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Fatty liver and acute pancreatitis severity: A prospective analysis utilizing computerized tomographic scan

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***Abstract*---**Introduction: Fatty liver (FL) is often recognized in patients with acute pancreatitis (AP) and is frequently found in clinical practice because of substantial variables that put one at risk of complications. Aim: To evaluate the severity of acute pancreatitis in patients with and without fatty liver using CT severity index. Methodology: In this prospective study was carried out from June 2020 till December 2022. Liver and spleen mean attenuation values were examined using plain CT scans abdomen of patients with AP. Fatty liver was defined as a mean Hounsfield Unit (HU) liver/spleen) ratio < 1. Contrast-enhanced computed tomography (CECT) scan and CT Severity Index (CTSI) to grade the severity of AP. Analyzed information in SPSS. Degree of significance was determined using the chi-square test. Results: This study comprised of 100 Patients with AP (88 (88.0%) males and 32 (32.0%) female, mean age 34.68 12.762 years), 46 (46.0%) had FL and 54 (54.0%), without FL. Patients with FL experienced much worse pancreatitis than patients without FL. Acute edematous pancreatitis (39.4% vs. 60.6%) and acute necrotic collections (58.8% vs. 41.2%) were observed in patients with FL and without FL respectively. Conclusion: The severity of acute pancreatitis is significantly influenced by fatty liver. It may also act as a marker for the illness. To assess FL, make a diagnosis, and gauge the severity of AP, Plain and contrast CT scans may be mixed.

***Keywords*---**Acute Pancreatitis (AP), Fatty Liver (FL), CT Severity Index (CTSI)

Introduction

An acute inflammatory condition of the pancreas is known as acute pancreatitis (AP). It is one of the most prevalent gastrointestinal diseases, with an incidence rate of 13–45/100,000 people. Gallstones and alcohol are the two main causes of acute pancreatitis. Hypercalcemia, iatrogenic causes, and infectious agents are among other etiological variables.[2] Although the condition usually progresses slowly, problems might occur in one-fifth of individuals. Visceral obesity is a poor predictor of outcome for acute pancreatitis, according to recent research. A sign of visceral obesity is fatty liver (FL). [2]

Other names for the condition include fatty liver (FL), non-alcoholic fatty liver disease (NAFLD), and fatty liver disease (FLD). Hepatocytes and liver parenchyma exhibit excessive lipid accumulation, which serves as a defining feature. The prevalence of fatty liver varies from 28 to 52/1000 people globally. According to an epidemiological survey, the estimated prevalence of fatty liver in the general population increased for males from 23.5% to 44.3% and for women from 17.6% to 43.1%.[3]

When examined by any imaging modality that quantifies the presence of fatty component, the presence of >5% steatosis in hepatocytes or the presence of >5.6% fat material in the liver is used to histologically diagnose fatty liver. [4] Patients with acute pancreatitis are thought to have a worse prognosis if they have fatty liver, which can range in severity from benign hepatic steatosis to catastrophic chronic liver disease. [5] It is also connected to every aspect of metabolic syndrome or might be viewed as a different aspect of the illness itself. [6] The clinical effects of fatty liver on acute pancreatitis have drawn attention from researchers over the past few years. Patients with acute pancreatitis were divided by whether or not they had fatty livers by Xu et al. 18% of individuals with acute pancreatitis had fatty livers. In individuals with fatty livers, a higher frequency of both local and systemic problems was seen. [7]

Studies on the relationship between acute pancreatitis and fatty liver have produced conflicting results. Thus, the findings cannot be applied generally. The purpose of this study was to examine the signs and symptoms of individuals with acute pancreatitis who had fatty livers or not. In this study, the CT severity index will be used to assess the acute pancreatitis severity between individuals with and without fatty liver.

Materials and Methods

Settings and Study duration: This prospective study was performed at Department of Gastroenterology, Lady Reading Hospital, Peshawar, on 100 patients with AP who presented with acute pancreatitis between June 2020 and December 2022. Approval was taken from research review committee of the hospital.

