Original Article

A Study on Prevalence and Correlates of Port Site Infections in Laparoscopic Cholecystectomy at a Tertiary Care Centre in Bihar

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Abstract

Background: The primary objective of this study was to evaluate the prevalence and correlates of port site infections (PSI) in patients undergoing laparoscopic cholecystectomy at a tertiary care centre in Bihar. The study specifically aimed to identify risk factors such as age, port creation techniques, and the impact of biliary spillage on infection rates. **Material and Methods:** This observational prospective study was conducted between June 2025 and December 2025 at ESIC Medical College and Hospital, Patna. A sample size of 421 patients aged 18 years and older was included. Patients with immunocompromised status or those whose surgeries were converted to open procedures were excluded. Data were collected through history taking, clinical examination, and microbiological analysis, including culture and sensitivity and CBNAAT for Mycobacterium tuberculosis. **Results:** Out of 421 patients, 23 (5.46%) developed port site infections. PSI was significantly more common in females (79%) and in the 40–50 years age group. Key findings included: Risk Factors: Infection prevalence was significantly higher in patients who underwent open port creation (60%) and those who experienced bile spillage (73.9%, $p < 0.001$). Port Site: The umbilical port was the most common site of infection (47.8%, $p < 0.005$). Microbiology: Gram-negative organisms were the most common pathogens (33.3%). Chronic discharging sinuses were specifically associated with Mycobacterium tuberculosis and atypical mycobacteria. Outcome: Infected patients had significantly longer hospital stays, often exceeding 72 hours. **Conclusion:** Port site infection remains a noteworthy complication of laparoscopic cholecystectomy, with a prevalence of 5.4% in this study. Biliary spillage, open port creation, and umbilical port usage are significant risk factors for infection. While superficial infections by Gram-negative and Gram-positive bacteria are common, clinicians must maintain a high index of suspicion for atypical mycobacteria in cases of chronic, non-healing deep surgical site infections.

Keywords: Port site Infection, Laparoscopic Cholecystectomy, Umbilical port, Atypical Mycobacteria, Non-Tuberculous Mycobacteria, Surgical Site Infection (SSI).

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Introduction

Laparoscopic surgery has become the standard due to its time-tested advantages over conventional open surgery. Better cosmesis, less pain, faster convalescence, and early return to work are among the rewards that appeal to the masses, leading to their overwhelming adoption over the past few decades. Port site infection (PSI) is not uncommon in laparoscopic cholecystectomy. It has been reported in 1.4–6.7% of cases.[1] It may be attributed to the use of reusable trocars, practice of improper sterilization techniques, poor umbilical hygiene, associated comorbidities and spillage of bile and stones while retrieving the gallbladder.[2] Laparoscopic surgery, also termed as minimally invasive surgery, was first presented in the 20th century; shortly after that, it became the surgical treatment of choice for many operations. Now, the laparoscopic cholecystectomy is the gold standard treatment for symptomatic gallstone disease and other conditions like cholecystitis, gall bladder polyps and gall bladder masses or suspected cancer.[3]

The incidence of SSI after elective laparoscopic cholecystectomy is lower than with open surgery. This is due to the minimally invasive nature of the procedure, which uses several small incisions rather than a single large one. It also results in less blood loss, reduced tissue exposure, and shorter hospital stays.[4,5]

Laparoscopic techniques have been deployed in a wide array of surgeries, ranging from relatively simple general surgical procedures such as cholecystectomies to more complex ones like GI surgeries (Colectomy, splenectomy) and Urological surgeries (Adrenalectomy), with encouraging outcomes. With the expanding application of laparoscopic techniques across surgical specialties, understanding and preventing port-site infections is of increasing clinical importance.[6] Generally, most of the surgical procedures may end with complications; One of these complications is surgical site infection (SSI). Infection can be intrinsic and/or extrinsic, as the human body supports the

