

Prevalence of Cardiovascular Dysfunction and its Association with Outcomes in Patients with Acute Pancreatitis

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ABSTRACT

Background and Aim: Acute pancreatitis is a rapid progressive abdominal inflammatory disease with acute onset in clinics which turns into severe acute pancreatitis. In approximately 20% of patients characterized by different parameters such as gland flaky necrosis, multiple organ dysfunction syndrome (MODS), inflammatory cell infiltration in large number, and hemorrhage. Electrocardiography and electromyography variations are the common cardiac failure in patients with acute pancreatitis. Elevated cardiac enzymes could be other factors for cardiac failure with acute pancreatitis. The present study aimed to assess the prevalence of cardiovascular dysfunction and its association in patients with acute pancreatitis.

Methodology: This cross-sectional study was carried out on 120 acute appendicitis patients in the department of Gastroenterology at Northwest General Hospital & Research Centre, Hayatabad Peshawar for the duration of six months from June 2021 to November 2021. All the patients who met the inclusion criteria were enrolled. Echocardiography and CK-MB (creatinine phosphokinase isoenzyme) was measured for evaluating myocardial function after admission. All the patients underwent physical, clinical, and laboratory examination. The findings of Electrocardiography (ECG) were recorded. Acute appendicitis severity, duration of hospital stay, infection, computed tomography severity index (CTSI), and mortality were different outcomes.

Results: Of the total 120 patients, about 83 (69.2%) were males and 37 (30.8%) were females. The overall mean age was 37.84±12.46 years. Out of 120 acute pancreatitis patients, the prevalence of gallstone disease, organic failure, respiratory failure, acute kidney failure, and cardiovascular dysfunction was 51 (43.3%), 47 (39.2%), 37 (30.8%), 19 (15.8%), and 9 (7.5%) respectively. Elevated CK-MB and ECG changes were seen in 32 (26.7%) and 42 (35%) respectively. The ECG variations and elevated CK-MB were related with severity of acute pancreatitis ($p < 0.05$), duration of hospital (OR: 18.9 ± 10.6 vs. 11.7 ± 6.8, $p = 0.005$), CTSI (6.9 ± 3.1 vs. 4.7 ± 2.9, $p = 0.001$), increased necrosis (2.34, 95%CI= 0.3-11.8, $p=0.011$), and mortality (OR= 5.46, 95% CI= 1.2-34.9, $p=0.05$). The incidence of Left ventricular systolic dysfunction (LVEF) and left ventricular diastolic dysfunction (LVDD) was 15 (12.5%) and 31 (25.8%) respectively.

Conclusion: The present study found that elevated CK-MB were significantly associated with higher CTSI, Prolonged hospital stay, severity of acute pancreatitis, LVDD, increased necrosis, and mortality. CK-MB increased levels have been reported as an indicator for cardiac failure and acute pancreatitis. There was a significant association between increased CK-MB levels and cardiovascular organ failure, pancreatic necrosis, and left ventricular diastolic dysfunction.

Keywords: Cardiovascular dysfunction, Acute pancreatitis, Outcomes

INTRODUCTION

Acute pancreatitis (AP) is a chronic fibrosis and inflammation of the pancreas causing functional abnormalities and irreversible morphological changes [1]. The advanced diagnostic modalities and increased alcohol consumption are the attributable factors for increased incidence of acute pancreatitis worldwide [2, 3]. Chronic diarrhea, weight loss, maldigestion, incessant abdominal pain, and glucose intolerance were the symptoms of acute pancreatitis which lead to significant impacts on life quality [4]. Patients with mild acute pancreatitis usually recover after treatment. Yet, approximately 20% patients advance to severe acute pancreatitis with rapid progress [5]. Heat organs are susceptible to pancreatitis inflammation [6]. Regardless of AP severity, various studies have shown that cardiac injury and degree of injury is clinically associated with type of acute pancreatitis. Additionally, a previous research investigated the organic failure incidence in acute pancreatitis patients and reported that prevalence of multiple organs failure was 62%. The incidence of single failure such as the liver, cardiovascular system, hematological system, respiratory system, and kidney was 16%, 22.3%, 9%, 34.9%, and 15% respectively [7].

