

Predictors of Choledocholithiasis in Patients Presenting with Cholecystitis: A Hospital-Based Observational Study

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Abstract

Aim: Choledocholithiasis is a critical complication of cholecystitis requiring early detection to reduce morbidity. The objective of this study was to determine dependable clinical, biochemical, and radiological markers for predicting outcomes.

Methods: This prospective observational study included 196 patients between 18 and 60 years of age. with cholecystitis at Santosh Medical College & Hospital. Data included clinical history, liver function tests, and ultrasonographic findings. Statistical analysis was done using Stata MP-17 ($p < 0.05$).

Results: Choledocholithiasis was found in 41 patients (20.9%). Significant predictors included age > 40 years, female sex, diabetes, and hypertension. Elevated SGOT, SGPT, ALP, GGT, and bilirubin levels were associated. Radiological markers such as CBD diameter > 8 mm, gallbladder distension, and multiple stones were also predictive. A diagnostic algorithm using these variables showed utility in guiding further imaging or ERCP.

Conclusion: Routine lab tests and ultrasound can effectively predict choledocholithiasis. A stepwise approach may reduce unnecessary ERCPs and improve outcomes.

Keywords: Cholecystitis, Liver Enzymes, CBD Stones.

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Introduction

Acute calculous cholecystitis (ACC) is the most common complication of gallstones, accounting for 14–30% of cholecystectomies¹. Patients with symptomatic gallstones are more likely to develop ACC and other complications such as pancreatitis and choledocholithiasis (CDL) [1].

Initial lab tests in suspected cholecystitis often show mild elevations in liver enzymes, but significant increases in bilirubin or alkaline phosphatase may raise suspicion of coexisting CBD stones². Imaging techniques like EUS, MRCP, IOC, or ERCP are used to evaluate CDL, but they can be costly, invasive, and delay surgery [2].

The reported incidence of choledocholithiasis in acute cholecystitis varies, and diagnosing it remains challenging. Inflammatory changes may alter liver tests, and ultrasound has limited sensitivity for CBD stones³. Elevated bilirubin

often triggers the question of whether ERCP is needed before surgery [3].

This study aims to identify clinical, biochemical, and radiological predictors of choledocholithiasis in cholecystitis patients and proposes a diagnostic algorithm to improve early detection, guide imaging decisions, and reduce unnecessary ERCPs.

Materials and Methods

Study Design and Setting: This prospective observational study was conducted over a 12-month period, from September 2023 to September 2024, at a tertiary care hospital in the Delhi NCR region.

Study Population: Patients aged 18 to 60 years with a preoperative clinical diagnosis of cholecystitis were enrolled. Informed consent was obtained from all participants, and the study

received ethical clearance from the institutional ethics committee.

Study Procedure: This prospective observational study enrolled patients between 18 and 60 years of age who had both clinical and radiological evidence of acute or chronic cholecystitis.

Patients with asymptomatic cholelithiasis, gallstone-induced pancreatitis, acalculous cholecystitis, gallbladder malignancy, or those unwilling to participate were excluded.

Data were collected using a structured proforma that captured demographic details, clinical history (including age, sex, comorbidities such as diabetes and hypertension, and any previous episodes of cholecystitis, and findings from physical examination (palpable gallbladder). Laboratory

investigations included total leukocyte count (TLC), liver function tests (SGOT, SGPT, ALP, GGT, and total bilirubin), serum albumin and lipase. Radiological evaluation was performed using abdominal ultrasonography, with MRCP or CT used selectively for the presence of CBD stones, CBD diameter, and gallbladder condition, were also documented.

Data Stratification: Patients were categorized into choledocholithiasis or non-choledocholithiasis groups based on preoperative imaging, laboratory findings and intraoperative findings.

Result: Out of 196 patients included in the study, 41 (20.9%) were diagnosed with choledocholithiasis based on intraoperative and/or preoperative radiological findings (Figure 1).

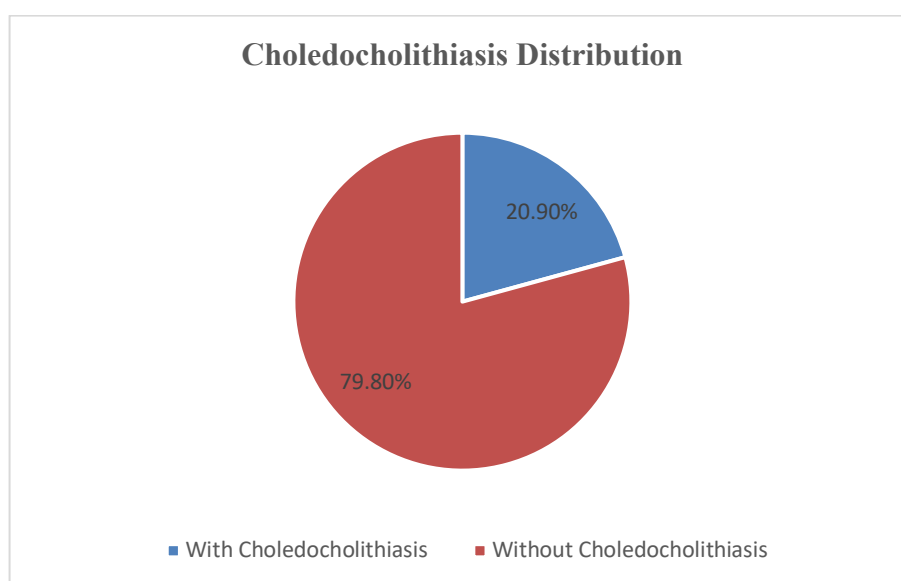


Figure 1: Choledocholithiasis Distribution

In this study, choledocholithiasis was most frequently observed in patients aged 51 to 60 years, accounting for 41.4% of cases, indicating a rising risk with advancing age.

