Section: Medical Gastroenterology

Original Research Article

ANALYSIS OF RISK FACTORS LEADING TO POST ERCP PANCREATITIS (PEP) IN A TERTIARY CARE CENTER

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ABSTRACT

Background: Despite the therapeutic benefits of ERCP, the most frequent and concerning adverse effect is post-ERCP pancreatitis (PEP). Many efforts have been made over the years to prevent or minimize the severity of post-ERCP pancreatitis, but only a handful of these methods have been proven effective and are now used in clinical settings. **Materials and Methods:** This Prospective cohort study was conducted between March 2022 to March 2025 among all patients who underwent ERCP. On a total of 298 patients, only those cases where desired duct canulation was attained were included in the study. Serum amylase, lipase was repeated 12 hours post procedure. Study group with PEP & control group without PEP & their clinical data & intra operative conditions were compared. Univariate and Multivariate logistic regression analysis were performed to identify the independent factors associated with risk of developing PEP. **Result:** Out of 298 patients who underwent ERCP, 37 cases failed. Desired duct canulation was achieved in 261 patients and their baseline clinical and intra operative conditions were compared. Among 261 cases who had desired duct canulation 39(14.9%) patients developed PEP. The patients who developed PEP were divided into 2 categories; with mild pancreatitis of 21(53.9%) patients & moderate to severe pancreatitis of 18(46.1%) patients. A Univariate analysis showed that age less than 50, female sex, history of pancreatitis, malignancy, multiple cannulation attempts, cannulation duration and periampullary diverticulum were significantly associated with PEP ($P < 0.05$). A Multivariate logistic regression analysis showed age less than 50years, female sex, history of pancreatitis, malignancy, multiple cannulation attempts, cannulation duration, precut and periampullary diverticulum were independent risk factors for PEP. **Conclusion:** A patient's risk of acquiring PEP may be increased by having several risk factors that work in concert. Therefore, by analysing the risk factors, it is possible to anticipate PEP early, which aids the treating physician in implementing appropriate post-procedure therapies such aggressive fluid challenge and NSAIDs.

INTRODUCTION

One of the most important tools for diagnosing and treating a variety of pancreatic and biliary conditions is endoscopic retrograde cholangiopancreatography (ERCP).[1] Gallstones, strictures, and tumours can all be effectively managed with this treatment, which enables visualization and intervention within the bile and pancreatic ducts.[2] Post-ERCP pancreatitis (PEP) is the most common and worrisome side effect, although ERCP is not risk-free despite its therapeutic advantages.[3] According to several studies, the incidence of PEP, which is defined by inflammation of the pancreas after the ERCP surgery, varies greatly, ranging from 2% to 16%.[4,5] Incidence rates ranging from 3.5% to 9.5% have even been reported.[6]

Over the course of several decades, numerous attempts have been undertaken to either avoid or lessen the severity of post-ERCP pancreatitis; however, only a small number of these techniques have been shown to be successful and subsequently incorporated into clinical practice.[7] A number of strategies are used to lessen the likelihood of this issue occurring. The first is selecting patients carefully to prevent needless exposure to ERCP and

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associated dangers; when appropriate, newer, less invasive diagnostic techniques are used instead. The second is determining the key risk factors for pancreatitis development using epidemiological data.[8] Certain preventive endoscopic treatments, such the implantation of a pancreatic duct stent, may be necessary for high-risk individuals.[9] This variation most likely results from variations in the patient groups receiving ERCP, the particular rationale for the surgery, the methods endoscopists utilize, and the standards by which PEP is diagnosed. A small percentage of patients experience severe pancreatitis, which can result in extended hospital stays, admission to the critical care unit, serious health problems, and in rare circumstances, death. Most PEP cases are minor and go away on their own. The consequences of severe PEP highlight how important it is to comprehend the processes that lead to its development. Determining the risk variables linked to PEP is crucial. Post-ERCP pancreatitis has been linked to a wide range of causes, which can be broadly divided into two categories: procedure-related and patient-related. For risk assessment and the use of preventative measures, it is essential to comprehend these risk variables. It's critical to understand that these risk variables frequently don't work alone. When a patient has several risk factors, the likelihood of PEP may rise dramatically. Determining which patients are most at risk and who could gain the most from intensive prophylactic measures meant to prevent PEP requires an understanding of these synergistic effects. The pancreaticobiliary system is probably under more stress during the ERCP operation when there are several risk factors present, which raises the possibility of an inflammatory reaction.[10] With this information, physicians can more effectively choose patients for ERCP, assess their risk of having this problem, and put specific preventive measures in practice.

