ISSN: 2091-2331 (Print) 2091-234X (Online)

Journal of Nobel Medical College

Volume 14, Number 02, Issue 27, July-December 2025, 37-41

Original Article

Endoscopic Retrograde Cholangiopancreatography: Therapeutic/Diagnostic Modality and Outcome Analysis

Khushboo Priya*[1], Rajesh Pandey [2], Rishab Shrestha [1], Dipak Kumar Sah [1], Kajol Yadav [1]

[1]Department of Gastroenterology, Nobel Medical College Teaching Hospital, Biratnagar, Nepal
[2]Department of Gastroenterology, Kathmandu Medical College Teaching Hospital, Kathmandu, Nepal

Article Received: 15th November, 2025; Accepted: 20th December, 2025; Published: 31st December, 2025

DOI: https://doi.org/10.3126/jonmc.v14i2.87907

Abstract

Background
Endoscopic Retrograde Cholangiopancreatography is an essential therapeutic modality for pancreaticobiliary diseases, but its outcomes and complication rates vary across clinical settings. This study assesses indications, success rates, and complications of Endoscopic Retrograde Cholangiopancreatography (ERCP) in a tertiary care center in Nepal.

Materials and Methods
A prospective cross-sectional study was conducted at the Department of Gastroenterology, Nobel medical college teaching hospital, from November 2024 to October 2025. All adults undergoing ERCP for therapeutic indications were included. Demographics, indications, procedural details, and complications were recorded. Statistical analysis was performed using SPSS version 26, with chi-square tests applied to assess associations.

Results
A total of 151 patients underwent ERCP, with a mean age of 55 ± 16.5 years; females accounted for 63.6%. Choledocholithiasis was the most common indication (76.8%). Selective biliary cannulation was successful in 97.4%, and overall procedural success was 90.7%. Endoscopic sphincterotomy was performed in 88.1% of patients, while 11.9% required precut. Immediate complications occurred in 19.2%, most commonly post-ERCP pancreatitis (5.3%) and bleeding (5.3%). Papilla type showed a statistically significant association with complications (p = 0.006).

Conclusion
Most patients underwent ERCP for benign diseases like common bile duct (CBD) stone and benign biliary stricture. Despite extensive research and refinement of this technique ERCP-related complications remain a major issue. The identification of risk factors for ERCP-related complications and implementation of measures that decreases the risk of complications and its prompt identification and treatment are key to ensuring good clinical outcomes.

Keywords: *Common bile duct, Endoscopic retrograde cholangiopancreatography, Endoscopic sphincterotomy*

***Corresponding Author:**
Dr. Khushboo Priya
Lecturer
Email: khushbu102030@gmail.com
ORCID: https://orcid.org/0009-0002-8335-3129

Citation
Priya K, Pandey R, Shrestha R, Sah DK, Yadav K, Endoscopic Retrograde Cholangiopancreatography: Therapeutic/Diagnostic Modality and Outcome Analysis, JoNMC. 14:2 (2025) 37-41. DOI: https://doi.org/10.3126/jonmc.v14i2.87907.

Introduction

Endoscopic Retrograde Cholangiopancreatography (ERCP) was first introduced in 1968 and has since become an essential diagnostic and therapeutic tool for pancreaticobiliary disorders [1]. Over time, the role of ERCP has evolved from primarily diagnostic to predominantly therapeutic, owing to the development of less invasive imaging modalities such as Magnetic Resonance Cholangiopancreatography (MRCP) and Endoscopic Ultrasound (EUS) [2]. ERCP allows direct visualization and intervention in the biliary and pancreatic ducts, enabling procedures like sphincterotomy, stone extraction, stent placement, and ductal dilation [3].

Despite its effectiveness, ERCP is associated with several complications. The most frequent is post-ERCP pancreatitis (PEP), with an incidence of 3–10% in average-risk patients and up to 15% in high-risk groups [4]. Other complications include bleeding, perforation, cholangitis, and cardiopulmonary events [5]. Although mortality is low, around 0.1–0.3%, severe cases can cause significant morbidity and prolonged hospitalization [6]. Risk factors for PEP include difficult cannulation, pancreatic duct injection, female sex, previous pancreatitis, and sphincter of Oddi dysfunction [4]. Preventive strategies such as prophylactic rectal nonsteroidal anti-inflammatory drugs (NSAIDs), aggressive hydration, and pancreatic stenting have significantly reduced complication rates [7].

