CHARACTERISTICS OF BLOOD LIPID DISORDERS AND PANCREATIC ENZYME LEVELS IN ACUTE PANCREATITIS PATIENTS AT THAI BINH GENERAL HOSPITAL

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ABSTRACT

Objective: To investigate blood lipid disorders and pancreatic enzyme levels in acute pancreatitis patients at Thai Binh General Hospital.

Method: A cross-sectional retrospective study on 139 acute pancreatitis patients hospitalized from May 2025 to December 2025. Blood lipid and pancreatic enzyme levels were collected within the first 48 hours of hospitalization.

Results: Hypertriglyceridemia was found in more than half of the patients, with 20.9% experiencing a significant increase. 51.1% had elevated total cholesterol. Lipase was elevated ≥3 times the upper limit more frequently than amylase (71.9% vs. 36.0%). Blood lipid disorders were more common in patients with a BMI ≥25, while pancreatic enzyme levels did not differ according to BMI or etiology.

Conclusion: Blood lipid disorders, especially elevated triglycerides, are commonly observed in acute pancreatitis. Lipase has a higher diagnostic value than amylase and should be prioritized.

Keywords: Acute pancreatitis; triglycerides; total cholesterol; amylase; lipase.

I. INTRODUCTION

Acute pancreatitis is a common acute digestive disorder that can progress severely and lead to many dangerous complications if not diagnosed and treated promptly. Although age-standardized incidence rates tend to decrease, the number of new cases and the global burden of disease from acute pancreatitis continue to rise, particularly in developing countries [1].

Alcohol and gallstones are the two leading causes of acute pancreatitis; additionally, elevated blood triglycerides have increasingly been recognized as an important etiology and are trending upwards alongside metabolic disorders and obesity [2]. Many studies have shown that the risk of acute pancreatitis significantly increases when triglyceride levels are ≥ 11.3 mmol/L, and blood lipid disorders can also exacerbate the disease progression even if they are not the primary cause [3].

In the diagnosis of acute pancreatitis, amylase and lipase are commonly used pancreatic enzymes, with lipase demonstrating higher sensitivity and specificity, especially in patients with acute pancreatitis due to elevated triglycerides [4]. However, the relationship between blood lipid components and the level of pancreatic enzyme elevation remains inconsistent across studies.

In Vietnam, particularly in provincial hospitals, data on blood lipid disorders and pancreatic enzyme levels in acute pancreatitis patients are still limited. Therefore, this study was conducted to investigate the characteristics of blood lipids and pancreatic enzymes in acute pancreatitis patients treated at Thai Binh General Hospital, contributing to providing scientific evidence for diagnosis and clinical practice.

II. STUDY SUBJECTS AND METHODS

2.1. Study Subjects

Medical records of patients diagnosed with acute pancreatitis who were hospitalized and treated at Thai Binh General Hospital from May 2025 to December 2025.

Inclusion Criteria: Patients diagnosed with acute pancreatitis according to the Atlanta 2012 criteria, meeting ≥2/3 of the following criteria: typical abdominal pain; serum amylase and/or lipase levels elevated ≥3 times the upper normal limit; imaging showing pancreatitis on ultrasound/ CT/MRI. Complete blood lipid tests (TG, TC, HDL-C, LDL-C) and pancreatic enzymes (amylase, lipase) must be performed within the first 48 hours of hospitalization.

Exclusion Criteria: Lack of necessary tests within the first 48 hours; pregnant women; terminal cancer or severe acute illness affecting test results; use of medications that significantly affect blood lipids or pancreatic enzymes within 1 month prior to hospitalization.

2.2. Research Methodology

Design: A retrospective cross-sectional descriptive study.

