# PREVALENCE OF BILIARY DILATATION IN PATIENTS WITH PANCREATITIS ON MDCT AND ITS CORRELATION WITH CT SEVERITY INDEX

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**How to cite this article**

Ahmad A, Umer US, Ghaus G, Sayed H, Hasnat M, Khan M, Abid H. Prevalence of Biliary Dilatation in Patients With Pancreatitis on MDCT and its Correlation with CT Severity Index. J Gandhara Med Dent Sci. 2025;13(2):29-33
https://doi.org/10.37762/jgmds.13-2.807

**Date of Submission:** 13-02-2025
**Date Revised:** 27-05-2025
**Date Acceptance:** 05-06-2025

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***ABSTRACT***

***OBJECTIVES***

*This study aimed to determine the prevalence of biliary dilatation in patients with pancreatitis on multidetector computed tomography (MDCT) and to evaluate its association with the CT Severity Index (CTSI).*

***METHODOLOGY***

*Analytical cross-sectional study. Department of Radiology, Rehman Medical Institute, Peshawar, from 1st August 2022 to 31st July 2023. A total of 146 adult patients with clinically suspected or confirmed pancreatitis who underwent contrast-enhanced MDCT were included through non-probability consecutive sampling. Patients with prior hepatobiliary surgery, pancreatic or hepatobiliary malignancy, or incomplete imaging were excluded. Biliary dilatation was defined as a common bile duct diameter >7 mm in patients <60 years and >8 mm in those ≥60 years. The CT Severity Index (CTSI) was calculated using the Balthazar grading system. Image interpretation was performed independently by two experienced radiologists, and interobserver agreement was assessed using Cohen's kappa statistic. The association between biliary dilatation and CTSI categories was analyzed using the Chi-square test for trend. Prevalence estimates were reported with 95% confidence intervals (CI). Statistical analysis was performed using SPSS version 26.0, with $p < 0.05$ considered significant.*

***RESULTS***

*The mean age of patients was 43.68 ± 11.20 years, and 79 (54.1%) were females. Biliary dilatation was observed in 54 patients (37.0%; 95% CI: 29.30-44.9). According to CTSI classification, 47 (32.2%) patients had mild, 45 (30.8%) moderate, and 54 (37.0%) severe pancreatitis. The proportion of biliary dilatation increased with disease severity, occurring in 13 (27.7%) mild, 15 (33.3%) moderate, and 26 (48.1%) severe cases. Although this trend suggested increasing biliary involvement with greater disease severity, the association did not reach statistical significance ($p = 0.086$). Interobserver agreement for CT interpretation demonstrated substantial reliability ($\kappa = 0.82$).*

***CONCLUSION***

*Biliary dilatation is a relatively common MDCT finding in patients with pancreatitis and shows an increasing trend with higher CTSI categories. Although the association was not statistically significant, careful CT evaluation of the biliary system may help identify patients who may benefit from further biliary assessment or targeted clinical management.*

***KEYWORDS:*** *Pancreatitis, Biliary Dilatation, Multidetector Computed Tomography, CT Severity Index, Balthazar Classification*

## INTRODUCTION

Acute pancreatitis is an inflammatory disorder of the pancreas characterized by a spectrum of clinical and morphological manifestations ranging from mild interstitial edema to severe necrotizing disease with systemic complications. It remains one of the most common causes of acute abdominal emergencies requiring hospital admission worldwide. Early diagnosis and accurate assessment of disease severity are essential for guiding clinical management, predicting complications, and improving patient outcomes.[1] Radiological imaging plays a central role in the evaluation of pancreatitis. Among available imaging modalities, multidetector computed tomography (MDCT) is considered the cornerstone for assessing pancreatic inflammation, detecting local complications, and evaluating disease severity due to its rapid acquisition, high spatial resolution, and ability to visualize both pancreatic and peripancreatic structures.[2]

