ISSN: 2091-2749 (Print)
2091-2757 (Online)

Submitted on: 17 Nov 2025
Accepted on: 22 Dec 2025

https://doi.org/10.3126/jpahs.v12i2.88956

Prevalence of port site infection after laparoscopic cholecystectomy in a tertiary care center: a retrospective descriptive study

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Abstract

Introduction: Laparoscopic cholecystectomy is the gold standard surgical procedure for gallstone diseases. Despite many benefits, laparoscopic cholecystectomy has certain complications including port site infections. This study aims to determine the prevalence of port site infections in patients undergoing laparoscopic cholecystectomy for gallstone diseases and to find the difference in prevalence of port site infection due to intraoperative spillage or use of endobag.

Method: This study was a retrospective, descriptive cross-sectional study conducted in Unit II of the Department of Surgery, Patan Academy of Health Sciences from June 2022 to May 2025. The study was conducted after the approval of the Institutional Review Committee (Ref. drs2511112150). We retrospectively collected the data of the patients who satisfied the inclusion and exclusion criteria.

Result: This study enrolled 107 patients who had undergone laparoscopic cholecystectomy. The mean age was 44.85±11.89 years. Our study noted the spillage of bile, pus or stone in 30(28.03%) patients but the use of endobag in only 18(16.82%) patients. Port site infection was recorded in 28(26.16%) patients, where all infected ports were umbilical and superficial. Port site infection was noted in three (16.66%) patients with use of endobag and 25(28.09%) patients in whom the endobag was not used. Among the patients with spillage, port site infection was noted in nine (30.00%) patients and among patients without spillage, it was noted in 19(24.68%) patients.

Conclusion: Port site infection was high (26.16%) in this study. Institutional-level clinical audits and quality improvement projects are recommended.

Keywords: Cholecystectomy; Endobag; Laparoscopic; Port-site infection; Spillage

How to Cite: Maharjan SB, Guragain N, Yogi B, Sapkota HP. Prevalence of port site infection after laparoscopic cholecystectomy in a tertiary care center: a retrospective descriptive study. J Patan Acad Health Sci. 2025 Dec;12(2):22-26.

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Introduction

Gallstone diseases are considered the most common biliary pathology. Cholecystectomy is the most common definitive surgical procedure for gallstone diseases. Laparoscopic cholecystectomy is a minimally invasive surgery and is considered the gold standard surgical procedure.[1] Laparoscopic cholecystectomy was first introduced by Philip Mouret in 1987 in France.[2] It has many benefits over open procedure, such as less pain, early return to work, fewer scars, lower infection rates, and shorter hospital stay.[3,4] Even with these benefits, laparoscopic cholecystectomy procedures may have complications like port site infections, hematoma formation, bleeding, port site hernia, and hypertrophic scar formation.[5] The port site infection is divided into superficial, deep, and organ space.[6] This study focuses on port site infections after laparoscopic cholecystectomy.

Port site infections add burden to the patient, surgeon, and the hospital staff. The patients become anxious, require frequent visits to the hospital, and add an economic burden. There are limited studies or audits done in our institution regarding the port-site infections and the projects done to address the possible causes. This study aims to know the prevalence of port site infections in our institution, to find the possible cause, and provide baseline data for further detailed studies and quality improvement projects in this topic.

Method

It was a hospital-based retrospective descriptive cross-sectional study, conducted from June 2022 to May 2025, at Unit II of the Department of Surgery, Patan Academy of Health Sciences (PAHS). The study was conducted after approval from the Institutional Review Committee (IRC) of PAHS (Ref. drs2511112150). The sample size of 107 was calculated based on the prevalence of port site infection of 7.5% after laparoscopic cholecystectomy in a study based on a teaching hospital in Nepal.[7]

All the cases undergoing laparoscopic cholecystectomy in Patan Academy of Health Sciences under Unit II of the Department of Surgery within the past three-year period (June 2022 to May 2025) were included in the study. The follow-up notes for 1 month were considered to look for the complications of the surgery. The patients with loss to follow-up or who lost their medical documents were excluded from the study. Following the inclusion and exclusion criteria, the list was filtered for duplication and missing of data. The patients with missing data were excluded from the study. The primary objective was to estimate the prevalence of port-site infection with a predefined margin of error (5%) and confidence interval (95%). Using an expected prevalence from prior literature, we collected a list of 107 patients by random sampling rather than analyzing the whole dataset. Each case was assigned a random number generated in Microsoft Excel 2013 using the =RAND() function. The cases were sorted by their random numbers and the top 107 were considered for this study. The records of these patients were obtained from the operation theatre record book, and the record files were taken from the medical records section. The collected data were entered in Google Forms and stored in Microsoft Excel 2013. The data was analyzed using the Statistical Package for Social Sciences (SPSS).

