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Clinical Profile and Etiology of Complications Following Biliary Tract Surgery

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Abstract | **Original Research Article**

Background: Gallstone disease is a common surgical condition worldwide, with laparoscopic cholecystectomy being the preferred treatment due to its advantages in recovery and reduced postoperative morbidity. The purpose of the study is to evaluate the timing of presentation and severity of complications following biliary tract surgery. ***Methods:*** This prospective study at the Department of Surgery, Dhaka Medical College Hospital (DMCH), and Bangabandhu Sheikh Mujib Medical University (BSMMU), Bangladesh, from January 2007 to February 2008 included 50 patients with postoperative biliary complications. Patients were evaluated with history, examination, and investigations (ultrasonography, liver function tests, ERCP, MRCP), managed conservatively or surgically as appropriate, and followed up to assess outcomes. ***Results:*** Among 50 patients with biliary tract surgery complications, mean age was 39.1 ± 9.1 years, mostly 31–40 years (40%), and 86% were male. Bile duct injury was most common (30%), followed by minor bile leak (20%) and post-cholecystectomy syndrome (12%). Most injuries occurred after laparoscopic cholecystectomy (80%), presented within the first month (70%), and were Bismuth Grade 3 (53.3%). ***Conclusion:*** Bile duct injury is the most common complication of biliary tract surgery, predominantly affecting middle-aged males after laparoscopic procedures, highlighting the need for early detection and vigilant postoperative management.

Keywords: Clinical Profile, Biliary Complications, Postoperative Outcomes.

INTRODUCTION

Gallstone disease represents a widespread clinical condition and has resulted in cholecystectomy becoming one of the most commonly performed surgical procedures worldwide. It continues to account for a substantial proportion of abdominal morbidity and mortality on a global scale [1,2]. In many hospitals across developing countries, cholelithiasis remains a frequent surgical diagnosis, with an increasing number of patients undergoing laparoscopic cholecystectomy (LC) each year due to symptomatic disease [3]. At present, laparoscopic cholecystectomy is regarded as the preferred treatment modality, as it is associated with less postoperative pain, shorter durations of hospital stay, and more rapid postoperative recovery when compared with open surgical approaches [4,5].

Iatrogenic bile duct injury is one of the most serious complications related to laparoscopic cholecystectomy and may be potentially life threatening. Such biliary tract injuries pose considerable diagnostic and therapeutic challenges for surgeons. Leakage of bile in the early phase commonly results in biliary peritonitis and sepsis [6-8]. Over time, these injuries may lead to severe sequelae that are associated with high levels of morbidity and mortality [6,9]. Notably, even after more than two decades of widespread clinical use, laparoscopic cholecystectomy continues to demonstrate a 2- to 2.5-fold higher risk of bile duct injury compared with open cholecystectomy [6,7,10-13].

In resource-limited settings, the true incidence of post-cholecystectomy biliary complications remains difficult to determine, and access to advanced diagnostic and therapeutic modalities may be restricted, limiting optimal management. Furthermore, reliable predictors for the development of these injuries are poorly defined, and the influence of key preoperative and perioperative factors remains a matter of ongoing debate [14,15]. Although gallstone disease is highly prevalent and associated with significant complications, data describing regional variations in clinical presentation, diagnostic approaches, and treatment outcomes in India

remain limited. Similarly, there is a notable lack of published data on bile duct injuries from developing countries [16]. The purpose of the study is to evaluate the timing of presentation and severity of complications following biliary tract surgery.

Objective

- To evaluate the timing of presentation and severity of complications following biliary tract surgery.

METHODOLOGY & MATERIALS

This prospective study was conducted at the Department of Surgery, Dhaka Medical College Hospital (DMCH), and Bangabandhu Sheikh Mujib Medical University (BSMMU), Bangladesh, between January 2007 and February 2008. A total of 50 patients with complications following biliary tract surgery were included in the study, who were selected based on predefined inclusion and exclusion criteria for the evaluation of the clinical profile, etiology, and management of postoperative biliary complications.

Inclusion criteria:

- All patients presenting with complications of biliary surgery, irrespective of the surgical method used.

