Original Article

Outcome Of Patients With Acute Pancreatitis Requiring Intensive Care Admission. A Retrospective Study

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Abstract

Acute pancreatitis (AP) is the inflammatory condition of the pancreas characterized by clinical manifestations of epigastric pain, digestive turbulence, tachycardia, fever, peritonitis and respiratory distress. The pathophysiological hallmark of acute pancreatitis was activation of the trypsin, release of pro-inflammatory mediators and organs damage. Therefore, this retrospective cohort was conducted to determine the outcome of AP in ICU patients by retrieving medical records of AK-diagnosed patients at the ICU of Allied Hospital, Faisalabad (2017-22). Fifty-eight patients, including 35 females and 23 men, diagnosed with AP were incorporated in the study. The clinical and pathological investigations were traced, computed tomography and Ranson scoring system for the determination of the severity of AP was used. Of these, 19 patients died during their stay at hospital but significantly high ($p<0.05$) proportion of individuals recovered. Their mean hospital stay was 7.20 ± 3.44, while admission to ICU lasted 2 to 8 days with a mean of 4.89 ± 2.86. A sum of 35 (60.34%) participants were female, whereas 23 (39.65%) were male out of which 13 females and 6 males died. Hemoglobin, white blood cell, and platelet counts of survivors were greater than ($p<0.05$) non-survivors, 9.12 ± 3.72, 17.78 ± 6.17, 3.4 ± 0.71 and 7.89 ± 2.87, 14.32 ± 6.01, and 2.3 ± 0.45, respectively. In contrast, the hematocrit and blood urea nitrogen levels of deceased were significantly ($p<0.05$) higher (41 ± 9.44, 44.11 ± 17.08 and 36 ± 9.18, 28.01 ± 9.78, respectively). Biochemical analysis revealed that serum albumin, liver enzymes, serum creatinine, lactate, lipase and total bilirubin values were high in non-survivors ($p<0.05$) than survivors i.e. 3.4 ± 1.2, 141 ± 48, 2.9 ± 0.65, 588 ± 220, 1012 ± 566, 2.2 ± 0.91 and 3.2 ± 0.87, 106 ± 32, 2.1 ± 0.77, 411 ± 189, 867 ± 332, 1.8 ± 0.34, respectively. Hence, it was concluded that biochemical investigation like BUN, amylase and creatinine had the efficacy in predicting prognosis and severity of the disease and gallstones were the foremost cause of the presented AP patients.

KEYWORDS: Biliary pancreatitis; Creatinine level; Gallstones; Non-survivors; Survivors.

INTRODUCTION

Acute pancreatitis (AP) is manifested by diverse tissue and organ involvement and inflammation of the pancreas with an incidence of 0.013-0.045% of people globally. Alcohol consumption, gallstones (biliary pancreatitis), and hypertriglyceridemia are the most prevalent etiological causes while, impacted bile duct with gallstone, trauma, mumps and systemic infective conditions also contribute to the incidence of AP (Shafiq et al., 2018; Tenner et al., 2013). Clinical manifestations revealed epigastric-pain, digestive turbulence (vomiting or nausea), hiccups, tachycardia, and peritonitis associated with fever and respiratory distress. Regardless of its etiology, the pathophysiological hallmark of AP is the early commencement of trypsin, severe pancreas inflammation, systemic release of pro-inflammatory mediators, and multiple organs damage. All guidelines concur the existence of clinical

symptoms, high serum lipase and amylase levels, and unique computed tomography characteristics are required for the diagnosis of AP (Hasibeder et al., 2009).

The disease's appearance can range from a moderate, self-limiting course to a harsh variant needing admission to intensive care unit (ICU) to monitor and organ support. Factors such as sepsis, acute kidney damage, multi-organ dysfunction syndrome and hospital-acquired infections can complicate the course of ICU care. Integrated healthcare services are crucial for a successful outcome. As the majority of current material is derived from sophisticated healthcare settings, where etiological factors and treatment methods are vastly distinct, therefore, it is essential to identify disease patterns, progression, and outcomes in the patients (Saleem et al., 2020).