Criteria for Inclusion: All patients diagnosed with AP between the ages of 18 and 75 were included in the research. A diagnosis of AP was made when at least two of the following conditions were present.

(1) pain abdomen typical of acute pancreatitis, i.e. sudden onset radiating straight to the back and relieved on leaning forward. (2) high blood levels of amylase or lipase, over the maximum acceptable level by thrice, and (3) CT findings that are indicative of AP.

Criteria for exclusion: Patients who have pancreatic disease in the past, chronic liver disease, or splenectomy, or any kind of cancer were not allowed to participate in the study.

Data collection: Patient fulfilling the inclusion criteria were enrolled from the indoor department of Gastroenterology. Informed consent was taken from all participants. Baseline information like age, gender, BMI, pain duration (hours) was recorded. At our institution, a contrast enhanced CT scan abdomen is performed for all patients with acute pancreatitis within 72 hours after admission to grade the severity and presence of any complications like localized collection.

Unenhanced phase CT abdomen scans were evaluated for fatty liver by a consultant radiologist who was blinded to clinical and demographic information. Mean Housefield units (HU) was calculated for the liver and spleen regions of interest (ROIs) using two consecutive axial CT slices. ROIs will be between 200 and 400 mm^2. The mean hepatic HU and splenic HU was divided to determine the liver-to-spleen attenuation ratio. Liver to spleen CT attenuation ratio less than 1 was considered confirmatory for fatty liver. The severity of acute pancreatitis was assessed in terms of Computed Tomography Imaging (CTSI), which measured the changes in the parenchyma of pancreas and any surrounding collection. Based on the findings of the CECT and the presence of pancreatic necrosis, absence of necrosis was called acute edematous pancreatitis while presence of necrosis was labelled acute necrotic pancreatitis. Necrotic pancreatitis was either walled or without wall. Other complications in the study were vascular complications in form of thrombosis and extrapancreatic fluid collection in the peritoneum and pleural cavity.

Table 1
Acute pancreatitis CT severity index (CTSI) modifications (AP). Total CTSI: 0-2 for mild, 4-6 for moderate, and 8-10 for severe pancreatitis

CTSI	Description	Score
Pancreatic Inflammation	Normal Intrinsic pancreatic abnormalities Abnormalities extending outside pancreas	0 2 4
Pancreatic Necrosis	None <30% necrosis >30% necrosis	0 2 4
Extra-pancreatic Complications	Pleural effusion, ascites, vascular problems etc	2

Statistical Analysis

Data was entered into a Microsoft Excel spreadsheet and analyzed using the statistical programmer for social sciences SPSS version 25.0. Categorical data was shown as frequencies and proportions. Mean and standard deviation were employed to portray continuous data. Chi-square test was used to analyze categorical data and student t test was used to compare means of continuous data. Regression model was used assess the impact of fatty liver on the severity of acute pancreatitis. A linear regression analysis was applied to continuous data while logistic regression analysis was done for categorical variables. After considering all statistical testing rules, a p-value (probability that the result is true) of 0.05 was determined to be statistically significant.

Results

CECT was obtained for 113 people with pancreatitis during the study period. However 100 patients were finally selected for the study and rest were excluded because majority of them had chronic pancreatitis and one had history of splenectomy.

Majority of the study participants were male (68.0%). The mean age was 34.68 ± 12.762 years. (Table-1). According to Atlanta classification (Table 2), 66 (66.0%) patients had acute interstitial edematous pancreatitis and 34 (34.0%) patients had ANP. Based on Computed Tomography severity index (Table-3), patients divided into three groups: mild, moderately severe, and severe diseases. 30 patients (30%) showed signs of mild pancreatitis, 42 (42.0%) showed signs of moderately severe pancreatitis, and 28 (28.0%) showed signs of severe pancreatitis. Based on Atlanta criteria for disease severity, it was observed that out of the total 46 patients (46.0%) in fatty liver group, 26 (39.4%) had acute edematous pancreatitis and 20 (58.8%) had acute necrotic pancreatitis. While based on CTSI, Four (8.7%) of the FL group's patients had mild pancreatitis and twenty patients (43.7%) had severe disease. In comparison, out of the total 54 patients, 40 (60.6%) had acute edematous pancreatitis and 14 (39.4%) had necrotic pancreatitis. CTSI of patients without fatty liver revealed, mild pancreatitis in 26 patients (86.7%), moderate pancreatitis in 20 patients (47.6%) and severe disease in 08 patients (28.6%) as shown in table 4.

