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Original Research Article

DIAGNOSTIC UTILITY OF SERUM LIVER ENZYMES AND BILIRUBIN LEVELS IN DIFFERENTIATING BILIARY AND NON-BILIARY ACUTE PANCREATITIS: A BIOCHEMICAL PERSPECTIVE

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Abstract

Background: Early differentiation between biliary and non-biliary acute pancreatitis is essential for appropriate management. Biochemical markers such as liver enzymes and bilirubin may aid in identifying biliary aetiology, especially when imaging is inconclusive.

Objectives: To evaluate the diagnostic utility of serum liver enzymes and bilirubin levels in differentiating biliary and non-biliary acute pancreatitis.

Materials and Methods: This prospective observational study was conducted over one year at JLN Medical College, Ajmer, and included 200 patients with acute pancreatitis. Patients were classified into biliary and non-biliary groups based on clinical, biochemical, and imaging findings. Serum AST, ALT, ALP, GGT, total and direct bilirubin levels were measured at admission and compared between groups. Statistical analysis was performed to assess diagnostic accuracy.

Results: Of the 200 patients, 90 (45%) had biliary and 110 (55%) had non-biliary acute pancreatitis. Serum AST, ALT, ALP, GGT, and bilirubin levels were significantly higher in biliary pancreatitis ($p < 0.001$). ALT demonstrated the highest diagnostic accuracy, with values >150 IU/L showing good sensitivity and specificity for predicting biliary aetiology.

Conclusion: Liver enzymes and bilirubin levels are valuable biochemical tools for early differentiation of biliary acute pancreatitis, with serum ALT being the most reliable marker. Their routine assessment can support timely etiological diagnosis and management.

Keywords: Acute pancreatitis; Biliary pancreatitis; Liver enzymes; Alanine aminotransferase; Bilirubin; Etiological diagnosis.

Introduction

Acute pancreatitis is a common gastrointestinal emergency with a wide spectrum of clinical presentation, ranging from mild, self-limiting disease to severe, life-threatening illness associated with significant morbidity and mortality [1]. The global incidence of acute pancreatitis has been rising over the past few decades, placing an increasing burden on healthcare

systems, particularly in developing countries [2].

Gallstone disease and alcohol consumption are the two most common etiological factors responsible for acute pancreatitis, together accounting for nearly 70–80% of cases worldwide [3]. In India, biliary pancreatitis constitutes a substantial proportion of cases, especially among females, whereas alcohol-related pancreatitis is more prevalent among males [4]. Early differentiation between biliary and non-biliary causes of acute pancreatitis is crucial, as management strategies and prognosis differ significantly between the two groups.

Biliary acute pancreatitis results from transient or persistent obstruction of the common bile duct by gallstones or biliary sludge, leading to reflux of bile and pancreatic enzyme activation within the pancreas [5]. Prompt identification of a biliary aetiology allows early intervention, such as endoscopic retrograde cholangiopancreatography (ERCP) or cholecystectomy, which can reduce complications and prevent recurrence [6]. However, imaging modalities such as ultrasonography may fail to detect small gallstones or sludge, particularly in the early stages of the disease [7]. Biochemical markers, especially liver enzymes and serum bilirubin levels, have been extensively studied as non-invasive tools for identifying biliary obstruction in acute pancreatitis. Elevated serum alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), gamma-glutamyl transferase (GGT), and bilirubin levels are suggestive of biliary involvement [8]. Among these, an ALT level greater than 150 IU/L within the first 48 hours of symptom onset has been reported to have high specificity for biliary pancreatitis [9].

Despite the availability of advanced imaging techniques, early biochemical evaluation remains an accessible, cost-effective, and rapid diagnostic approach, particularly in resource-limited settings. However, the diagnostic accuracy of individual liver enzymes and bilirubin levels varies across different populations and clinical settings [10]. Therefore, further evaluation of their diagnostic utility is essential to optimise early etiological classification of acute pancreatitis.

The present study was undertaken to assess the diagnostic utility of serum liver enzymes and bilirubin levels in differentiating biliary and non-biliary acute pancreatitis from a biochemical perspective in patients admitted to a tertiary care centre.

Materials and Methods

Study Design and Setting: This was a prospective observational study conducted over 1 year at Jawaharlal Nehru (JLN) Medical College and Associated Group of Hospitals, Ajmer, Rajasthan, a tertiary care teaching hospital serving both urban and rural populations.

Study Population and Sample Size: A total of 200 consecutive patients diagnosed with acute pancreatitis and admitted to the Department of Medicine and General Surgery during the study period were included. Patients were evaluated within 24 hours of hospital admission.