Individuals with acute cholangitis are encouraged to be treated with endoscopic-retrograde cholangiopancreatography. All guidelines emphasize the essence of aggressive fluid resuscitation, oxygen therapy and enteral nutrition over parenteral nutrition was preferably recommended with nasojejunal route as the most desireable route. In the absence of scientific evidence, the majority of guidelines discouraged using prophylactic antibiotics in pancreatic necrosis for prevention of infection. The preferred method for discriminating between sterile and infectious pancreatic necrosis is fine needle aspiration guided by computed tomography. Infected pancreatic necrosis must be treated with debridement, drainage, and antibiotics, whereas clean necrosis should be managed conservatively. Surgical necrosectomy is the standard treatment for necrosis, but less invasive techniques including laparoscopic necrosectomy, retroperitoneal necrosectomy, percutaneous catheter drainage(guided by CT-scan) may be uniformly effective (Hasibeder et al., 2009).

Acute pancreatitis can be a severe ailment with the consequences of prolonged hospitalization and surgical interventions. Without surgical debridement, the AP patients attained 100% mortality owing to infected pancreatic necrosis. Even following debridement, death and morbidity rates in certain series approach 40 and 100%, respectively. While patients who frequently spent weeks or months in ICU and hospital, using substantial quantity of resources, their mortality rate was curtailed and most of them survived (Soran et al., 2000).

Acute pancreatitis epidemiology data are scarce in developing countries and there is a deficiency of published data on the incidence, admissions, hospital length of stay and outcome of acute pancreatitis in Pakistan. Therefore, this study was executed to examine factors that may predict the requirement for critical care admission (CCA) in patients diagnosed with AP in Allied Hospital, Faisalabad along with their outcome. The study will pave the way for the healthcare department in identifying the adverse factors relating to the poor prognosis of AP and enable them to treat the patients at the standard pace as per international guidelines.

MATERIALS AND METHODS

Study Design

The retrospective cohort involved the retrieving of medical records of presented patients at ICU who were diagnosed with AP at Allied Hospital, Faisalabad, Pakistan, from 01-01-2017 to 31-12-2022 (06 years). Fifty-eight patients, including 35 females and 23 men, diagnosed with AP were integrated in this study pertaining to the selection through pre-set criteria for inclusion and exclusion. Adult subjects up to the age of 70 years were included in the study who were admitted to the ICU during their ailment. While, the patients with mild pancreatitis who did not receive intensive care in the hospital, deficient documented records and misclassified AP patients were excluded. The clinical and pathological investigations were recorded on the approved study Performa comprising the data from demography (age, gender, BMI, comorbidities, etc) to CT and Ranson scoring system for the determination of the severity of AP upon hospital admission and 48 hours thereafter. CT scan observed inflammation, necrosis, edema, etc in AP.

The disease complications including sepsis, acute respiratory distress syndrome (ARDS), multi-organ dysfunction syndrome (MODS), acute kidney injury (AKI), and post-cardiopulmonary resuscitation (CPR), were also documented. Biochemical indicators to predict the severity of physiological deviations during ICU admission and severity of physiological disruption were also analyzed, including hemoglobin, hematocrit, WBC and platelets count, liver function test, serum albumin, blood urea nitrogen, serum creatinine, lactate, amylase and lipase level in ICU were assessed for investigation of Acute Physiology and Chronic Health Evaluation II (APACHE II) score. Throughout the

ICU course, six instances of mechanical ventilation, vasopressor, or renal replacement therapy (RRT) were documented. These individuals' outcomes were determined based on ICU mortality and ICU length of stay, as well as hospital mortality and hospital length of stay. Additionally, details of surgical interventions were documented.