Objective: To investigate the incidence & risk factors of post-endoscopic retrograde cholangiopancreatography pancreatitis.

MATERIALS AND METHODS

A Prospective cohort study was conducted in Coimbatore Medical College & Hospital between March 2022 to March 2025 among all patients who underwent ERCP at Coimbatore Medical College & Hospital during the study duration. All patients above the age of 18 years who underwent ERCP during the study period were included. Patients below 18 years, failed ERCP – where successful desired duct canulation was not possible were excluded.

Data Collection procedure: A total of 298 patients who underwent successful ERCP were finally included in the study after getting written informed consent. Only those cases where desired duct canulation was attained were included in the study. The baseline demographics- like age, sex , clinical parameters like indication for ERCP, comorbid conditions like diabetes, hypertension, past history of pancreatitis, current history of biliary pancreatitis, cholangitis, lab parameters like LFT, hemogram, amylase lipase levels, intra operative parameters like type of ampulla, presence of periampullary diverticulum, canulation duration, canulation attempts, pancreatic duct canulation, pancreatic stenting done or not, precut sphincterotomy, sphincteroplasty etc were noted down. All patients who underwent successful ERCP received rectal diclofenac suppository and adequate fluids (Ringer Lactate) post procedure. Serum amylase, lipase was repeated 12 hours post procedure.

Diagnosis of PEP was made if any 2 of the 3 conditions are met

1. 3-fold rise in amylase/ lipase
2. Worsening of pain abdomen or new onset pain abdomen
3. Radiological evidence of pancreatitis

The patients were divided into two groups study group with PEP & control group without PEP & their clinical data & intra operative conditions were compared. Univariate and Multivariate logistic regression analysis were performed to identify the independent factors associated with risk of developing PEP. The patients who developed PEP were divided into 2 groups based on severity (mild, moderate to severe).

All ERCPs were performed by experienced teams using standard duodenoscopes. Procedures included papilla visualization, duct cannulation, contrast injection, and therapeutic interventions (sphincterotomy, stent placement, stone removal). Rectal diclofenac was used prophylactically. Cannulation difficulty and imaging details were recorded.

Statistical Analysis: The Statistical analysis was performed using SPSS v30.0. The Count data are presented as n (%) and measurement data as mean ± SD. Categorical variables were compared using χ^2 or Fisher's exact test; continuous variables used t-tests. Univariate and multivariate logistic regression were used to analyse the clinical data and PEP to determine independent risk factors for PEP. P value < 0.05 indicated significance.

RESULTS

Out of 298 patients who underwent ERCP 37 cases failed. Desired duct canulation was achieved in 261 patients. The Indication for ERCP in failed case is shown in [Table 1].

Table 1: The Indication for ERCP in failed cases.

ERCP Failed	37
Malignancy	15
Stricture	10

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Bile duct injury	3
Stone	9

So, these 261 patients who underwent successful ERCP were included in the study and their baseline clinical and intra operative conditions were compared in [Table 2].

Table 2: Baseline Characteristics

Age	<50 years	>50 years
	182	79
Sex	Male	Female
	125	136

The indications of ERCP in successful 261 cases were Choledocholithiasis in 179(68.58%) patients, Stricture in 42 patients (16.09%), Cholangitis in 53(20.30%) patients and others were mentioned in [Table 3].

Table 3: The indications of ERCP.

Indications		**N=261**	**Percentage (%)**
Choledocholithiasis		179	68.58
Stricture		42	16.09
Cholangitis		53	20.30
Malignancy		33	12.64
Biliopathy		3	1.14
Bile duct injury		4	1.53

Among 261 cases who had desired duct canulation 39(14.9%) patients developed PEP. The patients who developed PEP were divided into 2 categories; with mild pancreatitis of 21(53.9%) patients & moderate to severe pancreatitis of 18(46.1%) patients based on the duration of hospitalization.