All the laparoscopic cholecystectomies were performed under general anesthesia after complete pre-operative workup and pre-operative clearance from an anesthesiologist. All surgeries were performed with four standard ports. Pneumoperitoneum was created using the open Hassen technique. Reusable metallic ports were used during laparoscopic cholecystectomy after immersing in 2% glutaraldehyde solution for 20 minutes after each use. All cases received prophylactic antibiotic Inj. Ceftriaxone 1 gm intravenously. The gall-bladder specimen was retrieved from the umbilical ports without using an endo bag. Endobags were used if stones, bile or pus were spilled in the abdomen. In cases where there was spillage of bile, stone or pus, a thorough peritoneal lavage was performed and the stones were collected in an endobag made from a sterile latex glove or condom, or without using an endobag based on the surgeon's preference. The fascia of the umbilical port was closed with polyglactin 2/0 suture, but the fascia of the epigastric port was not closed. After the completion of surgery, cleaning and dressing of the incision site were done and the skin incisions were closed with staplers.

Result

This study enrolled 107 patients undergoing laparoscopic cholecystectomy within the three-year study period. The mean age of the study population was 44.85±11.89 years, ranging from 22 year to 74 years. This study sample had a female preponderance of 80(74.76%), with the female to male ratio of 3:1. In the sample population, 11(10.28%) patients were hypertensive, six (5.60%) patients were both hypertensive and diabetic, and three (2.80%) patients were diabetic.

The port site infection was noted in 28 of 107 (26.16%) patients, among which nine (32.14%) were male, and 19(67.86%) were female patients. All the infected port sites were umbilical ports, all had superficial surgical site infection, and were treated by simple dressing without requiring major interventions. The spillage of bile, stone or pus during the intraoperative period was

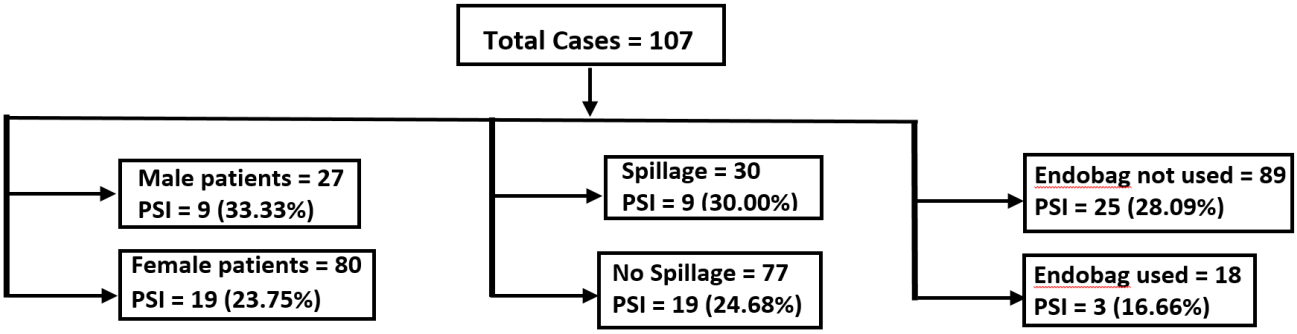

Figure 1. Flow diagram showing rates of port-site infection in different sub-groups

found to occur in 30(28.03%) patients, among whom nine (30%) had developed port site infection (PSI). Among the remaining 77 patients without spillage, 19(24.68%) developed PSI.

The endobag was used only in 18(16.82%) patients. Among the patients in whom endobags were used, three (16.66%) patients developed PSI, and among the patients without the use of endobag, 25(28.09%) patients developed PSI.