Using the Short Form-36 of the General Health Survey (SF-36), we determined the quality of life of recovered patients after hospital discharge (Soran et al., 2000). The SF-36 included questions regarding both physical and mental well-being. Questions about physical health involved bodily functionality, physical role, discomfort and general health. Concerns pertaining to mental health like vitality, emotional health, social functioning and mental health were noted too.

The Charlson Comorbidity Index (CCI) was implemented to quantify common chronic pre-existing diseases and comorbidities across health conditions because it served as a good predictor of poorer outcomes in a variety of acute and chronic conditions. The overall CCI score is the sum of the weighted items (Charlson et al., 1987).

On abdominal CT scans, the Balthazar CT severity index (CTSI) was used to objectively quantify the severity of acute pancreatitis. Zero to four points were granted based on the severity of pancreatitis, necrosis of up to 30% (02 points), necrosis of 30-50% (04 points) and necrosis of more than 50% (06 points) (Balthazar, 2002; Ubaidi et al., 2020).

Acknowledgment
All authors participated equally in this study.

Conflict of Interest
Declared none.

Funding Declaration
No funding or financial sponsorship.

Ethical Approval
This retrospective study was started after acquiring ethical approval from the Ethical Review Board of Allied Hospital, Faisalabad, the study was conducted as per moral norms and the confidentiality of the patients was duly maintained.

Statistical Analysis
The statistics was displayed as Mean±SD and percentages. Continuous data were compared using the paired t-test and parametric data using chi-square test, with the p-value of 0.05, ranked statistically significant. SPSS 20 was used to conduct statistical analysis.

RESULTS

Throughout this study, 58 patients were diagnosed with severe AP and admitted to the ICU ward of Allied Hospital, Faisalabad. Of these, 19 patients died during their hospital care, while the remaining 39 patients survived and were successfully discharged (Table 1). A significantly high ($p<0.05$) proportion of individuals with severe AP have recovered. The details of the hospitalization of the patients and their admission to the hospital's intensive care unit (ICU) were analyzed, and it was determined that their hospital stay ranged from 2 to 60 days with a mean of 7.20±3.44, while their admission to the ICU lasted 2 to 8 days with a mean of 4.89±2.86 (Table 2).

A sum of 35 (60.34%) of 58 study participants were female, whereas 23 (39.65%) were male. 13 females and 6 males passed away as a result of AP throughout treatment. The average age of survivors was recorded as 53.25±10.18, whereas the average age of non-survivors was 57.98±12.60. The highest prevalence of AP ($p<0.05$) was found in patients with a BMI between 25 and 30. Hematological tests revealed that the hemoglobin, white blood cell, and platelet counts of survivors were greater than those of non-survivors, with values of 9.12±3.72, 17.78±6.17, 3.4±0.71 and 7.89±2.87, 14.32±6.01, and 2.3±0.45, respectively. In contrast, the hematocrit and blood urea nitrogen

levels of deceased individuals were significantly higher (41±9.44, 44.11±17.08 and 36±9.18, 28.01±9.78, respectively).

Biochemical analysis revealed that serum albumin, liver enzymes, serum creatinine, lactate, lipase and total bilirubin values were high in died non-survivor patients than survivor group i.e. 3.4±1.2, 141±48, 2.9±0.65, 588±220, 1012±566, 2.2±0.91 and 3.2±0.87, 106±32, 2.1±0.77, 411±189, 867±332, 1.8±0.34, respectively, while serum amylase was seen high among survivors than died persons (688±218 and 529±201, respectively) (Table 3). The etiological components of AP were compared and classified revealing a non-significant association ($p \geq 0.05$) among the treatment groups. Gallstones were found the major etiological factor, followed by alcoholism, hypertriglyceridemia, impacted bile duct, trauma and other systemic infections in both survivor and non-survivor groups (Table 4).