Inclusion Criteria

- Patients aged 18 years and above
- Newly diagnosed cases of acute pancreatitis, based on the presence of at least two of the following three criteria:

1. Typical abdominal pain suggestive of acute pancreatitis
2. Serum amylase and/or lipase levels ≥3 times the upper limit of normal
3. Imaging findings (ultrasonography or contrast-enhanced CT abdomen) consistent with acute pancreatitis

- Patients willing to provide informed consent

Exclusion Criteria

- Patients with chronic pancreatitis
- Known cases of chronic liver disease, viral hepatitis, or cirrhosis
- History of hepatobiliary malignancy
- Patients with drug-induced liver injury
- Pregnant patients
- Patients presenting more than 72 hours after symptom onset

Etiological Classification

Based on clinical evaluation, biochemical parameters, and imaging findings, patients were classified into two groups:

- Biliary acute pancreatitis: Presence of gallstones or biliary sludge on ultrasonography and/or elevated liver enzymes suggestive of biliary obstruction
- Non-biliary acute pancreatitis: Acute pancreatitis due to other etiologies such as alcohol, hypertriglyceridemia, post-ERCP, or idiopathic causes, with absence of biliary pathology on imaging

Data Collection: Detailed demographic and clinical data, including age, sex, presenting symptoms, alcohol intake, and comorbidities, were recorded using a pre-designed proforma.

Biochemical Assessment: Venous blood samples were collected at the time of admission for estimation of the following biochemical parameters:

- Serum Aspartate Aminotransferase (AST)
- Serum Alanine Aminotransferase (ALT)
- Serum Alkaline Phosphatase (ALP)
- Serum Gamma-Glutamyl Transferase (GGT)
- Serum Total Bilirubin and Direct Bilirubin
- Serum Amylase and Lipase

All biochemical analyses were performed in the central clinical biochemistry laboratory using standard automated analysers and commercially available kits, following manufacturer guidelines and internal quality control protocols.

Imaging Studies: All patients underwent abdominal ultrasonography at admission to assess gallbladder and biliary tract pathology. Contrast-enhanced CT (CECT) of the abdomen was performed when clinically indicated to confirm the diagnosis and assess severity.

Outcome Measures: The primary outcome measure was the diagnostic utility of serum liver enzymes and bilirubin levels in differentiating biliary from non-biliary acute pancreatitis. Specific biochemical cut-off values, particularly ALT levels, were evaluated for their sensitivity and specificity.

Statistical Analysis: Data were entered into Microsoft Excel and analysed using SPSS software 25. Continuous variables were expressed as mean ± standard deviation, while categorical variables were expressed as frequencies and percentages.

- Student's t-test or Mann–Whitney U test was used for comparison of continuous variables
- Chi-square test was used for categorical variables
- Receiver Operating Characteristic (ROC) curve analysis was performed to assess diagnostic accuracy. A p-value <0.05 was considered statistically significant.

Ethical Considerations: The study was conducted after obtaining approval from the Institutional Ethics Committee, JLN Medical College, Ajmer. Written informed consent was obtained from all participants before enrollment. Patient confidentiality was strictly maintained throughout the study.

Results and Observations: A total of 200 patients diagnosed with acute pancreatitis were included in the study. Based on clinical, biochemical, and radiological evaluation, patients were categorised into biliary acute pancreatitis and non-biliary acute pancreatitis groups.

Table 1: Distribution of Patients According to Aetiology

Aetiology of Acute Pancreatitis	Number of Patients (n)	Percentage (%)
Biliary	90	45.0
Non-biliary	110	55.0
Total	200	100

Non-biliary acute pancreatitis was slightly more common than biliary pancreatitis in the present study.

Table 2: Age and Sex Distribution of Study Population

Variable	Biliary (n = 90)	Non-biliary (n = 110)	Total (n = 200)
Mean age (years)	48.6 ± 12.4	42.3 ± 11.8	45.1 ± 12.3
Male	32 (35.6%)	78 (70.9%)	110 (55.0%)
Female	58 (64.4%)	32 (29.1%)	90 (45.0%)

Biliary pancreatitis showed a female predominance, whereas non-biliary pancreatitis was more common among males.

Table 3: Comparison of Serum Liver Enzymes Between Biliary and Non-Biliary Groups

Biochemical Parameter	Biliary (Mean ± SD)	Non-biliary (Mean ± SD)	P-value
AST (IU/L)	186.4 ± 72.1	94.6 ± 48.3	<0.001
ALT (IU/L)	214.8 ± 85.7	88.9 ± 41.2	<0.001
ALP (IU/L)	312.6 ± 96.5	186.7 ± 72.8	<0.001
GGT (IU/L)	268.9 ± 110.3	132.5 ± 64.7	<0.001

Serum AST, ALT, ALP, and GGT levels were significantly higher in biliary acute pancreatitis compared to non-biliary pancreatitis.