Overall, there were 10 patients (37.0%) with ascites, 08 patients (29.6%) with pleural effusions, 5 patients (18.5%) with splenic vein thrombosis, and 4 patients (14.8%) had portal vein thrombosis as shown in (Table-5).

Table-2
Statistics on the study's sample population by age and gender

AGE GROUP (years)	**MALE**	**FEMALE**	**TOTAL**
18-35	31(65.9%)	16 (34.1%)	47 (100.0%)
36-50	23 (76.7%)	07 (23.3%)	30 (100.0%)

51 and above	14 (60.9%)	09 (39.1%)	23 (100.0%)
TOTAL	68 (68.0%)	32 (32.0%)	100 (100.0%)

Table -3
Pancreatitis type distribution in patients with and without FL – Atlanta Criteria (n=100).

PANCREATITIS TYPE	WITH FATTY LIVER	WITHOUT FATTY LIVER	TOTAL
Acute edematous pancreatitis (AEP)	26(39.4%)	40(60.6%)	66(100%)
Acute Necrotic Pancreatitis (ANP)	20(58.8%)	14(41.2%)	34(100%)
Total	46(46.0%)	54(54.0%)	100(100%)

Table-4
Acute pancreatitis severity in patients with and without FL – CTSI (n=100)

SEVERITY OF PANCREATITIS	PATIENTS WITH FL	ATIENTS WITHOUT FL	TOTAL
Mild pancreatitis	4 (13.3%)	26(86.7%)	30(100.0%)
Moderately severe pancreatitis	22(52.4%)	20(47.6%)	42(100.0%)
Severe pancreatitis	20(71.5%)	08(28.5%)	28(100.0%)
Total	46(100%)	54(100%)	100(100%)

Table-5
Systemic complications in patients with and without fatty liver

	Ascites	Pleural effusions	Splenic vein thrombosis	Portal vein thrombosis	TOTAL
Patients with FLD	8(40.0%)	5(25.0%)	3(15.0%)	4 (20.0%)	20 (100.0%)
Patients without FLD	2(28.6%)	3(42.8%)	2(28.6%)	0 (0.0%)	07 (100.0%)
Total	10(37.0%)	08(29.6%)	5(18.5%)	4 (14.8%)	27 (100.0%)

Discussion

The goal of the current study was to see whether fatty liver affects the severity of acute pancreatitis using CT imaging. The findings revealed a substantial relationship between FL patients and a greater incidence of severe acute pancreatitis than those without FL, which is consistent with the findings of previous studies. [3,4,6,10].

Patients in this study who had FL and acute pancreatitis also had a greater number of complications at the loco-regional and systemic complications. Our study results are comparable to the results of the study performed by Xu and colleagues who reported peripancreatic fluid collection 20.9% patients with fatty liver compared to 10.5% patients without fatty liver ($p < 0.001$). [3] Yoon S et al. found that the FL group had significantly higher rates of peripancreatic fluid collection (44.8 vs. 20.3%, $p<0.001$) and walled off necrosis (14.9 vs. 3%, $p<0.006$) than the Non FL group [4].

A systematic review comparing the FL and Non FL groups, the FL group had a greater risk of both moderately severe and severe acute pancreatitis (OR=3.14, CI 1.87-5.25 and OR=2.67, CI 2.01-3.56, respectively.[13] Similar findings were reported in another as well whereby patients with fatty liver showed higher propensity towards loco-regional and systemic complications [14].