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survival of a wide variety of microorganisms that can cause infection as a result of surgical intervention.[7]

Materials and Methods

Patients who underwent laparoscopic cholecystectomy and presented with PSI in the General Surgery OPD (Outpatient Department) and the emergency department of ESIC Medical College and Hospital were included in the "Observational Prospective Study" between June 2025 and December 2025. Tissue samples were taken for the detection of Mycobacterium tuberculosis by CBNAAT. The incidence of port-site infection after laparoscopic cholecystectomy was approximately 6% in hospital records from the previous 2 years, consistent with previous studies. Hence, P (Prevalence) is taken as 6% from Singla et al, d (Design effect) is taken as 5%, and with a 10% dropout, the sample size is 421.[8] After thorough history taking and clinical examination, samples were sent for culture and sensitivity in all patients who developed port site infection after laparoscopic cholecystectomy.

Inclusion Criteria:

Patients aged 18 years and older presenting to the surgery outpatient or emergency departments with port site infection following laparoscopic cholecystectomy were included.

Exclusion Criteria:

1. Patients whose laparoscopic surgery was converted to open surgery.
2. Patients with immunocompromised status (HIV, hepatitis).

Results

In the present study, 421 patients who underwent laparoscopic cholecystectomy, 23 patients reported port site infection after surgery, whereas the remaining patients had an uneventful post-operative period. Of the 23 infected, 5 were male, and 19 were female. Port site infections accounted for 5.46% of total cases. Infected cases were treated with antibiotics or local exploration. Patients with port site infection had longer hospital Stays, whereas those with no complications were discharged on the 2nd to 3rd post-operative day. No mortalities were noted in our study. This study shows that the majority of subjects infected were in the 40-50-year age group. Among infected patients, only a minority were under 40 years of age. [Table 1]

We also see that the prevalence of port-site infection is significantly higher in patients who underwent open port creation. Around 60% of the patients who had PSI belonged to this group. [Table 1]

Further, it was found that 17 out of 23 cases [73%] with bile spillage into the ports during surgery faced PSI. Only 1% of cases with no spillage had infection. [Table 2] Here, the chi-square value is 18.9, and the corresponding p-value is less than 0.001. Hence, the higher infection prevalence in cases with biliary spillage is statistically significant.

It was also concluded that nearly 47.8% of port-site infections in our study occurred at the umbilical port site. [Table 3] Here, the chi-square value is 8.8 with a corresponding p-value less than 0.005. So, the association between the umbilical port site and incidence of infection is significant.

In our study, Gram-negative organisms were the most common pathogens in PSI. Cultures showed that about 33% of cases were infected with Gram-negative bacteria. [Table 4]

Table 1: Age distribution of patients and port creation techniques.

	Infected	Non-infected	Total
Male	05	104	109
Female	18	294	312
Age group			
18-30	3	52	55
30-40	8	139	147
40-50	9	155	164
>50	3	52	55
Port creation technique			
Open	14	239	253
Close	9	159	168

Table 2: Distribution of infected cases on the basis of bile spillage.

	N=23	Percentage	p-value
Infection with spillage	17/23	73.9%	Chi square=18.9
Infection without spillage	06/23	26.1%	P=0.0001

Table 3: Distribution on the basis of port involvement.

	Site	N=23	Percentage	P value
PORT INVOLVEMENT	Umbilical port infection	11/23	47.8%	Chi square=8.8
	Epigastric port infection	09/23	39.1%	p = 0.0005
	More than 1 ports	03/23	13.1%	

Table 4: Distribution on the basis of depth of infection, culture report, histopathological examination report and hospital stay.