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The sample size was calculated using the formula

$$n = Z^2_{(1-\alpha/2)} \frac{p(1-p)}{d^2}$$

Select α=0,05, $Z_{(1-\alpha/2)}$=1,96, p=0,1471 [5] based on the prevalence of hypertriglyceridemia-associated acute pancreatitis reported in a previous study conducted at Thai Nguyen Central Hospital [Pham NQ, Le TTH, 2024], d = 0.06 (allowable margin of error)

Substituting the values, the minimum required sample size was n = 139 patients

Sampling Method: All medical records that met the inclusion criteria and did not fall under the exclusion criteria during the study period were selected.

Study Variables and Indicators

General Characteristics: Age; gender; BMI (kg/m²: <18.5; 18.5–24.9; ≥25); underlying diseases/medical history; etiology of acute pancreatitis (alcohol, gallstones, elevated triglycerides, others).

Total cholesterol (TC), triglycerides (TG), high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol (LDL-C) were measured.

Lipid parameters were interpreted according to the 2019 ESC/EAS Guidelines [6] for the management of dyslipidaemias, combined with institutional laboratory reference ranges.

TG ≥ 1.7 mmol/L: considered elevated

Other lipid parameters (TC, HDL-C, LDL-C): interpreted within the ESC/EAS 2019 cardiovascular risk-based framework and local laboratory reference intervals.

Pancreatic Enzymes (U/L): Amylase, lipase; the ratio of levels increased ≥3× the upper limit of normal (ULN according to the Thai Binh General Hospital laboratory).

Research Indicators:

Describe the general characteristics of the study subjects.

Describe the characteristics of blood lipid disorders and pancreatic enzyme levels.

Compare blood lipid levels and the rate of pancreatic enzyme elevation by gender, BMI, and etiology of acute pancreatitis.

Data Collection and Analysis:

Data were retrospectively collected from medical records and the hospital's laboratory system, entered, and processed using statistical software. Quantitative variables are presented as mean ± SD or median (IQR); qualitative variables are presented as frequency and percentage (%). Comparisons between groups were made using appropriate statistical tests; $p < 0.05$ was considered statistically significant.

2.3. Research Ethics

This is a retrospective study with no therapeutic intervention. Patient information was anonymized, kept confidential, and used solely for research purposes, in compliance with current ethical regulations in biomedical research.

III. RESULTS

Table 1. Age, Gender and BMI Characteristics of the Study Subjects

Characteristics		Frequency (n)	Percentage (%)
Age		50 ± 12.3	
Gender	Male	117	84.2
	Female	22	15.8
BMI	BMI < 18.5	17	12.2
	BMI 18.5–24.9	96	69.1
	BMI ≥ 25	26	18.7

Comments: The study population primarily consists of middle-aged men. The average BMI is within the normal range, with most patients having a BMI between 18.5–24.9. The proportion of overweight patients is less than 20%, while the underweight group represents a small proportion.

Table 2. Underlying Diseases and Medical History

Underlying Disease / Medical History	Frequency (n)	Percentage (%)
Metabolic disorders (Diabetes, dyslipidemia, obesity)	12	8.6
Cardiovascular diseases (Hypertension, coronary artery disease)	7	5.0

Underlying Disease / Medical History	Frequency (n)	Percentage (%)
Liver – biliary diseases (Cirrhosis, chronic gallstones, viral hepatitis)	18	12.9
Chronic kidney disease	0	0.0
History of acute pancreatitis	23	16.5
No underlying diseases	79	56.8

Comments: The majority of patients did not have any underlying diseases. Among the recorded diseases, a history of acute pancreatitis and liver – biliary diseases were more common, while cardiovascular diseases were less prevalent, and no cases of chronic kidney disease were found.

Table 3. Etiology of Acute Pancreatitis

Etiology	Frequency (n)	Percentage (%)
Gallstones	15	10.8
Alcohol	72	51.8
Elevated triglycerides	40	28.8
Other	12	8.6
Total	139	100.0

Comments: The most common cause of acute pancreatitis is alcohol (51.8%), followed by elevated triglycerides (28.8%). Gallstones account for 10.8%, and other causes make up 8.6% of the study population.