Table 2: Demographics & Clinical Features in Choledocholithiasis cohort

Parameter	Frequency	%
Age 51–60	17	41.4
Female	30	73.1
Any Comorbidity	22	53.7
Palpable Gallbladder	4	9.7

A marked female predominance was evident, with 73.1% of patients in the choledocholithiasis group being women, consistent with the established higher prevalence of gallstone-related conditions among females. Comorbidities were frequently observed, with 53.7% of patients having at least one associated condition. Specifically, diabetes mellitus and hypertension were present in 24.3% of patients each, while 4.8% had both comorbidities

concurrently. These findings highlight the potential contributory role of metabolic and cardiovascular risk factors in the development of choledocholithiasis. Patients with Choledocholithiasis have higher liver enzyme level and signs of biliary obstruction when compared to those without the condition. Radiological evaluation revealed several key features associated with choledocholithiasis.

Table 3: Biochemical Differences

Parameter	With CBD Stone	Without CBD Stone	p-value
SGOT	76.4 ± 64.4	29.4 ± 11.9	<0.001
SGPT	86.6 ± 63.7	28.2 ± 16.2	<0.001
ALP	420.2 ± 286.5	144.3 ± 46.3	<0.001
Total Bilirubin	4.82 ± 0.25	0.94 ± 0.14	<0.001
GGTP	184.6 ± 198.2	107.5 ± 43.4	0.01

Gallbladder distension was noted in 73.1% of patients, indicating a likely acute biliary obstruction.

Regarding the gallstone profile, multiple gallstones were observed in 63.4% of cases, whereas single stones were present in 9.7%, and 26.8% of patients had no visible stones on imaging. Common bile

duct (CBD) diameter was another significant finding: 7.3% of patients had a diameter <8 mm, 48.7% had diameters between 8–10 mm, and 43.9% had a diameter ≥10 mm.

A CBD diameter greater than 8 mm showed a strong correlation with the presence of choledocholithiasis (table 4).

Table 4: Gallbladder & CBD Findings in Choledocholithiasis cohort

Feature	Frequency	%
Distended Gallbladder	30	73.1
Multiple GB Stones	26	63.4
CBD >8mm	38	92.6
Single CBD Stone	27	65.8

Discussion

Acute calculous cholecystitis is one of the most frequent complications arising from symptomatic gallstone disease, often associated with choledocholithiasis, cholangitis, or biliary pancreatitis. In our study, choledocholithiasis was present in 20.9% of patients with acute cholecystitis, aligning with global reports of 10–20%, and emphasizing the need for routine evaluation of the CBD in such cases. Comparable incidences were reported by Chisholm et al. (17.8%) [2] and Siddhartha et al. (36.4%) [5], reinforcing the clinical significance of this association.

A notable age-related trend was observed, with 41.4% of cases in the 51–60 years group, and over 60% above 40 years, consistent with previous findings (Gouveia et al. – 68 years; Siddhartha et al. – 49.89 years [5]; Chisholm et al. – 52 years [2]). Females constituted 73.1% of choledocholithiasis cases, which correlates with known hormonal influences. However, male predominance was noted in studies by Gouveia et al. [6], Siddhartha et al. [5], and Chisholm et al. [2], suggesting possible population-based differences.

Comorbidities like diabetes and hypertension were seen in 53.7%, possibly contributing to bile stasis and gallstone migration. Physical signs like a palpable gallbladder were found in only 9.7%, indicating low sensitivity; imaging remains crucial. Radiological features included gallbladder distension (73.1%), multiple stones (63.4%), and CBD dilatation, with 48.7% between 8–10 mm and 43.9% >10 mm. Single CBD stones (65.8%) were

more frequent than multiple (34.1%). These features correlate with the risk of obstruction but should be interpreted alongside biochemical data. Liver enzymes and bilirubin were elevated statically, indicating cholestasis and hepatocellular injury, consistent with Chisholm et al. [2], Siddhartha et al. [5], Gouveia et al. [6], and Yuen et al. [7]. Albumin levels remained stable, suggesting preserved liver function.

Common imaging patterns included cholelithiasis with choledocholithiasis (24.4%) and intrahepatic biliary radicle dilatation (17.1%). Rare findings included Mirizzi's syndrome and biliary strictures, necessitating individualized diagnostic approaches. Open CBD exploration was required in 60.97%, while ERCP with cholecystectomy was done in 39.02%, highlighting a balance between open and minimally invasive techniques based on case complexity.

A moderate correlation ($r = 0.44$) between CBD diameter and GGTP suggests GGTP as a useful marker. Weak correlations with lipase indicate its limited diagnostic value. The minimal concordance between imaging and biochemical markers emphasizes the need for integrated diagnostic strategies.

Conclusion

A multimodal approach incorporating biochemical, clinical, and ultrasound findings effectively predicts choledocholithiasis. This strategy can streamline preoperative planning, reduce ERCP burden, and improve patient outcomes.

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