The variations in echocardiographic and electrocardiographic (ECG) are the commonest cardiovascular abnormalities investigated in acute pancreatitis patients. About 50% patients of AP reported ECG changes which includes changes in ST-T waves, tachycardia, and block of bundle branches, fibrillation, and atrial flutter [8, 9]. These variations were considered to be caused by vagus nerve reflexed mediation electrolyte disturbances, and myonecrosis by pancreatic proteolytic

enzymes released [10]. Regardless of advance treatment and modalities, the prevalence of acute pancreatitis is on the rise globally. In the United State, prevalence of AP rose to approximately 45/100,000 whereas 7 to 75 per 100,000 in Britain [11]. Cardiac injury patients with acute pancreatitis are challenging to treat as the risk of death increases. Various studies reported elevation of cardiac enzymes such as CK-MB and creatine phosphokinase in patients with AP [12, 13]. There is scarcity of data on cardiovascular dysfunction in patients with acute pancreatitis. Therefore, the present study aimed to assess the prevalence of cardiovascular dysfunction in acute pancreatitis patients.

METHODOLOGY

This cross-sectional study was carried out on 120 acute appendicitis patients at the department of Gastroenterology, Northwest General Hospital & Research Centre, Hayatabad Peshawar for the duration of six months from June 2021 to November 2021. All the patients who met the inclusion criteria were enrolled. Echocardiography and CK-MB (creatinine phosphokinase isoenzyme) was measured for evaluating myocardial function after admission. All the patients underwent physical, clinical, and laboratory examination. The findings of Electrocardiography (ECG) were recorded. Acute appendicitis severity, duration of hospital stay, infection, computed tomography severity index (CTSI), and mortality were different outcomes. Adult patients >18 years diagnosed with acute pancreatitis confirmed by radiological modalities and presented within week of symptom initiation. Patients with previous history of liver, acute pancreatitis,

cardiovascular, and liver disease were excluded from this study. A written informed consent was taken from all the participants. In laboratory, baseline tests such as levels of blood glucose and CBC was performed. Urine, nitrogen, and serum creatinine was performed for the assessment of blood urea and nitrogen and cardiovascular system. Abdomen CECT was performed in each patient for the assessment of acute pancreatitis levels.

ECG test was done for the cardiac examination of the participants. Additionally, CK-MB was elevated in each patient. The lower and upper limit for the CK-MB was 2 U/L to 24 U/L. Patients with CK-MB >48 U/L were considered to have excessive CK-MB levels. SPSS version 24 was used for data analysis. All the participants were grouped into two; group-I patients with presence of changes in ECG, LVDD, CK-MB levels, and LVEF and group-II absence of myocardial dysfunction. Various parameters such as infection, hospital duration, CTSI, intervention requirement, and mortality of both groups were compared. A p-value of <0.05 was considered significant in all the tests.

RESULTS

Of the total 120 patients, about 83 (69.2%) were males and 37 (30.8%) were females. The overall mean age was 37.84±12.46 years. Out of 120 acute pancreatitis patients, the prevalence of gallstone disease, organic failure, respiratory failure, acute kidney failure, and cardiovascular dysfunction was 51 (43.3%), 47 (39.2%), 37 (30.8%), 19 (15.8%), and 9 (7.5%) respectively. Elevated CK-MB and ECG changes were seen in 32 (26.7%) and 42 (35%) respectively. The ECG variations and elevated CK-MB were related with severity of acute pancreatitis (p<0.05), duration of hospital (OR: 18.9 ± 10.6 vs. 11.7 ± 6.8, p = 0.005), CTSI (6.9 ± 3.1 vs. 4.7 ± 2.9, p = 0.001), increased necrosis (2.34, 95%CI= 0.3-11.8, p=0.011), and mortality (OR= 5.46, 95% CI= 1.2-34.9, p=0.05). The incidence of Left ventricular systolic dysfunction (LVEF) and left ventricular diastolic dysfunction (LVDD) was 15 (12.5%) and 31 (25.8%) respectively as shown in Figure-3. Figure-1 illustrate the gender's distribution. Table-I shows the baseline characteristics of the all the patients. The prevalence of different dysfunction in acute pancreatitis patients are depicted in Figure-2.