The incidence of acute respiratory distress syndrome, pancreatic abscess, and infectious pancreatic necrosis was highest ($p<0.05$), followed by acute sepsis, acute kidney injury, multiple organ failure, and post-cardiopulmonary resuscitation (Figure 1). The Ranson score of the AP patients at admission in the ICU and after 24 hours, as well as the APACHE, CCI, and CTSI scores revealed substantially ($p<0.05$) higher values for non-survivors than for survivors, respectively (Figure 2). The CT scan images and interpretations of the results revealed that pancreatic abscess was the most prevalent condition among the patients, followed by pancreatic fistula and necrosis (Figure 3). Comparing survivors with non-survivors revealed that the pancreatic tissues of non-survivors were more severely damaged (Figure 4).

Table 1: Mortality rate in patients affected with acute pancreatitis

S. No	**Variables**	**Total No. of patients**	**Patients recovered n (%)**	**Patients died n (%)**	**$\chi 2$**	**p-value**
1	Mortality	58	39 (67.240	19 (32.75)	3.9866	0.0458*

*indicated that the p-value was significant at $p<0.05$

2: Hospital and ICU stay of patients affected by AP

S. No	**Variables**	**Total No. of patients**	**No. of days (Mean±SD)**	**No. of days (Median)**
1	Stay at the hospital (Days)	58	7.20±3.44	2-60
2	Admitted in ICU (Days)	58	4.89±2.87	2-8

Table 3: Clinical, biochemical and pathological investigations of AP patients in ICU

S. No	**Parameter**	**Survivors**	**Non-survivors**
1	Gender n (%) Male Female	 17 (43.58) 22 (56.41)	 6 (31.57) 13 (68.42)
2	Age (Years) n(%) 18-30 31-45 45-70 Mean age (Years±SD)	 2 (5.12) 11 (28.20) 26 (66.66) 53.25±10.18	 - 4 (21.05) 15 (78.94) 57.98±12.60

3	BMI (Kg/m^2) 18.5-24.9 25-30 30 and above	 13 (33.33) 19 (48.71) 7 (17.94)	 6 (31.57) 9 (47.36) 4 (21.05)
4	Hemoglobin (g/dl)	9.12±3.72	7.89±2.87
5	Hematocrit (%)	36±9.18	41±9.44
6	WBCs count (x1000)	17.78±6.17	14.32±6.01
7	Platelets count (x100000)	3.4±0.71	2.3±0.45
8	Serum albumin (g/dl)	3.32±0.77	2.78±1.2
9	Liver function test (U/dl)	106±32	141±48
10	Blood urea nitrogen (mg/dl)	28.01±9.78	44.11±17.08
11	Serum creatinine (mg/dl)	2.1±0.77	2.9±0.65
12	Serum lactate (U/dl)	411±189	588±220
13	Serum amylase (U/L)	688±218	529±201
14	Serum lipase (U/L)	867±332	1012±566
15	Total bilirubin (mg/dl)	1.8±0.34	2.2±0.91

Table 4: Etiology of acute pancreatitis in both survivors and non-survivors

S. No	**Etiology**	**Survivors n (%)**	**Non-survivors n (%)**	**χ2**	**p-value**
1	Gall stones	12 (30.76)	8 (42.10)	0.0989	0.7531
2	Alcohol consumption	9 (23.07)	3 (15.78)	0.0344	0.8528
3	Hypertriglyceridemia	8 (20.51)	3 (15.78)	0.00	0.9959
4	Impacted bile duct	5 (12.82)	2 (10.52)	0.0416	0.8383
5	Trauma	2 (5.12)	1 (5.26)	0.3721	0.5418
6	Other systemic infections	3 (7.69)	2 (10.52)	0.0272	0.8691