Exclusion criteria:

- Patients who underwent combined biliary, pancreatic, and stomach surgery.

After enrollment, detailed histories including age, sex, occupation, presenting complaints, previous surgeries, and relevant family history were recorded, followed by thorough physical examinations assessing jaundice, fever, peritonitis, biliary leakage, fistula, subphrenic abscess, and other clinical findings. Preoperative evaluation included ultrasonography of the whole abdomen, liver function tests, ERCP, and MRCP, with all information documented in a structured proforma. Management was tailored according to the severity of complications: minor complications were treated conservatively with intravenous fluids, electrolytes, nasogastric decompression, analgesics, antibiotics, sedation, and blood transfusion when indicated, while major complications such as biliary fistula, biliary peritonitis, or strictures were addressed surgically with Roux-en-Y hepaticojejunostomy, Roux-en-Y choledochojejunostomy, liver resection with ductal anastomosis, or controlled biliary fistula. Retained stones were managed by endoscopic papillotomy and extraction, and treatment outcomes were assessed through routine follow-up.

RESULTS

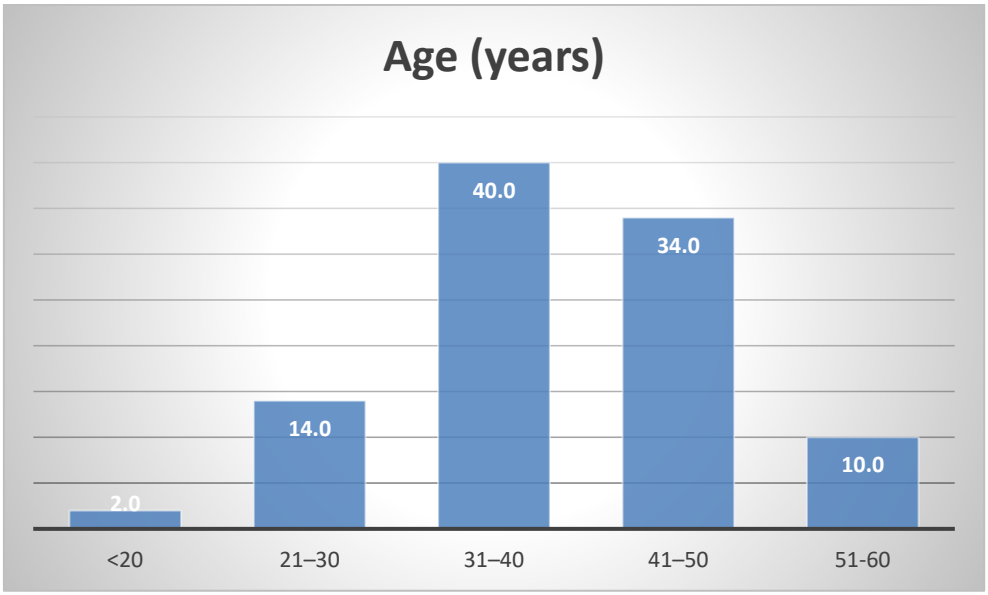

Figure 1: Age Distribution of the Study Patients (n=50)

The majority of patients were in the 31–40-year age group (20 patients, 40%), followed by 41–50 years (17 patients, 34%) and 21–30 years (7 patients, 14%). Patients younger than 20 years (1 patient, 2%) and older than 50 years (5 patients, 10%) were less commonly affected. The mean age of the study population was 39.1 ± 9.1 years.