The baseline characteristics, clinical and intraoperative conditions of the study group (n= 39 with PEP) were compared with the control group (n= 222 without PEP) [Table 4 and 5].

Table 4: Comparison of baseline characteristics

Baseline data	**Control group (n = 222)**	**Study group (n = 39)**	**X2**	**P**
Age (%)			5.334	0.021
<50	152	27		
>=50	70	12		
Sex (%)			13.516	<0.001*
Male	107	10		
Female	115	29		
Tot. Bilirubin	8.49± 6.17	12.87±6.61	1.091	0.276
T2DM			0.889	0.346
No	147	29		
Yes	75	10		
Hypertension			0.026	0.872
No	159	29		
Yes	63	10		
Choledocholithiasis				
No	43	30		
Yes	179	9		
Stricture			1.134	0.287
No	186	35		
Yes	36	4		
H/O Pancreatitis			23.069	<0.001*
No	203	23		
Yes	19	16		
Malignancy			5.612	0.018
No	210	20		
Yes	12	19		

* P < 0.05 indicate statistically significant

Table 5: Comparison of intraoperative conditions

Intraoperative Conditions	**Control group (n = 222)**	**Study group (n = 39)**	**X2**	**P**
Canulation			10.26	0.001
Attempts				
<3	190	29		
>3	32	10		
Canulation Duration			7.25	0.007

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<5 mins	180	27		
>5 mins	42	12		
Periampullary Diverticulum			15.47	< 0.001
No	159	18		
Yes	70	21		
PD Canulation			16.08	< 0.001
No	179	30		
Yes	43	9		
Pre cut			6.83	0.015
No	168	17		
Yes	54	22		
Sphincteroplasty			0.745	0.388
No	174	22		
Yes	48	17		

* P < 0.05 indicate statistically significant

A Univariate analysis of the general data and intraoperative conditions of the included patients showed that age less than 50, female sex, history of pancreatitis, malignancy, multiple cannulation attempts, cannulation duration and periampullary diverticulum were significantly associated with PEP (P < 0.05) [Table 6].

Table 6: Univariate logistic regression analysis

Variables	B	S.E	Wald	P	OR	95% CI(LL)	95% CI(UL)
Age<50	-0.585	0.255	5.423	0.022	0.557	0.338	0.919
Sex Female	0.926	0.257	12.956	<0.001	2.523	1.52	4.177
H/O pancreatitis	1.444	0.320	20.42	<0.001	4.239	2.266	7.929
T2DM	-0.318	0.338	0.883	0.347	0.728	0.375	1.412
HTN	-0.044	0.272	0.026	0.872	0.957	0.561	1.632
CBD stone	0.605	0.258	2.508	0.079	1.832	1.105	3.307
Malignancy	1.804	0.467	13.63	<0.001	6.077	2.434	15.172
Attempts	0.910	0.291	9.798	0.002	2.483	1.405	4.389
Duration	1.195	0.330	13.098	<0.001	3.304	1.73	6.312
PD canulation	1.115	0.263	17.934	<0.001	3.048	1.820	5.106
Pre cut	1.804	0.467	14.94	<0.001	6.077	2.43	15.17
Diverticulum	0.982	0.256	14.76	<0.001	2.67	1.618	4.406
Sphincteroplasty	0.218	0.253	0.743	0.389	1.244	0.757	2.043

A Multivariate logistic regression analysis was then performed to identify independent factors associated with the risk of developing PEP. The results showed age less than 50years (OR, 0.477; 95% CI, 0.26–0.855), female sex (OR, 2.162; 95% CI, 1.220–3.831), history of pancreatitis (OR, 2.567; 95% CI, 1.218–5.410), malignancy(OR 4.429;95%CI 1.481-13.242), multiple cannulation attempts (OR, 2.327; 95% CI, 1.205–4.493), cannulation duration (OR, 2.421; 95% CI, 1.143–5.128), precut (OR,2.387;95%CI 1.298-4.39) and periampullary diverticulum(OR,2.002 95%CI 1.125-3.564)were independent risk factors for PEP [Table 7].