MDCT also allows comprehensive assessment of adjacent hepatobiliary anatomy, which may be involved in the pathophysiology or complications of pancreatitis.[3] Biliary abnormalities are frequently encountered in patients with pancreatitis. Biliary dilatation may occur due to various mechanisms, including obstruction from choledocholithiasis, inflammatory compression of the distal common bile duct by edematous pancreatic tissue, or pressure effects from peripancreatic fluid collections and pseudocysts.[4] These changes may reflect underlying biliary pathology or secondary effects of pancreatic inflammation. Recognition of biliary dilatation on CT imaging is clinically important because it may prompt further evaluation of the biliary system and guide decisions regarding additional diagnostic or therapeutic procedures such as magnetic resonance cholangiopancreatography (MRCP) or endoscopic retrograde cholangiopancreatography (ERCP).[5,6] The CT Severity Index (CTSI), originally proposed by Balthazar and later modified, is a widely used radiological scoring system for grading the severity of acute pancreatitis. It combines morphological grading of pancreatic inflammation with the extent of pancreatic necrosis to generate a score ranging from 0 to 10. Higher CTSI scores have been associated with increased risk of complications, prolonged hospitalization, and higher morbidity and mortality.[7,8] While CTSI is well established for evaluating pancreatic parenchymal involvement and peripancreatic complications, its relationship with biliary changes such as bile duct dilatation has not been extensively investigated. Although biliary dilatation may be observed in pancreatitis, the available literature addressing its prevalence and its relationship with CT-based severity indices remains limited. Most studies have focused primarily on pancreatic necrosis and peripancreatic complications rather than on hepatobiliary alterations visible on CT. A clearer understanding of the association between biliary dilatation and pancreatitis severity may provide additional radiologic indicators of disease burden and help identify patients who require closer clinical monitoring or further biliary evaluation. Therefore, the present study aimed to determine the prevalence of biliary dilatation on MDCT in patients with pancreatitis and to assess its association with the CT Severity Index (CTSI). We hypothesized that biliary dilatation would be more frequently observed in patients with higher CTSI categories, reflecting greater inflammatory involvement and potential biliary compression.

## METHODOLOGY

This analytical cross-sectional study was conducted in the Department of Radiology at Rehman Medical Institute, Peshawar, from 1st August 2022 to 31st July 2023, after obtaining Institutional Ethical Review Board approval. Written informed consent was obtained from all participants prior to inclusion in the study. The sample size was calculated using the WHO sample size calculator, with a reported prevalence of biliary dilatation in pancreatitis patients of 38.6%, a 95% confidence level, and an absolute precision of 8%. Based on these parameters, the minimum required sample size was calculated to be 146 patients, who were enrolled in the study. Patients aged 18 years or above with clinically suspected or confirmed pancreatitis who underwent contrast-enhanced multidetector computed tomography (MDCT) of the abdomen were included in the study. Participants were recruited using non-probability consecutive sampling. Patients with a history of prior hepatobiliary surgery, known hepatobiliary or pancreatic malignancy, or incomplete or poor-quality imaging studies were excluded. All CT examinations were performed using a 128-slice multidetector CT scanner with a standard pancreatic imaging protocol. Non-ionic iodinated contrast medium was administered intravenously at a dose of 1 mL/kg body weight through an 18-gauge intravenous cannula using a pressure injector at a rate of 3-4 mL/sec. Imaging was acquired during the arterial and portal venous phases to evaluate the pancreatic parenchyma and surrounding structures adequately. Biliary dilatation was defined as a common bile duct (CBD) diameter greater than 7 mm in patients younger than 60 years and greater than 8 mm in patients aged 60 years or older, measured at the intrapancreatic portion of the duct. The CT Severity Index (CTSI) was calculated using the Balthazar grading system, which assigns scores for pancreatic inflammation (Grades A-E) and pancreatic necrosis, yielding a total score of 0-10. Based on the CTSI score, pancreatitis severity was categorized as mild (0-3), moderate (4-6), and severe (7-10). Two experienced radiologists independently reviewed all CT images, each having more than seven years of experience in abdominal imaging. Both radiologists interpreted the scans independently and were blinded to each other‘s assessments. In cases of disagreement, a consensus interpretation was reached. Interobserver agreement between the radiologists was assessed using Cohen‘s kappa statistic. Data were analyzed using IBM SPSS Statistics for Windows, Version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables, such as age and CBD diameter, were reported as mean ± standard deviation (SD), whereas categorical variables were presented as frequencies and percentages. The prevalence of biliary dilatation was reported with 95% confidence intervals (CI). The association between biliary dilatation and CTSI categories was assessed using the Chi-square test for trend. A p-value $< 0.05$ was considered statistically

significant.