Table 4: Comparison of Serum Bilirubin Levels Between the Two Groups

Bilirubin Parameter	Biliary (Mean ± SD)	Non-biliary (Mean ± SD)	P-value
Total Bilirubin (mg/dL)	3.1 ± 1.4	1.2 ± 0.6	<0.001
Direct Bilirubin (mg/dL)	1.9 ± 0.8	0.6 ± 0.3	<0.001

Both total and direct bilirubin levels were significantly elevated in biliary pancreatitis, reflecting biliary obstruction.

Table 5: Diagnostic Performance of ALT (>150 IU/L) in Predicting Biliary Pancreatitis

Parameter	Value
Sensitivity	82.2%
Specificity	78.1%
Positive Predictive Value (PPV)	75.6%
Negative Predictive Value (NPV)	84.2%
Diagnostic Accuracy	80.0%

An ALT level >150 IU/L showed good sensitivity and specificity in differentiating biliary from non-biliary acute pancreatitis.

Table 6: ROC Curve Analysis of Liver Enzymes for Biliary Aetiology

Parameter	Area Under Curve (AUC)
ALT	0.88
AST	0.82
ALP	0.79
GGT	0.81
Total Bilirubin	0.85

ALT demonstrated the highest diagnostic accuracy among the studied biochemical parameters.

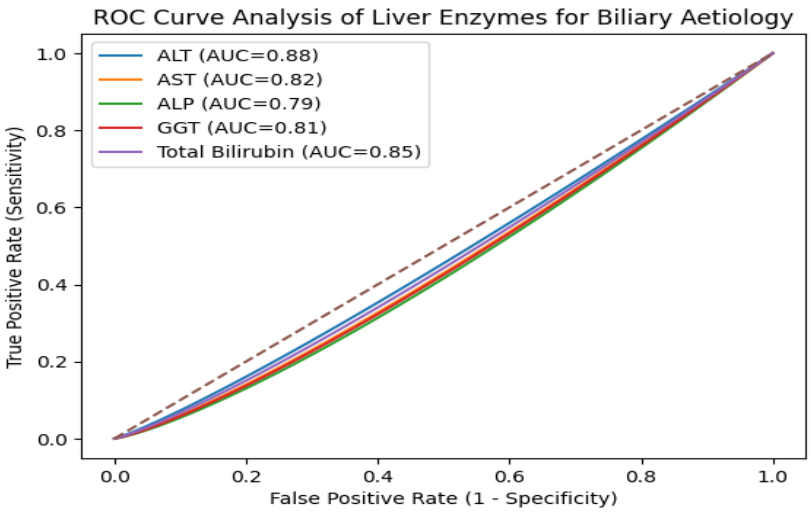

Figure 1: ROC Curve Analysis of Liver Enzymes for Biliary Aetiology

Discussion

Early etiological differentiation of acute pancreatitis remains a critical step in guiding management and preventing recurrence. The present study evaluated the diagnostic utility of serum liver enzymes and bilirubin levels in distinguishing biliary from non-biliary acute pancreatitis and demonstrated that these biochemical parameters provide valuable early diagnostic clues.

In the present study, biliary acute pancreatitis accounted for 45% of cases, which is comparable to earlier Indian and international studies reporting biliary etiology in 40–60% of patients [11,12]. The observed female predominance in biliary pancreatitis and male predominance in non-biliary pancreatitis aligns with established epidemiological patterns, reflecting the higher prevalence of gallstone disease among females and alcohol-related pancreatitis among males [13]. Significantly higher levels of AST, ALT, ALP, and GGT were observed in patients with biliary pancreatitis compared to the non-biliary group. These findings support the pathophysiological mechanism of transient biliary obstruction leading to hepatocellular injury and cholestasis [14]. Among the liver enzymes studied, ALT emerged as the most reliable marker, showing the highest mean values and diagnostic accuracy, consistent with previous studies [15,16].

An ALT level greater than 150 IU/L demonstrated good sensitivity and specificity for predicting biliary aetiology in acute pancreatitis in the present study. Similar observations have been reported by Anderson et al. and other authors, who highlighted ALT as a strong biochemical predictor, especially when measured within the first 48 hours of symptom onset [9,17]. This reinforces the clinical usefulness of early ALT estimation as a simple and cost-effective diagnostic tool.

Serum bilirubin levels, both total and direct, were significantly elevated in biliary pancreatitis, reflecting obstruction at the level of the common bile duct. Elevated bilirubin has been shown to correlate with persistent biliary obstruction and may indicate the need for early endoscopic intervention [18]. However, bilirubin alone lacks sufficient sensitivity, particularly in cases with transient obstruction, and is best interpreted in conjunction with liver enzymes and imaging findings [19]. Receiver operating characteristic (ROC) curve analysis in the present study further confirmed the

superior diagnostic performance of ALT, followed by totalS bilirubin and AST. These results are in agreement with earlier reports that recommend combining biochemical markers to enhance diagnostic accuracy rather than relying on a single parameter [20].