ERCP remains indispensable in managing biliary and pancreatic diseases, especially in regions where access to advanced imaging is limited. Assessing the indications, outcomes, and complications of ERCP in local clinical settings in Eastern Nepal can help to improve procedural safety and patient care. The aim of this study is to analyze various therapeutic spectrum of patients undergoing ERCP for biliopancreatic disorders. This study also review the complications due to ERCP and its risk factors and management of post ERCP- complications.

Materials and Methods

This hospital-based, prospective cross-sectional study was conducted in the Department of Gastroenterology at Nobel Medical College and Teaching Hospital, Biratnagar, Nepal from November 2024 to October 2025 with ethical approval obtained from institutional review committee (IRC) of the hospital and written informed consent was obtained from all participants. All admitted patients aged above 18 years who underwent Endoscopic Retrograde Cholangiopancreatography (ERCP) therapeutic indications and provide informed consent were included. Patients younger than 18 years or those unwilling to participate were excluded.

Based on a previous study [8] reporting a 10% prevalence of post-ERCP complications, the calculated sample size is 151 patients, including a 10% non-response allowance. A non-probability purposive sampling was employed.

Clinical data including patient demographics, indications for ERCP, procedure type, and post-procedural outcomes were collected using a structured questionnaire. Complications such as pancreatitis, cholangitis, bleeding, and perforation were recorded during hospital stay and at 30-day follow-up via outpatient. All procedures were performed using standard ERCP techniques under conscious sedation.

Data were entered into Microsoft Excel and analyzed using SPSS version 26. Descriptive statistics was presented as frequency and percentage, while associations between variables were assessed using the Chi-square test, with $p < 0.05$ considered statistically significant.

Results

A total of 151 patients underwent ERCP during the study period. The mean age was 55 ± 16.5 years, and females constituted 63.6% (n=96). Comorbidities were present in 33.1% (n=50) of patients, with hypertension (9.3%), type 2 diabetes mellitus (6.6%), hypothyroidism (4.0%), coronary artery disease (4.0%), and COPD (3.3%) being the most common as shown in Table 1.

Table 1: Comorbidities among patients

Comorbidities	Frequency (n=151)	Percentage (%)
HTN	14	9.3
T2DM	10	6.6
CAD	6	4.0
Hypothyroidism	6	4.0
COPD	5	3.3
HTN +T2DM	5	3.3
Stroke	4	2.6
Total	50	

Most procedures were performed on an elective basis (87.4%) compared to emergency ERCP (12.6%). Cholelithiasis was present in 85 patients (56.3%), and choledocholithiasis was the leading indication for ERCP, accounting for 76.8% (n=116) of procedures. Other indications included benign CBD stricture (6.6%), cholangiocarcinoma (3.3%), ampullary carci-

noma (2.0%), pancreatic carcinoma (2.0%), Mirizzi syndrome (2.0%), and malignant CBD strictures (2.6%) as shown in Table 2.

Table2: Indications of ERCP

Indications	Frequency	Percentage
Choledocholithiasis	116	76.8
Benign CBD Stricture	10	6.6
Cholangiocarcinoma	5	3.3
Malignant CBD stricture	4	2.6
Ampullary ca	3	2.0
Ca GB	3	2.0
Ca Pancreas	3	2.0
Mirizzi Syndrome	3	2.0
Bile duct injury due to Lap chole	1	.7
Ca GB with liver metastases	1	.7
Obstructive Jaundice of undetermined cause	1	.7
Proximally migrated CBD stent	1	.7
Total	151	100.0

Selective biliary cannulation was successful in 147 patients (97.4%), while cannulation failed in four cases. Endoscopic sphincterotomy (EST) was performed in 88.1% (n=133) of patients, and precut sphincterotomy was required in 11.9% (n=18). Biliary stenting was performed in 76.8% (n=116). Residual filling defects post-procedure were noted in 7.9% (n=12). Overall procedural success was achieved in 90.7% (n=137) of cases.