## RESULTS

A total of 146 patients with pancreatitis who underwent contrast-enhanced MDCT were included in the analysis. The mean age of the study population was 43.68 ± 11.20 years, and the mean common bile duct (CBD) diameter was 6.56 ± 2.41 mm. Among the participants, 67 (45.9%) were males, and 79 (54.1%) were females. Biliary dilatation was observed in 54 (37.0%; 95% CI: 29.3-44.9) patients, whereas 92 (63.0%) patients had no evidence of biliary dilatation on MDCT (Table 1). Based on the CT Severity Index (CTSI) classification, 47 (32.2%) patients had mild pancreatitis, 45 (30.8%) had moderate pancreatitis, and 54 (37.0%) had severe pancreatitis. When biliary dilatation was evaluated across CTSI categories, it was present in 13 (27.7%) patients with mild pancreatitis, 15 (33.3%) with moderate pancreatitis, and 26 (48.1%) with severe pancreatitis. Among patients without biliary dilatation, 34 (72.3%) were in the mild category, 30 (66.7%) in the moderate category, and 28 (51.9%) in the severe category (Table 2). The Chi-square test for trend showed an increasing proportion of biliary dilatation across CTSI categories; however, the association between biliary dilatation and pancreatitis severity did not reach statistical significance (p = 0.086). Interobserver agreement between the two radiologists for CT interpretation demonstrated substantial reliability, with a Cohen's kappa value of 0.82, indicating strong agreement in the evaluation of biliary dilatation and CTSI grading.

**Table 1: Demographic and Clinical Characteristics of Study Participants (n = 146)**

| Variable | Category | n (%) / Mean ± SD |
|---|---|---|
| Age (years) | Mean ± SD | 43.68 ± 11.20 |
| CBD Diameter(mm) | Mean ± SD | 6.56 ± 2.41 |
| Gender | Male | 67 (45.9) |
| | Female | 79 (54.1) |
| Biliary Dilatation | Yes | 54 (37.0) (95% CI 29.3-4 44.9) |
| | No | 92 (63.0) (95% CI 55.1-70.7) |
| CTSI Category | Mild (0-3) | 47 (32.2) |
| | Moderate (4-6) | 45 (30.8) |
| | Severe (7-10) | 54 (37.0) |

**Table 1: Association Between Biliary Dilatation and CT Severity Index (CTSI) Categories (n = 146)**

| Biliary Dilatation | CT Severity Index (CTSI) Categories | | | Total n (%) | p-value |
|---|---|---|---|---|---|
| | Mild n (%) | Moderate n (%) | Severe n (%) | | |
| Yes | 13 (27.7) | 15 (33.3) | 26 (48.1) | 54 (37.0) | 0.086 |
| No | 34 (72.3) | 30 (66.7) | 28 (51.9) | 92 (63.0) | |
| Total | 47 (100) | 45 (100) | 54 (100) | 146 (100) | |

## DISCUSSION

The present study evaluated the prevalence of biliary dilatation in patients with pancreatitis using multidetector computed tomography (MDCT) and examined its association with the CT Severity Index (CTSI). Biliary dilatation was identified in 54 (37.0%) patients, indicating that hepatobiliary involvement is a relatively frequent imaging finding in pancreatitis. Although the proportion of biliary dilatation increased across CTSI categories from 13 (27.7%) in mild, 15 (33.3%) in moderate, to 26 (48.1%) in severe pancreatitis, the association did not reach statistical significance (p = 0.086). Nevertheless, this trend suggests that increasing inflammatory severity of pancreatitis may contribute to secondary biliary changes. The prevalence observed in our study is comparable to that reported in the literature, which documents biliary dilatation or biliary involvement in approximately 30-45% of pancreatitis cases. Such biliary changes are often attributed to underlying gallstone disease, pancreatic head inflammatory edema, or compression of the distal common bile duct by peripancreatic fluid collections or pseudocysts.[9,10,11] These mechanisms may result in transient or persistent obstruction of the bile duct, which can be visualized on cross-sectional imaging modalities such as CT. MDCT remains a cornerstone in the evaluation of pancreatitis because it can simultaneously assess pancreatic parenchymal inflammation, peripancreatic complications, and adjacent hepatobiliary structures.[2] The increasing frequency of biliary dilatation with higher CTSI categories observed in our study may reflect the greater degree of pancreatic inflammation and peripancreatic edema in severe disease. These pathological processes may exert mechanical compression on the intrapancreatic portion of the common bile duct, resulting in upstream dilatation.[12] Similar observations have been reported, demonstrating that biliary abnormalities on contrast-enhanced CT were more common in patients with moderate-to-severe pancreatitis.[13] Likewise, another study described that inflammatory enlargement of the pancreatic head and surrounding tissues can lead to compression of the distal common bile duct, even in the absence of gallstones.[14] These findings support the concept that biliary dilatation in pancreatitis may occur due to inflammatory changes rather than primary biliary pathology alone. Despite the observed trend, the association between biliary dilatation and CTSI severity categories did not reach statistical significance in our study. Several factors may explain this finding. First, pancreatitis is a heterogeneous disease with multiple etiologies, including gallstone-related, alcohol-induced, and idiopathic pancreatitis. Since etiological stratification was not performed in the present study,