Table 1. Demographic characteristics of patients enrolled in the study (N=107)

Demographic Charactristics		n(%)
Gender	Male	27(25.24)
	Female	80(74.76)
Comorbidities	Diabetes	3(2.80)
	Hypertension	11(10.28)
	Diabetes + Hypertension	6(5.61)

Discussion

Laparoscopic cholecystectomy is the gold standard procedure for the management of gallstone diseases and related biliary pathologies, including biliary pancreatitis, gall bladder polyps, acute calculus cholecystitis, and empyema gall bladder. Despite its minimally invasive nature and well documented advantages, port-site infection (PSI) remains a notable postoperative complication.[8] This study aimed to determine the prevalence of port-site infection in patients who underwent laparoscopic cholecystectomy, which was found to be 26.16%.

The mean age of participants in this study was 44.85±11.89 years with female preponderance. This demographic profile is consistent with findings from similar studies conducted in India and Pakistan.[9-12] In this study, port site infections was observed in 26.16% patients, which is considerably higher than rates in the neighboring countries, where the prevalence ranges from 2.4% to 6.7%.[10,11,13] Studies conducted within Nepal have also reported lower infection rates; a study from Pokhara documented PSI in 3.3% of patients, while another teaching hospital based study reported a prevalence of 7.5%.[14,7] The substantially higher rate observed in our study highlights a potential gap in perioperative infection prevention practices and warrants further exploration.

All port-site infections in our study involved the umbilical port and were classified as superficial surgical site infections. This finding is in concordance with previous studies reporting a predominance of superficial PSI compared to deep or organ space infections.[7,13] The umbilical port is often more susceptible to infection due to its role as specimen extraction site, its relatively poor vascularity, and its colonization with endogenous skin flora.[15] Studies in which the gallbladder was retrieved through the epigastric port have reported a higher incidence of infection at that site.[2,15,16] Multiple studies have also demonstrated that the umbilical extraction port is the most commonly infected trocar site,[17-19] although one study reported no direct association between umbilical flora and PSI.[18] A latest meta-analysis has reported that the retrieval through epigastric port has clinically proven advantage of low infection rate and low incisional hernia rate.[8]

Intraoperative spillage of bile, stones or pus was observed in 28.03% and was more frequently observed with PSI compared to cases without spillage, supporting the evidence that contamination during extraction is an important risk factor for infection.[20,21] The routine use of endobags in cases with spillage has been shown to significantly reduce the PSI rates. [20,22,23] In this study, although infection was not eliminated with endobag use, the lower rate supports its protective role and reinforces the importance of selective or routine use, particularly in contaminated cases.

The higher prevalence of PSI observed in this study may be attributed to multiple factors, including variations in patient population characteristics, operating theatre environment, the use of reusable metallic trocars and sterilization techniques.[24] Other factors reported to influence PSI include prolonged preoperative hospital stay, longer duration of surgery, emergency procedures, acute cholecystitis, extended postoperative hospitalization, malnutrition and overall immune status.[22] Additionally, patient related comorbidities such as diabetes mellitus, hypertension, chronic obstructed pulmonary disease

and liver cirrhosis may also predispose individuals to postoperative infections.[24]

All patients with PSI in this study were successfully managed conservatively with removal of skin staples, regular wound care and systemic antibiotics. No patients required major surgical intervention, re-operation or hospital readmission, indicating that most PSIs were mild and manageable when detected early.

Our study was a retrospective, cross-sectional study which may include information bias including diagnosis misclassification, exposure misclassification, differential documentation and missing data bias and various limitations of the study design. The results cannot be generalized beyond the sample population. This study method is not appropriate to determine association and causality of high prevalence of port site infection and warrants prospective cohort or case-control studies to explore the cause in our institution. Clinical audits and quality improvement projects are also recommended to address the factors causing port site infections.

Conclusion

The prevalence of port site infection rate after laparoscopic cholecystectomy in this study was higher than other studies. Port site infection rate was noted more in male, in patients with spillage and in cases where endobag was not used. The notably higher rate in our study points to possible shortcomings in perioperative infection control measures and calls for further investigation.

Acknowledgement

None

Conflict of Interest

None

Funding

None

Author Contribution

Concept, design, planning: SBM, NG; Literature review: SBM, NG, BY, HPS; Data collection: SBM, NG, BY, HPS; Data analysis: NG, BY, HPS; Draft manuscript: SBM, NG, BY, HPS; Revision of draft: SBM, NG, BY, HPS Final manuscript: SBM, NG, BY, HPS; Accountability of the work: SBM, NG, BY, HPS; Guarantor: SBM

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