Figure 1: Complications associated with acute pancreatitis patients

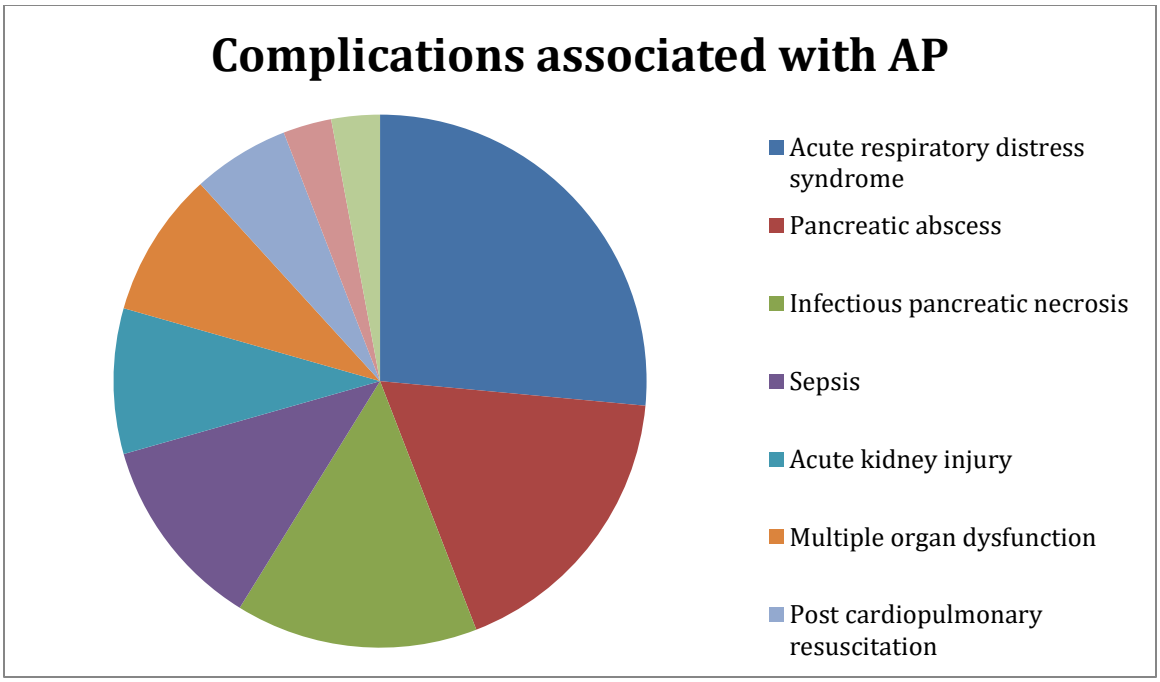


Figure 2: Comparative study of parameters of survivors and non-survivors