Cannulation time data were available for 146 patients. Among them, 63.4% (n=92) achieved cannulation in <5 minutes, while 36.6% (n=53) required ≥5 minutes. Type 1 papilla was the most common morphology (44.8%), followed by Type 3 (26.9%) as shown in figure 1.

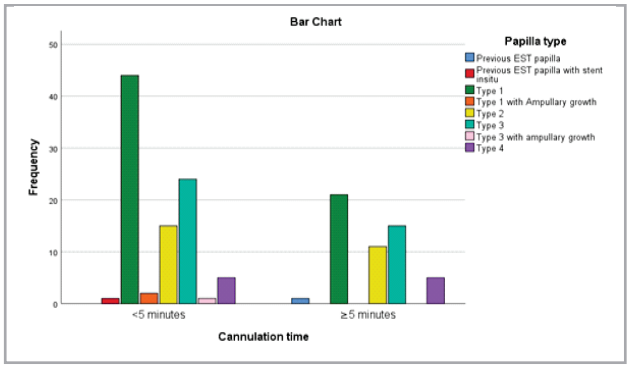

Figure1: Cannulation time in different papilla type

Chi-square analysis demonstrated no significant association between papilla type and cannulation time ($\chi^2 = 5.758$, df = 7, p = 0.568). Interpretation was limited by low expected cell counts.

Immediate complications occurred in 19.2% (n=29) of patients. The most common were bleeding (5.3%), post-ERCP pancreatitis (5.3%), and cholangitis (4.6%). Duodenal perforation occurred in 0.7%, scope non-negotiability in 0.7%, and unsuccessful CBD cannulation in 0.7%. The majority (82.7%) experienced no immediate complications as shown in table 3.

Table3: Different immediate complications

Complications	Frequency	Percentage (%)
Bleeding	8	5.3
Pancreatitis	8	5.3
Cholangitis	7	4.6
Unsuccessful cannulation of CBD	4	2.64
Duodenal Perforation	1	0.7
Scope not negotiable into D2	1	0.7
None	122	82.7
Total	151	100.0

Chi-square testing indicated a statistically significant association between papilla type and complications ($\chi^2 = 77.722$, p = 0.006).(Table 4)

Table 4: Association of types of papilla with complications

Papilla Type	Bleeding	Cholangitis	No Complication	Pancreatitis	Perforation	Scope Not Negotiable (D2)	Unsuccessful CBD Cannulation	Yes (Others)	Total
Previous EST papilla	0	0	1	0	0	0	0	0	**1**
Previous EST papilla with stent	0	0	0	0	0	0	0	1	**1**
Type 1	3	3	54	7	0	0	0	1	**68**
Type 1 with ampullary growth	0	0	2	0	0	0	0	0	**2**
Type 2	1	0	26	0	0	1	1	0	**29**
Type 3	4	3	30	1	1	0	0	0	**39**
Type 3 with ampullary growth	0	0	1	0	0	0	0	0	**1**
Type 4	0	1	8	0	0	0	0	1	**10**
Total	**8**	**7**	**122**	**8**	**1**	**1**	**1**	**3**	**151**

Discussion

In this study, the majority of ERCP procedures were performed for choledocholithiasis, consistent with global data reporting bile duct stones as the most common indication for ERCP [9]. The mean age of 55 years and female predominance also align with previous studies, where gallstone-related biliary pathology is more frequent in women [10]. The high rate of comorbidities, particularly hypertension and diabetes, reflects the typical patient profile undergoing ERCP in similar tertiary-care settings. Gurung et al [11] had similar findings as found in our study. The female:

male ratio was found to be 1.7 : 1. The mean age of patients were 50.57±17.8 Years. The most common indication for ERCP were: choledocholithiasis 208(49.17%); followed by: obstructive jaundice 69 (16.3%) of undetermined cause. The most common finding was CBD stone in 308(72.81%), normal in 51(12.1%), bile duct stricture in 45(10.63%). Similarly, Ganie B et al. [12] also found the median age of the patients included in the study was 55 years and the male-to-female ratio in the study cohort was 1.6:1, with 30 (62.5%) males and 18 (37.5%) females. Among the patients with comorbid conditions, hypertension was the most common, present in 12.5% of cases. Choledocholithiasis was the most frequent diagnosis, identified in 70.83% of patients.

