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ASSESSMENT OF SPECTRUM OF PULMONARY DYSFUNCTION IN ACUTE PANCREATITIS

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ABSTRACT

Background: Acute pancreatitis (AP) has long been considered as the cause of pulmonary dysfunction and multi-organ failure, which contribute to 20% cases with increasing rate of mortality.
Objective: The objective of the current study was to assess the spectrum of pulmonary dysfunction in acute pancreatitis patients.
Methodology: This prospective study was carried out on 72 patients admitted for acute pancreatitis in the General Surgical unit in collaboration of Medicine and Gastroenterology Department of Mardan Medical Complex Mardan, kpk,Pakistan from January 2021 to December 2021. Individual diagnosed of acute pancreatitis based on elevated serum amylase level, clinical findings, and computed tomography (CT) were enrolled. Pancreatitis severity was evaluated based on computed tomography severe index (CTSI). All the patients underwent Chest X-rays and Arterial blood gas analysis. SPSS version 27 was used for data analysis.
Results: The overall mean age was 38.96±16.4 years with an age range 16-70 years. The CSTI mean value (mean ± SD) was 8.20±2.29. There were 56 (77.8%) male and 16 (22.2%) female. Gallstones was the most prevalent etiology of AP found in 48 (66.7%) followed by trauma 10 (13.9%), infections 6 (8.3%), metabolic disorders 5 (6.9%), and idiopathic 3 (4.2%). The incidence of mild (PaO2 between 60 and 75 mmHg), moderate (PaO2 between 40 and 60 mmHg), and severe (<40 mmHg) hypoxemia during presentation at hospital was 32 (44.4%), 10 (13.9%), and 7 (9.7%) respectively. Pleural effusion was the most prevalent respiratory complication found in 38 (52.8%) followed by acute respiratory distress syndrome (ARDS) 17 (23.6%), atelectasis 11 (15.3%), and pulmonary infiltrates 6 (8.3%). The prevalence of >50% necrosis, 30-50% necrosis, <30% necrosis, and no necrosis was 35 (48.6%), 5 (6.9%), 17 (23.6%), and 15 (20.8%) respectively.
Conclusion: Hypoxemia at initial presentation is associated with cardio-renal dysfunction throughout disease progression and is a poor prognostic indicator. Gallstones was the most prevalent etiology of AP. Individuals with over 50% necrosis experienced delicate pulmonary dysfunction and required ventilator support.

Keywords: Acute Pancreatitis, Pulmonary dysfunction, Spectrum, Etiology

INTRODUCTION

Acute pancreatitis (AP) has been considered as the cause of pulmonary dysfunction and multi-organ failure. These primary causes contributes to 20% cases of acute pancreatitis (AP) and is associated with significant mortality [1]. Characterized by acute multiorgan involvement, pulmonary complications play an important role. These complications include hypoxia, acute respiratory distress syndrome (ARDS), atelectasis, and pulmonary edema [2]. Regardless of the etiology, inflammation that begins in acinar cells progresses to systemic inflammatory reaction syndrome (SIRS) [3]. Pulmonary issues are common and can be exacerbated by a variety of systemic complications. Earlier and effective treatment are possible by early identification of these complications and knowing their pathology [4]. Current research delves into the various pulmonary complications associated with acute pancreatitis, from hypoxemia to ARDS. Hypoxemia, the most common feature, can be evident in 75% of cases without overt radiation [5]. The increasing mortality rate of acute pancreatitis is directly associated with hypoxemia [6]. Pleural effusion is now recognized as a poor prognostic marker. Atelectasis, a common radiological finding, is attributed to bronchodilators [7, 8].

Early acute pancreatitis and failure of single organ failure is initially diagnosed among which approximately 80% of patients develop or progress to multiple organ failure (MSOF) despite effective treatment [9]. Mortality rates in in this subgroup is surprisingly high, up to 42%, compared with 12 in patients with acute pancreatitis (SAP) [10]. Mortality occurs in organ failure, which progresses or worsens and is associated with 30% to 50% mortality rate [11]. Pulmonary dysfunction and acute respiratory distress syndrome (ARDS) represents a significant systemic manifestation of severe acute pancreatitis (SAP), affecting 30-50% of patients [12, 13]. Among the complications associated with SAP, pulmonary dysfunction emerges as a primary contributor to mortality, accounting for 22-25% of cases [14]. There is paucity of data regarding pulmonary dysfunction in patients diagnosed of acute pancreatitis in local setting of Pakistan. Therefore, the current investigation was intended to assess the spectrum of pulmonary dysfunction in acute pancreatitis patients.