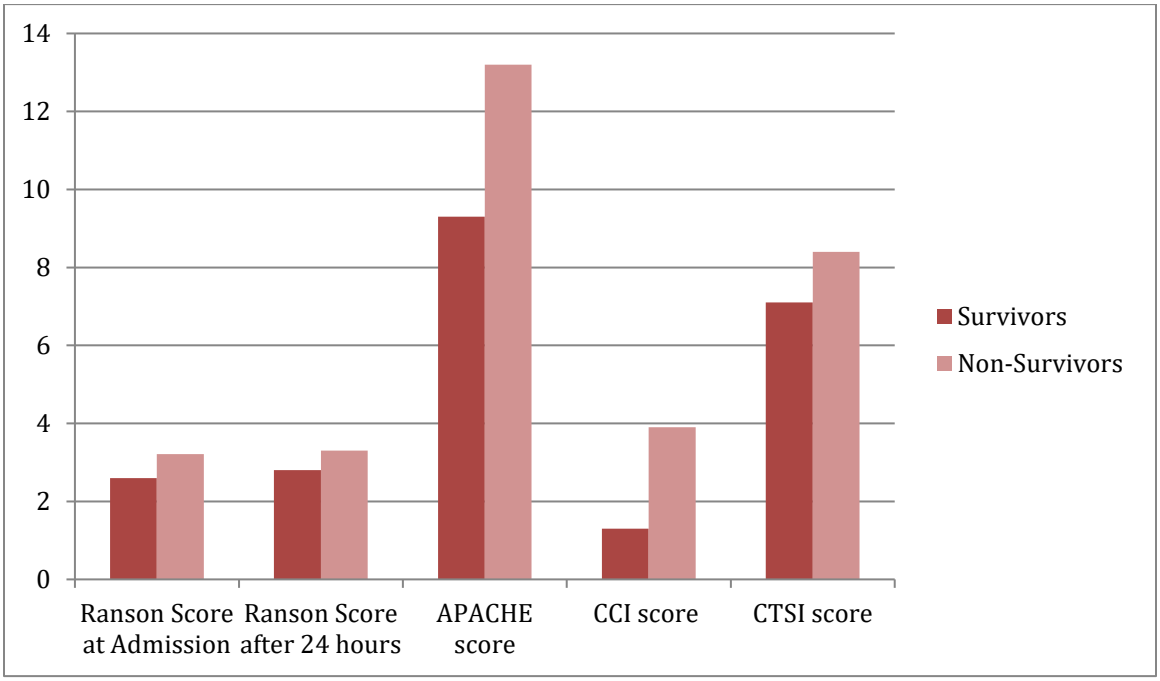


Figure 3: Comparative study CT-scan findings of survivors and non-survivors

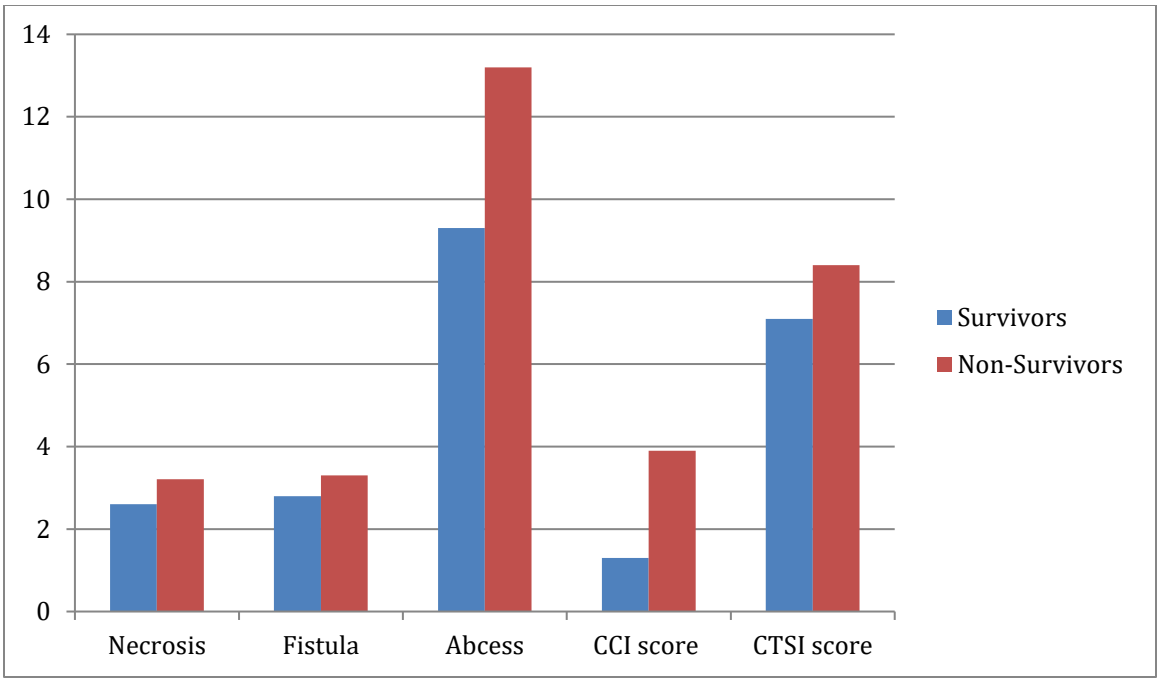
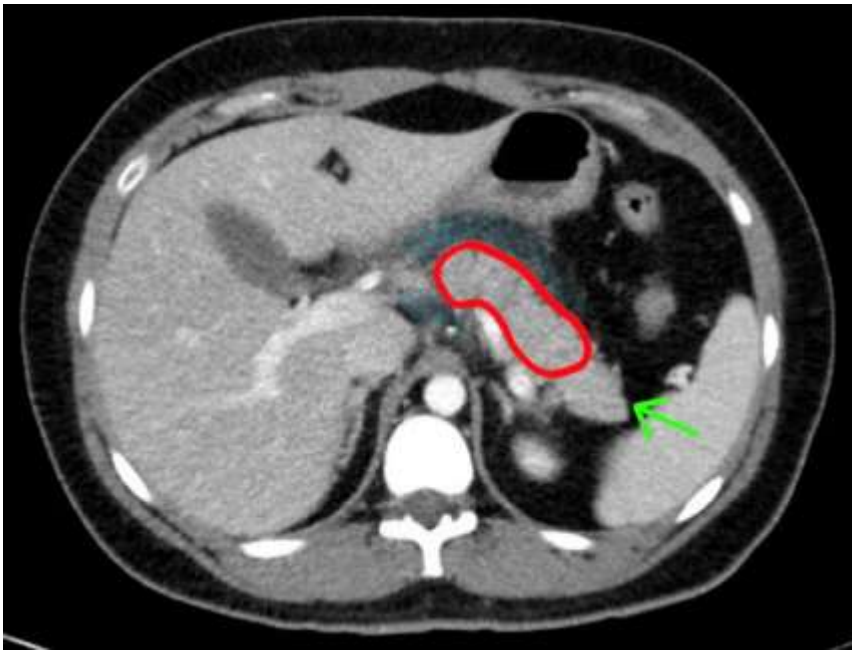