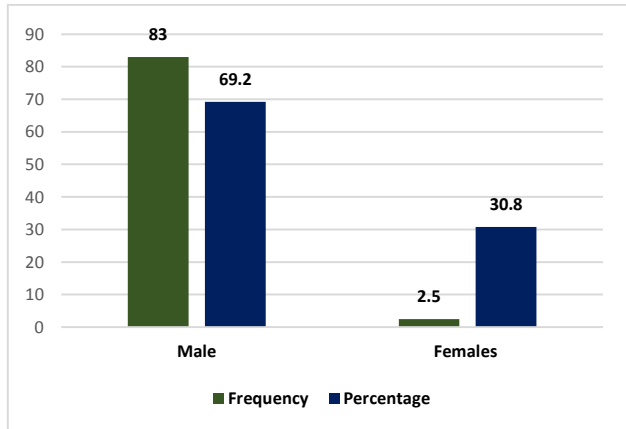


Figure-1: Gender's distribution

Table-1: Baseline characteristics

Parameters	Mean Value	Standard Deviation	Minimum	Maximum
Age	37.84	12.46	18	80
Pain duration	5.1	1.83	1	7
Systolic BP	126.73	18.79	80	180
Diastolic BP	79.13	10.3	60	110
Creatinine	0.79		0.19	9.6
% Necrosis	3.03	1.93	0	6
CTSI	6.1	2.95	0	10

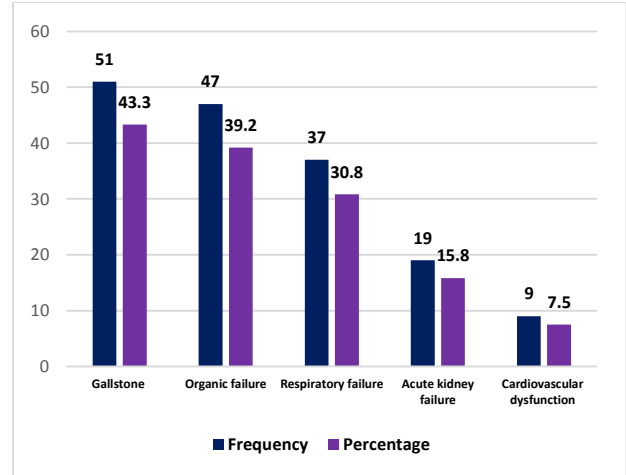


Figure-2: prevalence of different dysfunction in acute pancreatitis patients

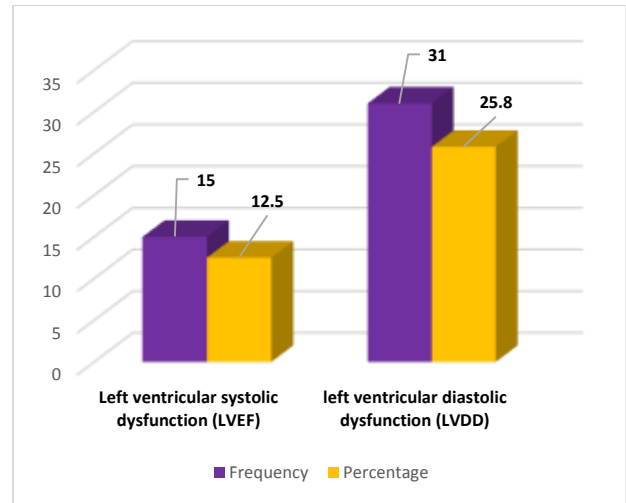


Figure-3: Incidence of Left ventricular systolic dysfunction (LVEF) and left ventricular diastolic dysfunction (LVDD)

DISCUSSION

The present study investigated 120 acute pancreatitis patients, organic failure was present in 47 (39.2%) followed by respiratory failure, acute kidney failure, and cardiovascular dysfunction. The prevalence of cardiovascular dysfunction was 7.5%. The increased levels of CK-MB was observed in 26.7% patients. Also, elevated CK-MB were significantly associated with higher CTSI, Prolonged hospital stay, severity of acute pancreatitis, LVDD, increased necrosis, and mortality. CK-MB increased levels have been reported as an indicator for cardiac failure and acute pancreatitis.