Table 4. Distribution of Blood Lipid Levels in Acute Pancreatitis Patient

Lipid Index	Frequency (n)	Percentage (%)	Mean ± SD (mmol/L)	Median (IQR)	Min – Max (mmol/L)
Triglycerides (TG)	139	100	9 ± 14.1	3.9 (8.1)	0.4 – 97.3
< 1,7 (mmol/L)	32	23	1.0 ± 0.3	1.1 (0.5)	0.4 – 1.5
1,7 – 2,2 (mmol/L)	11	7.9	1.8 ± 0.1	1.8 (0.1)	1.7 – 2
2,3 – 5,6 (mmol/L)	44	31.7	3.6 ± 1.0	3.5 (1.7)	2.3 – 5.5
5,7 – 11,2 (mmol/L)	23	16.5	8.1 ± 1.8	7.8 (3.3)	5.7 – 11.1
> 11,2 (mmol/L)	29	20.9	29.4 ± 20.1	22.9 (22.9)	11.3 – 97.3
Total Cholesterol (TC)	139	100	6.7 ± 4.2	5.3 (3.4)	1.5 – 23
< 5.2 mmol/L	68	48.9	4.0 ± 0.8	4.1 (1.1)	1.5 – 5.1
≥ 5.2	71	51.1	9.3 ± 4.5	7.5 (5.7)	5.3 – 23

Comments: Triglyceride levels are significantly elevated, with 68.1% of patients having TG ≥ 2.3 mmol/L and 20.9% with very high levels (> 11.2 mmol/L). Total cholesterol is also commonly elevated, with 51.1% of patients having TC ≥ 5.2 mmol/L.

Table 5. Distribution of Pancreatic Enzyme Levels and the Rate of Elevation ≥ 3×ULN (Amylase and Lipase)

Index	Mean ± SD (U/L)	Median (IQR)	Min – Max (U/L)	Elevation ≥ 3×ULN - n (%)
Amylase	451.5 ± 670.1	168.0 (516.0)	16.8 – 5099.7	50.0 (36.0%)
Lipase	1114.5 ± 1915.8	444.0 (1175.7)	16.2 – 16856.3	100.0 (71.9%)

Comments: Both amylase and lipase levels show a right-skewed distribution with a wide range of values. The rate of elevation ≥ 3×ULN for lipase (71.9%) is significantly higher than that for amylase (36.0%), indicating that lipase has a higher sensitivity in diagnosing acute pancreatitis.

Table 6. Lipid and Pancreatic Enzyme Indices by Gender

Sex / Index	Male		Female		p
	n	%	n	%	
TG	117	84.2	22	15.8	0.514
< 1,7 (mmol/L)	26	81.3	6	18.8	-

Index \ Sex	Male		Female		p
	n	%	n	%	
1,7 – 2,2 (mmol/L)	8	72.7	3	27.3	-
2,3 – 5,6 (mmol/L)	40	90.9	4	9.1	-
5,7 – 11,2 (mmol/L)	19	82.6	4	17.4	-
> 11,2 (mmol/L)	24	82.8	5	17.2	-
TC	117	84.2	22	15.8	0.199
<5,2 (mmol/L)	60	88.2	8	11.8	-
≥ 5,2 (mmol/L)	57	80.3	14	19.7	-
Amylase	117	84.2	22	15.8	0.014
< 3×ULN (U/L)	80	89.9	9	10.1	-
≥ 3×ULN (U/L)	37	74	13	26	-
Lipase	117	84.2	22	15.8	0.929
< 3×ULN (U/L)	33	84.6	6	15.4	-
≥ 3×ULN (U/L)	84	84	16	16	-

Comments: The distribution of triglycerides and total cholesterol by gender did not show a statistically significant difference (TG: p = 0.514; TC: p = 0.199). The rate of amylase elevation ≥ 3×ULN differs significantly by gender (p = 0.014), with females making up 26.0% of the group with increased amylase ≥ 3×ULN (13/50), despite accounting for only 15.8% of the total study population. In contrast, the rate of lipase elevation ≥ 3×ULN did not differ significantly between genders (p = 0.929).