METHODOLOGY

This prospective study was carried out on 72 patients admitted for acute pancreatitis in the General Surgical unit in collaboration of Medicine and Gastroenterology Department of Mardan Medical Complex Mardan, kpk,Pakistan from January 2021 to December 202. Individual diagnosed of acute pancreatitis based on elevated serum amylase level, clinical findings, and computed tomography (CT) were enrolled. Patients with pre-existing respiratory conditions were excluded. The diagnosis of acute pancreatitis (AP) was established through a combination of clinical signs and symptoms followed by confirmation through elevated amylase levels and further supported by ultrasound, computed tomography, and/or surgical findings. Pancreatitis severity was evaluated based on computed tomography severe index (CTSI). All the patients underwent Chest X-rays and Arterial blood gas analysis. On admission, all patients underwent detailed laboratory investigations, including serum amylase levels, electrolytes, hematocrit, and coagulation regulation. Intravenous blood gas tests were performed at baseline under room temperature conditions, and routine chest x-rays were performed on admission. In cases of respiratory failure, arterial oxygen tension was monitored daily. Periodic repeat chest x-rays were performed based on clinical observations. A uniform treatment approach was employed for all patients within a critical care unit, involving intravenous fluid administration, analgesics, nasogastric suction, and antibiotics for severe pancreatitis.

SPSS version 27 was used for data analysis. Mean and standard deviation was used to express the quantitative variables whereas qualitative parameters were described as frequency and percentages. Chi-square test was used for the comparison of categorical variables with 95% confidence intervals (95% CI) and 5% significance level.

RESULTS

The overall mean age was 38.96±16.4 years with an age range 16-70 years. The CSTI mean value (mean ± SD) was 8.20±2.29. There were 56 (77.8%) male and 16 (22.2%) female. Gallstones was the most prevalent etiology of AP found in 48 (66.7%) followed by trauma 10 (13.9%), infections 6 (8.3%), metabolic disorders 5 (6.9%), and idiopathic 3 (4.2%). The incidence of mild (PaO2 between 60 and 75 mmHg), moderate (PaO2 between 40 and 60 mmHg), and severe (<40 mmHg) hypoxemia during presentation at hospital was 32 (44.4%), 10 (13.9%), and 7 (9.7%) respectively. Pleural effusion was the most prevalent respiratory complication found in 38 (52.8%) followed by acute respiratory distress syndrome (ARDS) 17 (23.6%), atelectasis 11 (15.3%), and pulmonary infiltrates 6 (8.3%). The prevalence of >50% necrosis, 30-50% necrosis, <30% necrosis, and no necrosis was 35 (48.6%), 5 (6.9%), 17 (23.6%), and 15 (20.8%) respectively. Different etiology of acute pancreatitis are illustrated in Figure-1. Based on CECT, association of lung complications with pancreatic necrosis are demonstrated in Figure-2. Demographic and clinical details are shown in Table-I. Table-II represents the association of hypoxemia with organ failure. The relationship between respiratory complications, emerging during the progression of the disease with respiratory failure as shown in Table-III. Prevalence of necrosis is shown in Figure-3.

Table-I Demographic and clinical details (N=72)

Variables	Value [Mean ± SD]
Age (years)	38.96±16.4
Gender N (%)	
Male	56 (77.8%)
Female	16 (22.2%)
CSTI mean value	8.20±2.29
Hypoxemia	
Mild	32 (44.4%)
Moderate	10 (13.9%)
Severe	7 (9.7%)
CSTI (Total)	68 (94.4%)
1-3	15 (20.8%)
4-6	21 (29.2%)
>6	32 (44.4%)