The selective cannulation success rate of 97.4% in our study is comparable to international standards, where expert endoscopists report success rates exceeding 90% [13]. Precut sphincterotomy was required in 11.9% of patients, which is within the expected range of 10–15% reported in the ESGE technical guidelines [13]. Although difficult cannulation is a known risk factor for post-ERCP pancreatitis (PEP), our findings did not demonstrate a significant association between cannulation time and papilla type. This is likely due to the small number of patients in certain papilla subgroups, resulting in low cell counts and limited statistical power. Deng DH et al [14] had successful rate of deep biliary duct cannulation increased 8.6% (24/277), the total cannulation successful rate following precut was 97.7%. There was a significant difference between the two groups (97.7% vs 89.1%, $\chi 2 = 17.1, P < 0.01$).

The overall complication rate in this study was 19.2%, with PEP and bleeding being the most frequently encountered events. Gurung et al [11] found the most common complication was acute pancreatitis in 17(4%), post-ERCP cholangitis 6(1.4%), bleeding 6(1.4%), duodenal perforation in 1(0.2%), arrhythmia in 1(0.2%) and one death (0.2%). Reported global rates of PEP range between 3–10% in average-risk populations and up to 15% in high-risk settings [15], which is consistent with our observed PEP rate of 5.3%. Similarly, the rate of post-sphincterotomy bleeding (5.3%) aligns with previous multicenter data showing bleeding incidence between 1–10% depending on anticoagulation status, sphincterotomy technique, and patient comorbidities [16]. Cholangitis occurred in 4.6% of patients, comparable with published rates of 1–5% [9].

We observed a statistically significant association between papilla type and immediate complications. Anatomic variations such as Type 3 papilla (small, infiltrated, or flat papilla) are known to increase cannulation difficulty and risk of adverse outcomes [13]. This finding underscores the importance of careful papilla assessment before attempting cannulation. The procedural success rate of 90.7% in our cohort is in line with previous studies showing 85–95% success in therapeutic ERCP performed by experienced endoscopists [9,13]. The low duodenal retroperitoneal perforation rate (0.7%) is reassuring and falls within the expected range of 0.1–0.6% observed worldwide [17]. Most complications were mild and manageable with conservative treatment.

This study is limited by its single-center nature, modest sample size, and the lack of long-term follow-up for late complications

Conclusion

ERCP remains a highly effective therapeutic modality for pancreatobiliary diseases, with high cannulation and procedural success rates in our setting. Choledocholithiasis was the most common indication, and most complications were mild and manageable. Papilla type showed a significant association with immediate complications, underscoring the importance of anatomical assessment prior to cannulation. Being an invasive procedure, com-plications occur, and hence there should be backup of good surgical team.

References

[1] McCune WS, Shorb PE, Moscovitz H, Endoscopic cannulation of the ampulla of Vater: a preliminary report, Ann Surg. 167:5 (1968) 752–6. DOI: 10.1097/00000658-196805000-00013.

[2] Cotton PB, Garrow DA, Gallagher J, Romagnuolo J, Risk factors for complications after ERCP: a multivariate analysis of 11,497 procedures over 12 years, Gastrointest Endosc. 70:1 (2009) 80–8. DOI: 10.1016/j.gie.2008.10.039.

[3] Testoni PA, Mariani A, Aabakken L, Arvanitakis M, Bories E, Costamagna G, et al., Papillary cannulation and sphincterotomy techniques at ERCP: ESGE Technical Review, Endoscopy. 52:7 (2020) 676–91. DOI: 10.1055/s-0042-108641.

[4] Dumonceau JM, Andriulli A, Elmunzer BJ, Mariani A, Meister T, Devière J et al., Prophylaxis of post-ERCP pancreatitis: European Society of Gastrointestinal Endoscopy (ESGE) Guideline — Updated June 2014, Endoscopy. 46:9 (2014) 799–815. DOI: 10.1055/s-0034-1377875.