Imaging modalities, particularly abdominal ultrasonography, remain the first-line investigation for detecting gallstones; however, their sensitivity may be limited in the acute setting due to bowel gas or small stones [7]. In such scenarios, biochemical markers play a crucial complementary role and may prompt further evaluation with advanced imaging or early therapeutic interventions. The findings of the present study highlight the importance of early biochemical assessment in acute pancreatitis, especially in resource-limited settings where advanced imaging may not be readily available. Prompt identification of biliary aetiology allows early cholecystectomy or ERCP, thereby reducing morbidity, hospital stay, and recurrence rates [6,21].

Conclusion

Serum liver enzymes and bilirubin levels are useful, readily available markers for differentiating biliary from non-biliary acute pancreatitis. Elevated ALT, particularly values >150 IU/L, showed the highest diagnostic accuracy for biliary aetiology. Early biochemical assessment can aid prompt etiological diagnosis and guide timely management, especially in settings with limited imaging facilities.

References

1. Banks PA, Freeman ML. Practice guidelines in acute pancreatitis. Am J Gastroenterol. 2006;101(10):2379-2400.
2. Yadav D, Lowenfels AB. The epidemiology of pancreatitis and pancreatic cancer. Gastroenterology. 2013;144(6):1252-1261.
3. Tenner S, Baillie J, DeWitt J, Vege SS. American College of Gastroenterology guideline: management of acute pancreatitis. Am J Gastroenterol. 2013;108(9):1400-1415.
4. Tandon RK, Garg PK. Oxidative stress in chronic pancreatitis: pathophysiological relevance and management. Indian J Gastroenterol. 2011;30(2):77-82.
5. Opie EL. The etiology of acute hemorrhagic pancreatitis. Bull Johns Hopkins Hosp. 1901;12:182-188.
6. van Santvoort HC, Besselink MG, Bakker OJ, et al. Early endoscopic retrograde cholangiopancreatography in predicted severe acute biliary pancreatitis. N Engl J Med. 2010;362(16):1491-1502.
7. Hazem ZM. Acute biliary pancreatitis: diagnosis and treatment. Saudi J Gastroenterol. 2009;15(3):147-155.
8. Gullo L, Migliori M, Oláh A, et al. Acute pancreatitis in five European countries: etiology and mortality. Pancreas. 2002;24(3):223-227.
9. Anderson K, Brown LA, Daniel P. Alanine transaminase rather than abdominal ultrasound alone is an indicator of gallstone pancreatitis. Br J Surg. 2010;97(7):1030-1035.
10. Lankisch PG, Apte M, Banks PA. Acute pancreatitis. Lancet. 2015;386(9988):85-96.
11. Gullo L, Migliori M, Oláh A, et al. Acute pancreatitis in five European countries: aetiology and mortality. *Pancreas*. 2002;24(3):223-227.
12. Balakrishnan V, Unnikrishnan AG, Thomas V, et al. Chronic pancreatitis: a prospective nationwide study of 1,086 subjects from India. *JOP*. 2008;9(5):593-600.
13. Yadav D, Whitcomb DC. The role of alcohol and smoking in pancreatitis. Nat Rev Gastroenterol Hepatol. 2010;7(3):131-145.
14. Lerch MM, Gorelick FS. Models of acute and chronic pancreatitis. Gastroenterology. 2013;144(6):1180-1193.

15. Ammori BJ, Boreham B, Lewis P, et al. The biochemical detection of biliary aetiology in acute pancreatitis. Pancreas. 2003;26(4):331-337.
16. Liu CL, Fan ST, Lo CM, et al. Acute biliary pancreatitis: diagnosis and management. World J Surg. 1997;21(3):328-332.
17. Anderson K, Brown LA, Daniel P. Alanine transaminase rather than abdominal ultrasound alone is an indicator of gallstone pancreatitis. Br J Surg. 2010;97(7):1030-1035.
18. Neoptolemos JP, Carr-Locke DL, London NJ, et al. Controlled trial of urgent ERCP and endoscopic sphincterotomy versus conservative treatment for acute pancreatitis. Lancet. 1988;2(8618):979-983.
19. Lankisch PG, Weber-Dany B, Maisonneuve P, Lowenfels AB. Frequency and severity of acute pancreatitis in chronic alcoholics. Pancreatology. 2009;9(3):227-231.
20. Papachristou GI, Clermont G, Sharma A, et al. Risk and markers of severe acute pancreatitis. Gastroenterol Clin North Am. 2007;36(2):277-296.
21. Aboulian A, Chan T, Yaghoubian A, et al. Early cholecystectomy safely decreases hospital stay in mild gallstone pancreatitis. Arch Surg. 2010;145(10):906-909.