The ECG changes were more prevalent cardiovascular manifestation that appeared in acute pancreatitis patients. T-waves inversion and depression of ST segment were mostly seen abnormalities. A previous study found that ECG showing elevation of serum cardiac enzyme and ST segment in acute myocardial infarction could rarely mimic by acute pancreatitis and unrequired invasive procedures might be avoided with the same knowledge [14, 15]. However, coronary artery spasm, hypovolemia, and coagulation abnormalities could be caused by secondary myocardial infarction complicated by acute pancreatitis [16].

A previous study conducted by Sankaran et al. [17] investigated 54 patients reported that ECG abnormalities were found in 31 (57%) patients. The prevalent ECG changes were accelerated atrial found in 8 cases and non-specific T-waves in 25 cases. According to their study, underlying ischemic heart disease

impaired by acute pancreatitis stress were the implicated reasons for ECG changes. Another study by de la Iglesia et al. [18] evaluated 50 acute pancreatitis patients compared the ECGs recorded and found that during acute pancreatitis, ECG alteration usually occur in patients with previous history of cardiac abnormalities. Yegneswaran et al. studied acute pancreatitis patients with no prior heart disease and reported that about 55% patients had abnormal ECG [19]. The most prevalent disturbances were left anterior hemi-block, Nonspecific changes of repolarization, and sinus tachycardia. According to their findings, these disturbance were caused by electrolyte alterations which leads to disturbance in cardiac rhythm. Patients with prior heart disease and unavailability of cardiac evaluation were excluded.

The present study found that CK-MB elevated levels had a significant association with CTSI, increased necrosis, hospital duration, and mortality. There are various studies that reported that elevated CK-MB were seen in acute pancreatitis patients [20, 21]. However, few investigative studies focused on cardiac enzyme levels evaluation in acute pancreatitis patients. In contrast, Kumar et al. [22] reported that only 4% patients with severe hypotension and AP had elevated CK-MB which normalized after 3rd day. The present study elevated the CK-MB levels on first day of their hospitalization and demonstrated that severity of acute AP is significantly associated with and CK-MB level.

The majority of AP patients in the current study were men, with a mean age of 37.84 years. This study's findings are consistent with previous reports [23]. Despite the fact that the incidence of gallstones and organic failure was higher in patients with AP than in those without AP for both genders, men with AP had a significantly higher risk of SAP than those without AP. Patients with AP aged 69 years had a significantly higher risk of subsequent SAP than their counterparts without AP. According to research, pro-inflammatory cytokines and coagulation factor production increase with age and contribute to frailty [24, 25]. Furthermore, comorbidities are common in older adults, which may dilute the effect of AP [26].

In the current study, median hospital stay duration was 4 days in our patients and after admission their CK-MB levels were measured. Iso-enzyme of CK-MB normalized typically after 3rd day of myocardial infarction. Organ failure pathogenesis in acute pancreatitis patients were similar to severe sepsis [27]. Patients with severe pancreatitis appear to have a lower pattern of and low peripheral vascular resistance and high cardiac output, similar to that seen in sepsis [28]. Biomarkers of myocardial injury should be studied in patients with AP, preferably within 24 hours of the disease's onset.

The assessment of myocardium function could be assessed effectively by Echocardiography. A limited studies focused on performing echocardiography in patients with acute pancreatitis [29, 30]. Also, LV systolic dysfunction was present 12.5% and 25.8% patients in our study. Holmes et al. [31] and Rammohan et al. [32] reported that no evidence was found regarding myocardial dysfunction in acute pancreatitis patients. But, Cheng et al. [33] discovered diastolic dysfunction in 60% of their patients but found no systolic dysfunction.

CONCLUSION

The present study found that elevated CK-MB were significantly associated with higher CTSI, Prolonged hospital stay, severity of acute pancreatitis, LVDD, increased necrosis, and mortality. CK-MB increased levels have been reported as an indicator for cardiac failure and acute pancreatitis. There was a significant association between increased CK-MB levels and cardiovascular organ failure, pancreatic necrosis, and left ventricular diastolic dysfunction.

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