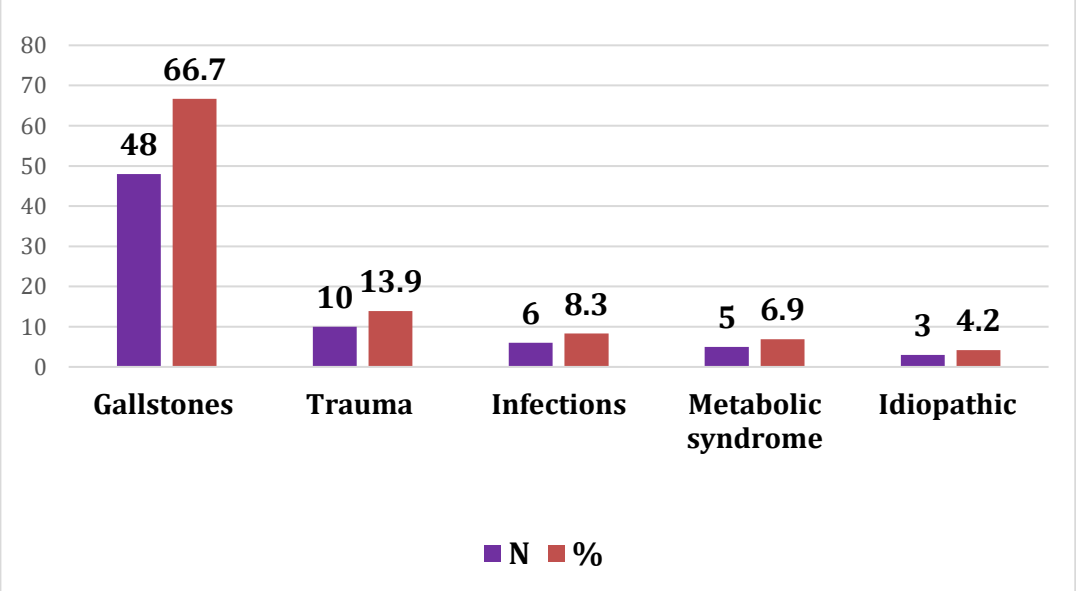

Figure-1 Etiology of AP (N=72)

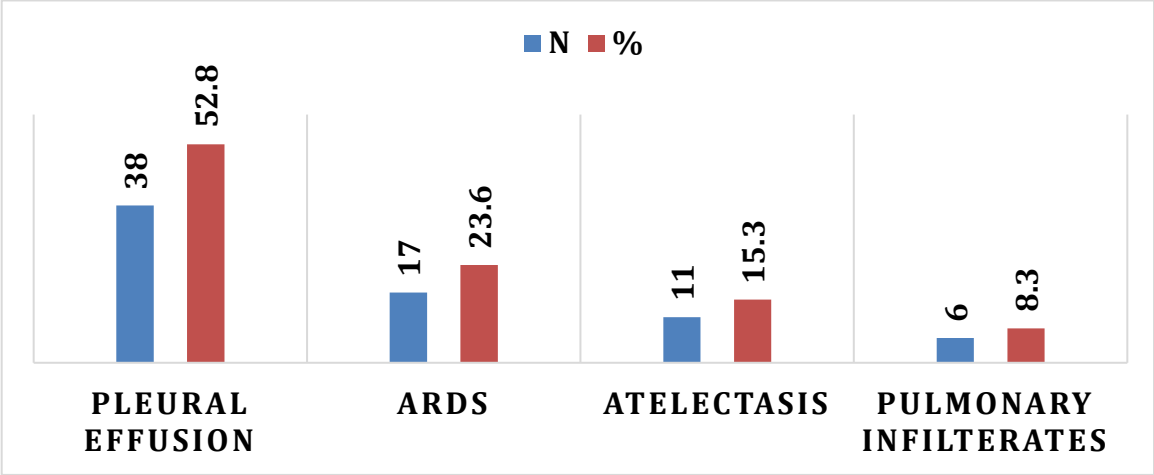

Figure-2 Lung complications based on CECT (N=72)

Table-II association of hypoxemia with organ failure

	N (%)	PaO2 (mmHg)	P-value
Mechanical ventilation	35 (48.6%)	67.3±7.9	<0.001
Cardiovascular failure	29 (40.3%)	67.6±8.8	0.019
Renal failure	16 (22.2%)	66.9±9.2	0.041
Coagulating failure	13 (18.1%)	68.9±8.2	0.359
Outcome			0.05
Survived	44 (61.1%)	73.9±9.2	
Mortality rate	28 (38.9%)	68.1±9.1	

Table-III Respiratory complications associated with respiratory failure

Respiratory complications	Respiratory Failure	CSTI (Mean± SD)	PaO2 (mmHg)
Atelectasis	5 (45.5%)	7.42±2.98	69.3±7.9
Pleural effusion	22 (57.9%)	7.63±2.78	72.6±8.8
Pulmonary infiltrations	4 (66.7%)	6.47±3.32	77.9±9.2