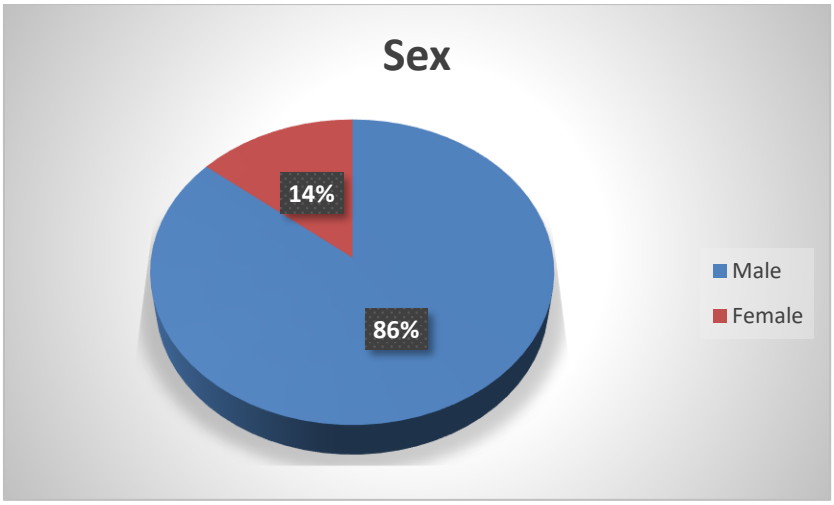

Figure 2: Sex Distribution of the Study Patients (n=50)

Of the 50 patients, 43 were male (86%) and 7 were female (14%), giving a male-to-female ratio of approximately 6.1:1.

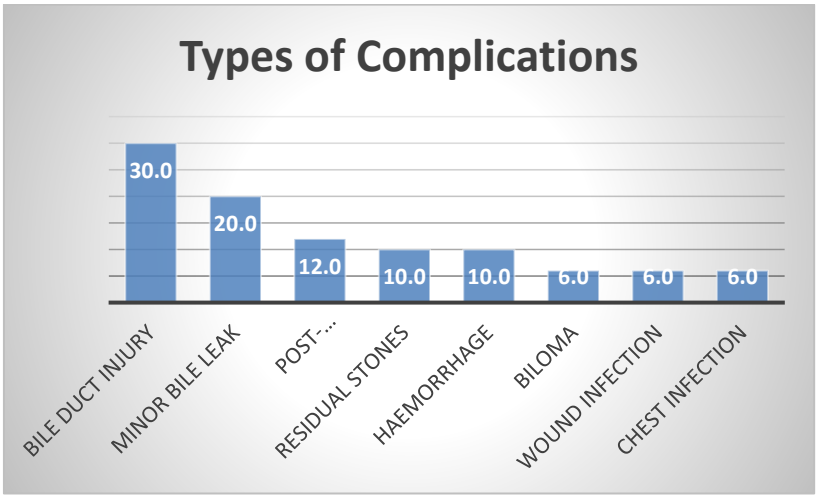

Figure 3: Types of Complications Observed in the Study Patients (n=50)

Among the 50 patients, bile duct injury was the most common complication (15 patients, 30%), including per-operative diagnosis in 3 patients (6%), biliary fistula in 5 patients (10%), biliary peritonitis in 3 patients (6%), and biliary stricture in 4 patients (8%). Other complications included minor bile leak (10 patients, 20%), post-cholecystectomy syndrome (6 patients, 12%), residual stones (5 patients, 10%), hemorrhage (5 patients, 10%), biloma (3 patients, 6%), wound infection (3 patients, 6%), and chest infection (3 patients, 6%).

Table 1: Cause of Biliary Injury in the Study Patients (n=15)

Cause of Biliary Injury	Number of Patients (n)	Percentage (%)
Laparoscopic cholecystectomy	12	80.0
Open cholecystectomy	3	20.0

Among the 15 patients with bile duct injury, 12 patients (80%) sustained injury following laparoscopic cholecystectomy, while 3 patients (20%) sustained injury following open cholecystectomy.

Table 2: Time of Presentation of Complications Following Biliary Tract Surgery (n=50)

Time of Presentation	Number of Patients (n)	Percentage (%)
1st month (peroperative and early post-operative)	35	70.0
2nd to 6th months	11	22.0
7th to 12th months	4	8.0

Of the 50 patients, 35 patients (70%) presented in the first month (per-operative and early post-operative period), 11 patients (22%) presented between the 2nd and 6th months, and 4 patients (8%) presented between the 7th and 12th months.