		N=23	Percentage	P value
Extent of infection	Deep tissue infection	08/23	33.3%	p = 0.0079
	Superficial skin infection	15/23	66.7%	
Culture report	Gram-negative	08/23	33.3%	p = 0.0235
	Gram-positive	03/23	11.1%	
	Mixed infection	03/23	11.1%	
	Sterile	09/23	44.5%	
HPE REPORT	Chronic inflammation	20/23	88.9%	p = 0.0363
	No inflammation	03/23	11.1%	
Hospital stay	Up to 72 Hours	10/23	43.5%	p = 0.0451
	More Than 72 Hours	13/23	56.5%	

Discussion

Laparoscopic cholecystectomy is a boon not only for the patient but also for the health care system, as it yields favourable outcomes. Although it has become the gold standard treatment for symptomatic gallstone disease, it is not entirely free of complications.[9] The present study aims to specifically evaluate the incidence of port site infections in cases of laparoscopic cholecystectomy. In our study, the majority of patients belonged to the 4th decade of life. Similar results were found in studies, consistent with previous reports, as seen in the study by Singla et al.[8] In their study, the prevalence of port site infection peaked at approximately 70% in the 21-50-year age group.

We can also see that the prevalence of port-site infection is significantly higher in patients who underwent open port creation and an umbilical port for gallbladder extraction, especially after bile and stone spillage. Around 60% of the patients who had PSI belonged to this group. Open port creation, umbilical port usage, and bile spillage were significantly associated with infection, findings that mirror those of earlier studies.[10,11]

In our study, the umbilical port was most commonly involved in PSI (47.8%), followed by the epigastric port. This matches other studies, which found that the umbilical port was usually the most affected. This may be due to anatomical features and higher bacterial colonization at the umbilical port.[12,13]

In our study, the majority of patients had Gram-negative infections (33%), about 11% had Gram-positive infections, and 11% had mixed infections. Similar results were obtained from studies by Colizza et al. and Shukla et al, which found that Gram-negative organisms were the predominant pathogens.[13,14] Notably, cases of chronic discharging sinuses were associated with Atypical Mycobacteria and Mycobacterium tuberculosis, underscoring the role of inadequate sterilization of reusable laparoscopic instruments.[15] Also, a study by Shukla et al showed an association between NTM and non-healing chronic infections or wound dehiscence.[14]

Recent evidence suggests that a breach in the sterilization protocol is the most common cause of PSIs due to non-tuberculous mycobacteria (NTM). NTMs are widespread in nature, including in soil and running water, and can easily contaminate hospital instruments. Infections with NTMs have been reported primarily after laparoscopic surgeries. This may be explained by two major factors. Firstly, laparoscopic instruments have an insulating layer that limits the use of autoclaving for sterilization, resulting in incomplete elimination of NTMs and endospores. Secondly, laparoscopic instruments have multiple joints and moving parts where biological soil, charred tissue, and grime can accumulate.

In our study cases presenting as recurrent discharging single or multiple sinuses; three of these were infected with atypical mycobacterium species, three were infected with typical mycobacterium tuberculosis, one patient had retained stone in deep layers where infection was mixed, other patient had retained foreign body (small fragment of plastic sheath of a laparoscopic instrument) inside deep layers of falciform ligament where no growth of bacteria was obtained and only chronic granulomatous reaction with chronic inflammatory cells was found and a patient had abscesses deep in the abdominal wall between epigastric and lateral port which was sterile.

Conclusion

Port site infection is not an uncommon entity in laparoscopic cholecystectomy. In our study, the prevalence of PSI was about 5.4%, with 79% of cases among females, and the majority of cases belonged to the 40-50 years age group. In our study, we also observed that 73% of patients with biliary spillage had PSI; the higher infection rate in these cases was statistically significant. Nearly 44.4% of port site infections in our study occurred at the epigastric port site, a finding that was statistically significant. 66.7% of our cases showed superficial skin infection, and gram-negative bacteria were found in most cases.

They were managed with either antibiotics, dressing or surgical exploration. Special consideration should be given to chronic deep surgical site infections, as Mycobacterium tuberculosis and atypical mycobacteria may be the cause.

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Conflicts of interest

There are no conflicts of interest.

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