the presence of non-biliary causes of pancreatitis may have diluted the strength of the association.[15] Second, the definition of biliary dilatation based solely on CBD diameter may not fully reflect functional biliary obstruction, particularly in the absence of biochemical correlation with liver function tests or direct cholangiographic evaluation. From a clinical perspective, recognition of biliary dilatation on CT imaging may have practical implications.[16] Identification of dilated bile ducts in patients with pancreatitis may prompt further evaluation of the biliary tree using modalities such as magnetic resonance cholangiopancreatography (MRCP) or endoscopic retrograde cholangiopancreatography (ERCP) to exclude obstructive pathology such as choledocholithiasis or strictures.[17,18] Early detection of such conditions may help guide therapeutic decisions and prevent recurrent biliary pancreatitis.[18] The present study has several strengths. A standardized MDCT imaging protocol was used for all patients, and two experienced radiologists independently interpreted CT images. Interobserver agreement analysis demonstrated substantial reliability ($\kappa = 0.82$), supporting the reproducibility of the imaging findings. Furthermore, the use of consecutive patient inclusion helped minimize selection bias.

## LIMITATIONS

The study did not stratify patients by the underlying etiology of pancreatitis, which may have influenced the prevalence of biliary dilatation. Biochemical parameters, such as liver function tests, were not analyzed to correlate imaging findings with functional biliary obstruction. A multivariable analysis adjusting for potential confounders, such as age, gender, and etiology, was not performed. Future prospective studies incorporating clinical, biochemical, and endoscopic correlation may provide a more comprehensive understanding of the clinical significance of biliary dilatation in pancreatitis.

## CONCLUSIONS

Biliary dilatation was observed in a substantial proportion of patients with pancreatitis undergoing MDCT and showed an increasing frequency across higher CT Severity Index (CTSI) categories. Although the association between biliary dilatation and disease severity did not reach statistical significance, the observed trend suggests that biliary changes may accompany more severe pancreatic inflammatory involvement. Careful evaluation of the biliary system during CT assessment of pancreatitis may therefore help clinicians identify patients who could benefit from further biliary investigation or targeted clinical management.