Table 3: Bismuth Grade of Bile Duct Injury in the Study Patients (n=15)

Bismuth Grade	Number of Patients (n)	Percentage (%)
Grade 1	2	13.3
Grade 2	4	26.7
Grade 3	8	53.3
Grade 4	1	6.7

Among the 15 patients with bile duct injury, 2 patients (13.3%) had Grade 1 injury, 4 patients (26.7%) had Grade 2 injury, 8 patients (53.3%) had Grade 3 injury, and 1 patient (6.7%) had Grade 4 injury.

DISCUSSION

Biliary tract surgery is a common intervention for gallstone disease and other hepatobiliary disorders, but it carries a risk of significant postoperative complications. Among these, bile duct injury serves as a key indicator of surgical risk and reflects the severity of postoperative morbidity. The findings of this study demonstrate that most complications occur early after surgery, predominantly in middle-aged males, and that laparoscopic procedures are associated with a higher proportion of injuries. These results highlight the clinical importance of careful surgical technique, early recognition, and prompt management of complications to minimize morbidity and optimize patient outcomes.

In the present study, the mean age of patients with complications following biliary tract surgery was 39.1 ± 9.1 years, with the highest frequency observed in the 31–40-year age group (20 patients, 40%), followed by 41–50 years (17 patients, 34%) and 21–30 years (7 patients, 14%). Only a small proportion of patients were younger than 20 years (2%) or older than 50 years (10%). These findings are consistent with previous reports on bile duct injury patients. Haque *et al.,*[17] reported that the largest proportion of patients fell in the 30–39-year age group (35%), followed by 40–49 years (25%) and 20–29 years (15%), while Karn *et al.,*[18] observed the highest frequency of injuries in the 30–40-year age bracket, followed by 40–50 and 20–30 years. Collectively, these data indicate that complications following biliary tract surgery predominantly occur in middle-aged adults, reflecting the age distribution of patients undergoing cholecystectomy and related procedures.

In the present study, the majority of patients with complications following biliary tract surgery were male (43 patients, 86%), while females accounted for 7 patients (14%), resulting in a male-to-female ratio of approximately 6.1:1. This predominance of male patients is consistent with published evidence indicating that male sex is a significant risk factor for bile duct injury during cholecystectomy. Burns *et al.,*[19], in a recent meta-analysis of risk factors for bile duct injury, identified male sex as statistically associated with an increased likelihood of injury, supporting the observation that men may be more susceptible to complications following biliary tract surgery.

In the present study of 50 patients undergoing biliary tract surgery, bile duct injury was the most common complication, occurring in 15 patients (30%), with subtypes including per-operative diagnosis (6%), biliary fistula (10%), biliary peritonitis (6%), and biliary stricture (8%). Other complications included minor bile leak (20%), post-cholecystectomy syndrome (12%), residual stones (10%), hemorrhage (10%), biloma (6%), wound infection (6%), and chest infection (6%). These findings are consistent with previously reported complication profiles following biliary tract surgery. According to Sicklick *et al.,*[20], wound infection, cholangitis, intra-abdominal abscess/biloma, and bile leaks were common postoperative complications in large cohorts of patients with bile duct injuries. Wound infection occurred in 8% of cases, cholangitis in 5.7%, and abscess/biloma in 2.9% of patients. Similarly, Çoğal *et al.,*[21] reported that early postoperative complications such as bile leaks and wound infections are frequent after bile duct injury repair, with bile leakage and infection representing the most common clinical challenges. Collectively, these studies support the pattern of complications observed in our cohort, highlighting bile duct injury, bile leaks, and wound infection as predominant postoperative issues following biliary tract surgery.

In the present study, the majority of bile duct injuries occurred following laparoscopic cholecystectomy, accounting for 12 out of 15 cases (80%), while only 3 injuries (20%) followed open cholecystectomy. These findings are in line with previously reported data indicating a higher incidence of bile duct injuries during laparoscopic procedures. Ahmed *et al.,*[22] reported that bile duct injuries occurred significantly more frequently after laparoscopic cholecystectomy than open surgery, with rates of 9.4% versus 3.8%, respectively. This similarity suggests that laparoscopic cholecystectomy continues to be the predominant surgical approach associated with bile duct injury, reflecting both the widespread adoption of the laparoscopic technique and the technical challenges inherent to minimally invasive biliary surgery.