[5] Ribeiro IB, do Monte Júnior ES, Miranda-Neto AA, Proença IM, de Moura DTH, Minata MK, et al. Pancreatitis after endoscopic retrograde cholangiopancreatography: a narrative review, World J Gastroenterol. 27:20 (2021) 2495–2506. DOI: 10.3748/wjg.v27.i20.2495.

[6] Freeman ML, DiSario JA, Nelson DB, Fennerty MB, Lee JG, Bjorkman DJ, et al, Risk factors for post-ERCP pancreatitis: a prospective, multicenter study, Gastrointest Endosc. 54:4 (2001) 425-34. DOI: 10.1067/mge.2001.117550.
[7] Elmunzer BJ, Scheiman JM, Lehman GA, Chak A, Mosler P, Higgins PDR, et al, A randomized trial of rectal indomethacin to prevent post-ERCP pancreatitis, N Engl J Med. 366:15 (2012)1414–22. DOI: 10.1056/NEJMoa1111103.
[8] Arslan Y, Gürbulak B, Özcan U, Kutlutürk K, Cingi A, Aktaş A, et al. Post-ERCP complications, risk factors and management of complications, LaparoscEndosc Surg Sci. 28:2 (2021) 93–8. DOI:10.14744/less.2021.58966
[9] Dumonceau JM, Kapral C, Aabakken L, Papanikolaou IS, Tringali A, Vanbiervliet G, et al. ERCP-related adverse events: European Society of Gastrointestinal Endoscopy (ESGE) Guideline, Endoscopy. 52:2 (2020) 127-49. DOI: 10.1055/a-1075-4080.
[10] Bhatt H. Post-Endoscopic Retrograde Cholangiopancreatography Pancreatitis: An Updated Review of Current Preventive Strategies, Clin Exp Gastroenterol. 2:14 (2021) 27-32. DOI: 10.2147/CEG. S276361.
[11] Gurung RB, Purbey B, Koju R, Bedi TRS, Endoscopic Retrograde Pancreato Cholangiography (ERCP) at Dhulikhel hospital: Outcome Analysis, Kathmandu Univ Med J. 45:1 (2014) 55-9. PMID: 25219996.
[12] Ganie B, Javaid Wani S, Qadri U, et al, Diagnostic and Therapeutic Value of Endoscopic Retrograde Cholangiopancreatography in Acute Cholangitis: A Study From Kashmir Valley, India, Cureus. 16:11 (2024) e74396. DOI:10.7759/cureus.74396.
[13] Akshintala V S, Kanthasamy K, Bhullar F A, Sperna Weiland C J, Kamal A, Kochar B et al., Incidence, severity, and mortality of post-ERCP pancreatitis: an updated systematic review and meta-analysis of 145 randomized controlled trials, GastrointestEndosc. 98:1 (2023) 1-6.e12. DOI: 10.1016/j.gie.2023.03.023.
[14] Deng DH, Zuo HM, Wang JF, Gu ZE, Chen H, Luo Y,et al, New precut sphincterotomy for endoscopic retrograde cholangiopancreatography in difficult biliary duct cannulation. World J Gastroenterol. 13:32 (2007) 4385-90. DOI: 10.3748/wjg.v13.i32.4385.
[15] Kang X, Zhang L, Zhou Y, et al. The Incidence and Severity of Post-ERCP Pancreatitis in Patients Receiving Rectal NSAIDs: A Systematic Review and Meta-analysis, J Gastrointest Surg. 26:9 (2022) 2141-9. DOI: 10.1007/s11605-022-05399-6.
[16] Manaka T, Takikawa T, Tarasawa K, Kikuta K, Matsumoto R, Tanaka Y, et al., Current status and trends in ERCP and post-ERCP pancreatitis in Japan: a nationwide observational study, J Gastroenterol. 60:8 (2025) 1036-46. DOI: 10.1007/s00535-025-02254-8.
[17] Cozma MA, Angelescu C, Haidar A, Mateescu RB, Diaconu CC. Incidence, Risk Factors, and Prevention Strategies for Post-ERCP Pancreatitis in Patients with Biliopancreatic Disorders and Acute Cholangitis: A Study from a Romanian Tertiary Hospital, Biomedicines. 13:3 (2025) 727. DOI: 10.3390/biomedicines13030727.