infection, laparoscopic approach with acute cholecystitis/obstruction.¹⁴

CONCLUSION

Almost two out of ten patients with LC had bile spillage and those with bile spillage had increase chances of SSI without increase in re-admission & re-operation. A significantly higher number of SSI among the spillage group should be a concern of surgeons. We need to be extra cautious to avoid spillage during LC.

RECOMMENDATIONS

We need to be extra careful with the bile-spillage group for

possible surgical site infection. The iatrogenic nature of bile spillage needs to be minimised because of its complications. We recommend further studies considering the impact of all the risk factors.

LIMITATION OF THE STUDY

There are multiple factors for iatrogenic bile spillage. These factors are inexperienced surgeons, faulty technique, acutely inflamed gallbladder, chronic cholecystitis and empyema of gall bladder. Further, the surgical site infection might have a number of risk factors. We were limited not to find the various risk factors that might cause bile-spillage among patients attending for laparoscopic cholecystectomy.

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CONFLICT OF INTEREST

We have no conflict of interest to declare for this research work.

FINANCIAL DISCLOSURE

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