In the present study, the majority of patients with complications following biliary tract surgery (35 out of 50, 70%) presented within the first postoperative month, encompassing both per-operative and early post-operative periods. A smaller proportion of patients presented between the 2nd and 6th months (22%) and 7th to 12th months (8%). These findings align with observations from Kambakamba *et al.,*[23], who noted that the timing of detection and intervention for bile duct injuries and related complications typically clusters into early, intermediate, and late phases, with a substantial proportion of cases being identified early, often within weeks after surgery. This similarity indicates that early postoperative monitoring is crucial for timely detection and management of biliary tract complications, while a smaller subset of patients may present later with delayed sequelae such as strictures or fistulae.

In the present study, the majority of bile duct injuries were classified as Bismuth Grade 3 (8 patients, 53.3%), followed by Grade 2 (4 patients, 26.7%), Grade 1 (2 patients, 13.3%), and Grade 4 (1 patient, 6.7%). This distribution demonstrates a predominance of mid-level injuries, with fewer low- or high-grade injuries. These findings are consistent with the observations of Haque *et al.,*[17], who reported that in a surgical series of 20 bile duct injury cases, the most frequent injuries were Bismuth Grades 2 (35%) and 3 (30%), with lower frequencies of Grades 1 and 4/5, indicating a similar clustering of injuries in the intermediate severity categories. The similarity between the two studies suggests that bile duct injuries following biliary tract surgery most commonly involve moderate severity injuries, which has implications for both management strategy and prognosis.

Limitations of the study

The study had several limitations

- The relatively small sample size limited the ability to detect rare complications and restricted detailed subgroup analyses.
- Delayed presentation of patients and inconsistent access to advanced diagnostic modalities may have affected outcomes and potentially underrepresented the full spectrum of postoperative complications.

CONCLUSION

Biliary tract surgery carries a risk of significant postoperative complications, with bile duct injury being the most frequent and potentially serious. In this study, middle-aged adults, particularly males, were predominantly affected, and most complications arose following laparoscopic cholecystectomy. The majority of patients presented early after surgery, and moderate-to-severe injuries were more common, highlighting the need for vigilant postoperative monitoring. These findings emphasize the importance of timely recognition and appropriate management to reduce morbidity associated with biliary tract surgery.

REFERENCES

1. Hassan R, Alam JQ, Uddin MA, Akhter M. Clinical Profile of Patients with Common Bile Duct Stones. Hypertension. 2021; 28:32-94.
2. Tazuma S. Epidemiology, pathogenesis, and classification of biliary stones (common bile duct and intrahepatic). Best practice & research Clinical gastroenterology. 2006 Jan 1;20(6):1075-83.
3. Elhamel A, Nagmuish S, Elfaidi S, Ben Dalal H. Handling of biliary complications following laparoscopic cholecystectomy in the setting of Tripoli Central Hospital. HPB. 2002 Sep;4(3):105-10.
4. Purwar V, Sachan VK. Clinical profile and management outcomes of gallstone disease in a tertiary care center. Int J Med Public Health. 2025 Jul-Sep;15(3).
5. Alius C, Serban D, Bratu DG, Tribus LC, Vancea G, Stoica PL, Motofei I, Tudor C, Serboiu C, Costea DO, Serban B. When critical view of safety fails: A practical perspective on difficult laparoscopic cholecystectomy. Medicina. 2023 Aug 19;59(8):1491.
6. McPartland KJ, Pomposelli JJ. Iatrogenic biliary injuries: classification, identification, and management. Surgical clinics of north America. 2008 Dec 1;88(6):1329-43.
7. Lillemoe KD. Current management of bile duct injury. Journal of British Surgery. 2008 Apr;95(4):403-5.
8. Lillemoe KD. Evaluation of suspected bile duct injuries. Surgical Endoscopy and Other Interventional Techniques. 2006 Nov;20(11):1638-43.
9. Selvakumar E, Rajendran S, Balachandar TG, Kannan DG, Jeswanth S, Ravichandran P, Surendran R. Long-term outcome of gastric access loop in hepaticojejunostomy. Hepatobiliary & Pancreatic Diseases International: HBPD INT. 2008 Apr 1;7(2):152-5.
10. Club SS. A prospective analysis of 1518 laparoscopic cholecystectomies. The New England journal of medicine. 1991 Apr 18;324(16):1073-8.
11. Hasl DM, Ruiz OR, Baumert J, Gerace C, Matyas JA, Taylor PH, Kennedy GM. A prospective study of bile leaks after laparoscopic cholecystectomy. Surgical endoscopy. 2001 Nov;15(11):1299-300.
12. Adamsen S, Hansen OH, Funch-Jensen P, Schulze S, Stage JG, Wara P. Bile duct injury during laparoscopic cholecystectomy: a prospective nationwide series. Journal of the American College of Surgeons. 1997 Jun 1;184(6):571-8.
13. Deziel DJ, Millikan KW, Economou SG, Doolas A, Ko ST, Airan MC. Complications of laparoscopic cholecystectomy: a national survey of 4,292 hospitals and an analysis of 77,604 cases. The