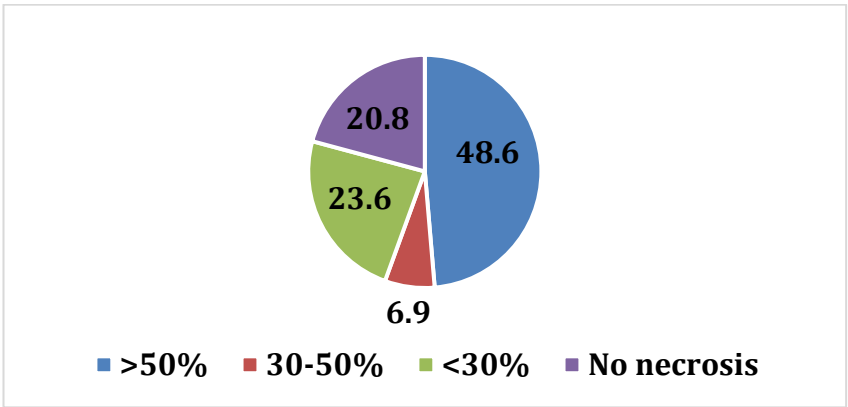

Figure-3 Prevalence of necrosis

DISCUSSION

The present study mainly focused on the evaluation of spectrum of pulmonary dysfunction in acute pancreatitis patients, observed that hypoxemia at initial presentation is associated with cardio-renal dysfunction throughout disease progression, and is a poor prognostic indicator. Gallstones was the most prevalent etiology of AP. Individuals with over 50% necrosis experienced delicate pulmonary dysfunction and required ventilator support. Pulmonary dysfunction plays a significant role in

multiple organ system failure (MSOF) and identification of early mortality severe acute pancreatitis (SAP) [15, 16]. Awareness of these manifestations can assist in the identification of high-risk groups, enabling the implementation of supportive measures early stages of disease. Fei et al. [17] showed that an oxygen saturation level lower than 92% by itself indicates severity.

The lung represents the most important organ affected by the inflammatory dysfunction associated with acute pancreatitis (AP). The severity of pulmonary vascular involvement in AP ranges from mild to severe acute respiratory distress syndrome (ARDS) and typically requires mechanical ventilation. Early detection of physiologic changes is important to reduce the increased mortality associated with pulmonary complications in AP and to maximize overall clinical outcomes. Maintaining adequate oxygenation empowers clinicians establishes basic standards. There is decreased saturated oxygen (SpO2) and increased respiratory rate are subtle indicators of clinical deterioration. This prompts clinicians to perform more invasive tests such as arterial blood gas testing to monitor partial oxygen tension (PaO2) and PaO2/FiO2 ratio, to aid in the early diagnosis of ARDS [18].

In the present study, the incidence of mild hypoxemia was 44.4%. Similarly, Lu et al [19] reported that PaO2 <71 mm Hg was 51% cases. Similarly, Amiti et al [20] reported that PaO2 <60 mmHg was found in 46% cases of acute hypoxemia. An earlier study showed 10 cases of acute edematous pancreatitis, up to 47% for acute sterile pancreatitis and even 74% for infected pancreatitis [21]. The presence of hypoxemia at the initial presentation was significantly related to the subsequent development of acute respiratory distress syndrome (ARDS). Furthermore, hypoxemia at presentation emerged as a significant risk factor for mortality.

A variety of complications arises from acute pancreatitis, including cholecystitis and pancreatic abscess especially pulmonary complications [22, 23]. Pulmonary complications beginning with pancreatitis in which is intensive about 4.2 days for pulmonary edema, 5 days for atelectasis, 12 for acute respiratory distress syndrome (ARDS), and diagnosed within 2 days. Admission episodes have been associated with respiratory failure for obvious reasons [24]. In our study, effective consolidation treatment was successful in preventing death.

Acute respiratory distress syndrome (ARDS) has been documented to manifest in up to 15% of all persons with acute pancreatitis, with those experiencing exacerbations requiring prolonged hospitalization at high risk for pre-existing ARDS [25]. The severity or persistence of the may have influenced the disease by both local and systemic infections [26]. Pang et al. reported that early hypoxemia itself acts as a risk factor for ARDS [27], a finding that is consistent with our results.

CONCLUSION

Hypoxemia at initial presentation is associated with cardio-renal dysfunction throughout disease progression and is a poor prognostic indicator. Gallstones was the most prevalent etiology of AP. Individuals with over 50% necrosis experienced delicate pulmonary dysfunction and required ventilator support.

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