Table 7: Multivariate logistic regression analysis

Variables	B	S.E	Wald	P	OR	95% CI(LL)	95% CI(UL)
Age<50	-0.740	0.298	6.180	0.013	0.477	0.266	0.855
Sex Female	0.771	0.292	6.983	0.008	2.162	1.220	3.831
H/O pancreatitis	0.943	0.38	6.146	0.013	2.567	1.218	5.41
Malignancy	1.488	0.559	7.090	0.008	4.429	1.481	13.242
Attempts	0.845	0.336	6.328	0.012	2.327	1.205	4.493
Duration	0.884	0.383	5.330	0.021	2.421	1.143	5.128
PD canulation	0.724	0.293	6.115	0.013	2.062	1.162	3.658
Pre cut	0.870	0.311	7.831	0.005	2.387	1.298	4.390
Diverticulum	0.694	0.294	5.570	0.018	2.002	1.125	3.564

DISCUSSION

PEP is a common complication of ERCP & can significantly increase the risk of mortality & health care associated costs Hence it is important to identify the risk factors of PEP The incidence of PEP in our study was 14.9%. Majority of the patients had mild pancreatitis which was 53.3% There was no mortality in our study. Multivariate logistic regression analysis confirmed that age < 50 years, female sex, history of pancreatitis, malignancy, difficult canulation, periampullary diverticulum, pancreatic duct canulation, precut sphincterotomy were independent risk factors for PEP.

If PEP arises, treatment is comparable to that for acute pancreatitis from other causes. To assign patients to the right degree of care, it's critical to categorize the severity of their conditions. Early fluid resuscitation and appropriate analgesia are the cornerstones of care.[11,12] Risk calculators are

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available to estimate mortality in people suffering from acute pancreatitis.[13,14] Although some models have been put forth to forecast PEP danger, none of them have been widely accepted.[15]

According to multivariate prospective studies or meta-analyses, a number of technical factors are known to raise the likelihood of post-procedure pancreatitis. Regardless of other considerations, difficult cannulation—defined as requiring more tries or more time to properly cannulate the bile duct—can cause ampulla trauma and raise the risk of future pancreatitis.[16-18] The risk rises as the number of cannulation attempts increases. According to one study that examined all intra-ERCP procedure types, patients who needed fewer than five cannulation attempts had a 3.3% pancreatitis rate, those who needed six to twenty attempts had a 9% rate, and those who needed more than twenty attempts had a 14.9% rate.[16] The findings align with prior research indicating that demographic (age, sex), medical history, and procedural factors contribute to PEP risk. Younger patients may have more active pancreatic enzymes; females may be more susceptible due to anatomical and hormonal differences. Pancreatic duct interventions directly irritate the pancreas. Repeated cannulation increases mechanical injury risk. These insights can guide prophylactic strategies and improve outcomes.[17]

A number of independent risk factors for post-ERCP pancreatitis have also been identified, including ampullectomy, pancreatic duct cannulation, multiple passages of a pancreatic guide wire, pancreatic duct injection/pancreatogram, pre-cut sphincterotomy (a last-resort technique to gain access to the bile duct after other cannulation methods have failed), and pancreatic sphincterotomy.[19,20] According to research, there is a very significant negative predictive value for post-ERCP pancreatitis if serum lipase or amylase levels are less than 1.5 and 4 times the upper limit of normal, respectively, 2–4 hours after ERCP. Serum lipase or amylase levels measured two to six hours after ERCP and determined to be below these cut-offs are comforting enough to permit a patient who is scheduled to be discharged on the day of the surgery but is in pain to be sent home safely.[21]

The major limitation of our study is basically conducted in a single centre and consists of small population and the results may not be representative.

CONCLUSION

Independent risk factors for post-ERCP pancreatitis include age <60, female sex, history of pancreatitis, pancreatic duct imaging, pancreatic sphincterotomy, multiple and difficult cannulation, and periampullary diverticula. Risk assessment and preventive strategies targeting these can reduce PEP incidence. Clinicians need to evaluate these risk factors before ERCP. Effective preventive measures need to be adopted especially in high-risk patients. A single patient may have multiple risk factors which has synergistic effect thereby increasing the chance of developing PEP. So early prediction of PEP is possible by analysing the risk factors which in turn helps the treating doctor to adopt effective measures like aggressive fluid challenge and NSAIDs post procedure.

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