American journal of surgery. 1993 Jan 1;165(1):9-14.
14. Aikaterini Mastoraki MD, Mastoraki S, Kriaras I, Geroulanos S. Complications involving gall bladder and biliary tract in cardiovascular surgery. Hepato-gastroenterology. 2008; 55:1233-7.
15. Zacharias A, Schwann TA, Parenteau GL, Riordan CJ, Durham SJ, Engoren M, Fenn-Buderer N, Habib RH. Predictors of gastrointestinal complications in cardiac surgery. Texas Heart Institute Journal. 2000;27(2):93.
16. Jayasundara JA, De Silva WM, Pathirana AA. Changing clinical profile, management strategies and outcome of patients with biliary tract injuries at a tertiary care center in Sri Lanka. Hepatobiliary & Pancreatic Diseases International. 2011 Oct 1;10(5):526-32.
17. Haque DMS, Ali DS, Banik DSK, Islam DMA, Salahuddin DGM, Dipu D, *et al.,* Correlation of injury classification with surgical management and outcomes in post-cholecystectomy bile duct injuries. SAS J Surg. 2025;11(07):839–44.
18. Karn AK, Khan PA. Outcome of early and delayed repair of bile duct injury. Ann Int Med Dent Res. 2021 Sep-Oct;7(5):92-97.
19. Burns R, Connor KL, Guest RV, Johnston CC, Harrison EM, Wigmore SJ, Sherif AE. Risk factors and mitigating measures associated with bile duct injury during cholecystectomy: meta-analysis. BJS Open. 2025 Jul 1;9(4):zraf076. doi: 10.1093/bjsopen/zraf076. PMID: 40751483; PMCID: PMC12317273.
20. Sicklick JK, Camp MS, Lillemoe KD, Melton GB, Yeo CJ, Campbell KA, Talamini MA, Pitt HA, Coleman J, Sauter PA, Cameron JL. Surgical management of bile duct injuries sustained during laparoscopic cholecystectomy: perioperative results in 200 patients. Ann Surg. 2005 May;241(5):786-92; discussion 793-5.
21. Çoğal İ, Yavuz B, Kaycı Y, Topal U, Aydın İ, Saritas AG, Dalci K, Eray İC, Akcam AT, Ülkü A. Factors affecting early and late period outcomes in patients undergoing surgical repair due to biliary tract injury. Frontiers in Surgery. 2025 Jul 3; 12:1576454.
22. Ahmed A, Fatima A, Kamran M, Sami M. Frequency of Common Bile Duct Injury in Open Cholecystectomy versus Laparoscopic Cholecystectomy. Indus Journal of Bioscience Research. 2025 Mar 31;3(3):707-12.
23. Kambakamba P, Cremen S, Möckli B, Linecker M. Timing of surgical repair of bile duct injuries after laparoscopic cholecystectomy: A systematic review. World J Hepatol. 2022 Feb 27;14(2):442-455.