Table 7. Lipid and Pancreatic Enzyme Indices by BMI

Index \ BMI	<18,5		18,5 – 24,9		≥ 25		p
	n	%	n	%	n	%	
TG	17	12.2	96	69.1	26	18.7	0.037
< 1,7 (mmol/L)	6	18.8	25	78.1	1	3.1	-
1,7 – 2,2 (mmol/L)	3	27.3	6	54.5	2	18.2	-
2,3 – 5,6 (mmol/L)	6	13.6	29	65.9	9	20.5	-
5,7 – 11,2 (mmol/L)	0	0	16	69.6	7	30.4	-
> 11,2 (mmol/L)	2	6.9	20	69	7	24.1	-
TC	17	12.2	96	69.1	26	18.7	<0.001
<5,2 (mmol/L)	15	22.1	48	70.6	5	7.4	-
≥ 5,2 (mmol/L)	2	2.8	48	67.6	21	29.6	-
Amylase	17	12.2	96	69.6	26	18.7	0.135
< 3×ULN (U/L)	8	9	61	68.5	20	22.5	-
≥ 3×ULN (U/L)	9	18	35	70	6	12	-
Lipase	17	12.2	96	69.1	26	18.7	0.308
< 3×ULN (U/L)	3	7.7	26	66.7	10	25.6	-
≥ 3×ULN (U/L)	14	14	70	70	16	16	-

Comments: Triglyceride distribution differs by BMI (p = 0.037), with higher TG levels (≥5.7 mmol/L) predominantly observed in the BMI ≥25 group, where 24.1% of patients with TG >11.2 mmol/L are in the BMI ≥25 group (7/29). Total cholesterol shows a significant difference according to BMI (p < 0.001), with a higher rate of TC ≥5.2 mmol/L in the BMI ≥25 group (29.6%; 21/71) compared to the BMI <18.5 group (2.8%; 2/71). The rate of amylase and lipase elevation ≥ 3×ULN did not differ significantly across BMI groups (amylase: p = 0.135; lipase: p = 0.308).

Table 8. Lipid and Pancreatic Enzyme Indices by Etiology

Etiology / Index	Other		Alcohol		Gallstones		Elevated TG		p
	n	%	n	%	n	%	n	%	-
TG	12	8.6	72	51.8	15	10.8	40	28.8	0.657
< 1,7 (mmol/L)	2	6.3	22	68.8	3	9.4	5	15.6	-
1,7 – 2,2 (mmol/L)	1	9.1	5	45.5	1	9.1	4	36.4	-
2,3 – 5,6(mmol/L)	5	11.4	20	45.5	5	11.4	14	31.8	-
5,7 – 11,2 (mmol/L)	2	8.7	14	60.9	2	8.7	5	21.7	-
> 11,2 (mmol/L)	2	6.9	11	37.9	4	13.8	12	41.4	-
TC	12	8.6	72	51.8	15	10.8	40	28.8	0.014
< 5,2 (mmol/L)	8	11.8	40	58.8	2	2.9	18	26.5	-
≥ 5,2 (mmol/L)	4	5.6	32	45.1	13	18.3	22	31	-
Amylase	12	8.6	72	51.8	15	10.8	40	28.8	0.066
< 3×ULN (U/L)	8	9	53	59.6	7	7.9	21	23.6	-
≥ 3×ULN (U/L)	4	8	19	38	8	16	19	38	-
Lipase	12	8.6	72	51.8	15	10.8	40	28.8	0.061
< 3×ULN (U/L)	1	2.6	27	69.2	2	5.1	9	23.1	-
≥ 3×ULN (U/L)	11	11	45	45	13	13	31	31	-

Comments: The distribution of triglycerides did not differ according to etiology (p = 0.657), although the elevated triglyceride group accounted for 41.4% of cases with TG >11.2 mmol/L. Total cholesterol significantly differed by etiology (p = 0.014), with a higher rate of TC ≥5.2 mmol/L in the elevated triglyceride and gallstone groups. The rate of amylase and lipase elevation ≥3×ULN did not differ significantly across etiologies (p > 0.05).