**CONFLICT OF INTEREST:** None

**FUNDING SOURCES:** None

## REFERENCES

1. Walkowska J, Zielinska N, Tubbs RS, Podgórski M, Dłubek-Ruxer J, Olewnik Ł. Diagnosis and treatment of acute pancreatitis. Diagnostics (Basel). 2022;12(8):1974. https://doi.org/10.3390/diagnostics12081974 PMID: 36011125; PMCID: PMC9409874.
2. Liao Q, He WH, Li TM, Lai C, Yu L, Xia LY, et al. Evaluation of severity and prognosis of acute pancreatitis by CT severity index and modified CT severity index. Zhonghua Yi Xue Za Zhi. 2022;102(26):2011-2017. PMID: 35801833.
3. Marchegiani G, Barreto SG, Bannone E, Sarr M, Vollmer CM Jr, Connor S, et al. Postpancreatectomy acute pancreatitis (PPAP): Definition and grading from the International Study Group for Pancreatic Surgery (ISGPS). Ann Surg. 2022;275(4):663-672.https://doi.org/10.1097/SLA.0000000000005177 PMID:35089850.
4. Sun H, Jian S, Peng B, Hou J. Comparison of magnetic resonance imaging and computed tomography in the diagnosis of acute pancreatitis: A systematic review and meta-analysis of diagnostic test accuracy studies. Ann Transl Med. 2022;10(7):410. https://doi.org/10.21037/atm-22-1161 PMID: 35425659; PMCID: PMC8993495.
5. Benson M, Goncharov DA, Jain S. Diagnosis and management of acute pancreatitis in pregnancy. Clin Obstet Gynecol. 2023;66(1):237-249.https://doi.org/10.1097/GRF.0000000000000743 PMID:36640758.
6. Garg PK, Meena D, Babu D, Padhan RK, Dhingra R, Krishna A, et al. Endoscopic versus laparoscopic drainage of pseudocyst and walled-off necrosis following acute pancreatitis: A randomized trial. Surg Endosc. 2020;34(3):1157-1166. https://doi.org/10.1007/s00464-019-06804-1 PMID: 30903255.
7. Zhang Y, Bai L, Wen Y, Ke X, Xie Y, Zhang W, et al. Differential diagnosis of pancreatic cystic masses with quantitative analysis of spectral CT imaging: Initial results. Int J Radiat Res. 2021;19(1):155-165.
8. Colvin SD, Smith EN, Morgan DE, Porter KK. Acute pancreatitis: An update on the revised Atlanta classification. Abdom Radiol (NY). 2020;45(5):1222-1231.https://doi.org/10.1007/s00261-019-02301-0 PMID: 31786769.
9. Mederos MA, Reber HA, Girgis MD. Acute pancreatitis: A review. JAMA. 2021;325(4):382-390.https://doi.org/10.1001/jama.2020.20317 PMID: 33464312.
10. Ektov VN, Khodorkovsky MA, Skorynin OS, Minakov OE. Atlanta 2012 classification: Terminology and definitions in the diagnosis of acute pancreatitis. J Exp Clin Surg. 2021;14(4):325-333.
11. Lee PJ, Papachristou GI. New insights into acute pancreatitis. Nat Rev Gastroenterol Hepatol. 2019;16(8):479-496.https://doi.org/10.1038/s41575-019-0158-2 PMID: 31160720.
12. Tartari C, Poroes F, Schmidt S, Abler D, Vetterli T, Depeursinge A, et al. MRI and CT radiomics for the diagnosis of acute pancreatitis. Eur J Radiol Open. 2025;14:100636. https://doi.org/10.1016/j.ejro.2025.100636 PMID: 38874229; PMCID: PMC11589772.
13. Apisarnthanarak P, Boonsri P, Suvannarerg V, Chaiyasoot W, Pongprasobchai S, Apisarnthanarak A. Comparison of CT severity index and modified CT severity index in the clinical severity assessment of acute pancreatitis. J Health Sci Med Res. 2022;40(4):425-435. https://doi.org/10.31584/jhsmr.2022878.

14. Hameed M, Hameed S, Harvey C, Moser S, Muthusamy A. Imaging in whole-organ pancreatic transplants and a multimodality review of its complications. Br J Radiol. 2021;94(1122):20200106.https://doi.org/10.1259/bjr.20200106 PMID: 33631118; PMCID: PMC8113232.
15. Agrawal B. Diagnostic value of multidetector computed tomography in evaluation of clinically diagnosed patients of obstructive jaundice. Int J Life Sci Biotechnol Pharma Res. 2024;13:12-18.
16. Khalaf N, El-Serag HB, Abrams HR, Thrift AP. Burden of pancreatic cancer: From epidemiology to practice. Clin Gastroenterol Hepatol. 2021;19(5):876-884. https://doi.org/10.1016/j.cgh.2020.08.065 PMID: 32882383.
17. Klein AP. Pancreatic cancer epidemiology: Understanding the role of lifestyle and inherited risk factors. Nat Rev Gastroenterol Hepatol. 2021;18(7):493-502. https://doi.org/10.1038/s41575-021-00457-x PMID: 33927351.
18. Li QY, Luo Y, Chen H, Kong R, Wang YW, Li GQ, et al. Analysis of clinical features and risk factors for severe acute pancreatitis complicated with biliary system diseases. Zhonghua Wai Ke Za Zhi. 2025;63(8):713-720.

## AUTHORS CONTRIBUTION

***Ashfaq Ahmad -*** *Concept & Design; Data Acquisition; Data Analysis/Interpretation; Drafting Manuscript; Critical Revision; Final Approval*
***Ummara Siddique Umer -*** *Concept & Design; Data Acquisition; Drafting Manuscript; Supervision; Final Approval*
***Ghulam Ghaus -*** *Concept & Design; Data Acquisition; Drafting Manuscript; Critical Revision; Final Approval*
***Hira Sayed -*** *Concept & Design; Data Acquisition; Drafting Manuscript; Final Approval*
***Muhammad Hasnat -*** *Concept & Design; Data Acquisition; Drafting Manuscript; Final Approval*
***Mohsin Khan-*** *Concept & Design; Data Acquisition; Drafting Manuscript; Final Approval*
***Hadia Abid -*** *Concept & Design; Data Acquisition; Drafting Manuscript; Final Approval*

*The authors accept responsibility for all aspects of the work and will ensure that any concerns regarding the accuracy or integrity of any part are properly investigated and resolved.*