It is not fully understood why patients with fatty liver experience more complications. Moreover, the potential mechanism by which fatty liver impacts the clinical scenario of acute pancreatitis is yet to be explored. Nonetheless, it has been proposed that fatty liver patients are in a constant pro-inflammatory state, which may aggravate the course of AP.[15,16] The diagnosis of fatty liver by CT scan in the early stages of AP may anticipate the underlying inflammatory condition which would otherwise be masked by delayed peak in CRP level – a marker that is frequently used in our setup to inflammatory conditions, allowing for early management and a reduction in morbidity and death.

Conclusion

Patients with fatty liver experience more severe acute pancreatitis progression and are more prone to potentially fatal local and systemic complications. The unenhanced phase may be used to identify fatty liver. In individuals with acute pancreatitis, it could be a useful prognostic marker.

References

[1] Frossard J, Steer M, Pastor C. Acute pancreatitis. The Lancet. 2008;371(9607):143-52.
[2] Lankisch P, Apte M, Banks P. Acute pancreatitis. The Lancet. 2015;386(9988):85-96.
[3] Xu C, Qiao Z, Lu Y, Zhang D, Jia Z, Zhuang X, et al. Influence of fatty liver on the severity and clinical outcome in acute pancreatitis. PLOS ONE. 2015;10(11):e0142278.
[4] Yoon S, Lee I, Choi M, Lee K, Ham H, Oh H, et al. Impact of fatty liver on

acute pancreatitis severity. Gastroenterology Research and Practice. 2017;2017:01- 07.

[5] Boyce C, Pickhardt P, Kim D, Taylor A, Winter T, Bruce R et al. Hepatic Steatosis (Fatty Liver Disease) in Asymptomatic Adults Identified by Unenhanced LowDose CT. American Journal of Roentgenology. 2010;194(3):623-628.

[6] Wu D, Zhang M, Xu S, Wu K, Wang N, Wang Y et al. Nonalcoholic Fatty Liver Disease Aggravated the Severity of Acute Pancreatitis in Patients. BioMed Research International. 2019;2019:4532320.

[7] Jia J, Wu Q, Kou J, Yang M. Relationship between fatty liver and pancreatitis. International Journal of Clinical Medicine. 2018;09(04):243-48.

[8] Xiao B, Zhang X, Jiang Z, Tang W, Huang X, Yang L, et al. Fatty liver in acute pancreatitis. Journal of Computer Assisted Tomography. 2012;36(4):400-05.

[9] Yuan L, Tang M, Huang L, Gao Y, Li X. Risk factors of hyperglycaemia in patients after a first episode of acute pancreatitis. Pancreas. 2017;46(2):209-18.

[10] Jasdanwala S. NAFLD diagnosed with abdominal ultrasound is a marker of severity in acute pancreatitis. Journal of Gastrointestinal & Digestive System. 2015;05(03).

[11] Satapathy S, Friedman B, Bittman M, Aronson S, Kwak N, Novak S, et al. Hepatic steatosis a novel marker for severe outcomes in patients with acute pancreatitis: 2011 ACG presidential poster. American Journal of Gastroenterology. 2011;106:S115-16.

[12] Morel-Cerda EC, Velarde-Ruiz VJA, Álvarez-López F, García-Jiménez ES, Rangel-Orozco MF, González-Álvarez R, et al. Prevalence of fatty liver in patients with acute pancreatitis. Rev Med MD. 2018;10(2):113-18.

[13] Suchsland T, Aghdassi A, Kühn K, Simon P, Lerch M, Mayerle J, et al. Predictive factors for and incidence of hospital readmissions of patients with acute and chronic pancreatitis. Pancreatology. 2015;15(3):265-70.

[14] Mikolasevic I, Orlic L, Poropat G, Jakopcic I, Stimac D, Klanac A et al. Nonalcoholic fatty liver and the severity of acute pancreatitis. European Journal of Internal Medicine. 2017;38:73-78.

[15] Banks P, Bollen T, Dervenis C, Gooszen H, Johnson C, Sarr M, et al. Classification of acute pancreatitis—2012: Revision of the Atlanta classification and definitions by international consensus. Gut. 2012;62(1):102-11.

[16] Garip G. Effects of disease severity and necrosis on pancreatic dysfunction after acute pancreatitis. World Journal of Gastroenterology. 2013;19(44):8065.