IV. DISCUSSION

The study found that patients with acute pancreatitis were predominantly middle-aged men (84.2%). This finding is consistent with the global mortality burden reported in the 2023 Global Burden of Disease (GBD) Study, which demonstrated a higher burden of pancreatic and digestive diseases in males, particularly in middle-aged populations [7]. The predominance of male patients may be partly explained by higher exposure to established risk factors such as alcohol consumption and metabolic disorders in this group.

Most patients had a normal BMI (69.1%), which is consistent with Trikudanathan et al. (2024), who reported that acute pancreatitis is not restricted to overweight or obese individuals but also frequently occurs in patients with normal body weight [8]. This suggests that metabolic and non-metabolic mechanisms may contribute independently to disease onset.

Elevated triglycerides were a prominent metabolic feature, with 68.1% of patients presenting TG ≥ 2.3 mmol/L and 20.9% exceeding 11.2 mmol/L. Acute pancreatitis due to hypertriglyceridemia accounted for 28.8% of cases, ranking second after alcohol-related etiology. These findings are consistent with recent evidence indicating that hypertriglyceridemia is an increasingly recognized etiological and coexisting metabolic factor in acute pancreatitis, even when not the primary cause [8]. From a mechanistic perspective, elevated triglycerides may contribute to pancreatic injury through the hydrolysis of triglycerides into free fatty acids, leading to

local lipotoxicity, microcirculatory impairment, and exacerbation of inflammatory cascades. However, in this study, no significant difference in triglyceride levels was observed between genders, which is consistent with Hamesch et al. (2025), who reported that hypertriglyceridemia is a common metabolic abnormality across both sexes [9]. Total cholesterol was elevated in 51.1% of patients and showed associations with higher BMI and certain etiologies such as gallstone-related pancreatitis. This supports the role of metabolic dysregulation in biliary and metabolic forms of acute pancreatitis [9]. Overall, these findings highlight that lipid abnormalities are frequently present across different clinical subgroups and may reflect underlying metabolic vulnerability rather than a single causative pathway.

Regarding pancreatic enzymes, lipase elevation ≥3×ULN (71.9%) was significantly more frequent than amylase elevation (36.0%), consistent with recommendations from the American College of Gastroenterology (2024), which emphasize lipase as a more sensitive and stable biomarker in acute pancreatitis diagnosis [4]. The lack of significant differences in enzyme levels according to BMI or etiology can be explained by the fact that serum amylase and lipase primarily reflect the degree of pancreatic acinar injury and enzyme leakage at the time of sampling, rather than underlying metabolic status or etiological classification. Therefore, enzyme levels are more closely related to the acute inflammatory process than to patient-specific risk factors. As a retrospective study, several limitations should be acknowledged. First, selection bias and information bias may have occurred due to reliance on medical records. Second, residual confounding factors such as timing of blood sampling, prior lipid-lowering therapy, and comorbid metabolic conditions could not be fully controlled. Third, the lack of stratification by disease severity may limit interpretation, as lipid levels and enzyme responses may vary according to the clinical severity of acute pancreatitis.

From a clinical perspective, the high prevalence of dyslipidaemia observed in this study suggests that lipid profiling should be considered as part of routine evaluation in patients with acute pancreatitis. Early identification of hypertriglyceridaemia and other lipid abnormalities may support risk stratification and secondary prevention strategies, particularly in patients with metabolic risk factors or gallstone-associated disease.

V. CONCLUSION

Blood lipid disorders, especially elevated triglycerides, are commonly observed in acute pancreatitis patients. Triglyceride and total cholesterol levels are associated with overweight and obesity. Lipase has a higher diagnostic threshold of ≥3×ULN compared to amylase and is less affected by demographic factors, making it more valuable in the diagnosis of acute pancreatitis.

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