Figure 4: CT-scan image of acute pancreatitis (Source: Ronald Goubert)



DISCUSSION

The management of AP should be conducted in stages at International guidelines. Evaluation of disease severity is crucial not only for predicting mortality and case fatality but also for resource allocation. Despite advancements in healthcare facilities, sickness continues to impose a substantial mortality rate among severely infected patients. The absence of local data, coupled with poor healthcare facilities and management practices, made our patients susceptible to negative outcomes (Saleem et al., 2020).

Another study confirmed our results that Gallstones were the major etiological factor accounting for 46% of AP patients (Shafiq et al., 2018). Cucher et al. (2014) reported a gallstone pancreatitis death rate of approximately 20% in advanced healthcare settings. Gallstone pancreatitis looks to be a dangerous illness with a higher mortality rate in our location. AKI was present in around 38% of the patients at ICU admission. According to another report, AKI was also a risk factor for increased morbidity, mortality, and treatment costs15. In this analysis, AKI was not identified as an independent risk factor for the poor outcome; however, there was a significant difference in mortality between patients who required RRT and those who did not (25 vs. 5%, P = 0.014). The mean APACHE II score of patients was 23. The estimated mortality rate at this level is approximately 70%. At this score range, an earlier study conducted in a similar ICU showed a mortality rate of over 60 percent. In this instance, the score predicts the outcome with the same degree of certainty. The difference between survivors and non-survivors' mean APACHE II scores was statistically significant (P = 0.0005). The mean score in the sample was 2.6 at admission and 2.7 after 48 hours (Shafiq et al., 2018).

It was reported in a study that AK caused 60% mortality in the ICU or wards due to the severity of their illness. Gallstones and alcohol contributed equally to the risk of AK patients' condition. But neither gender nor etiology predicted the prognosis (Chatzicostas et al., 2002). Patients admitted with organ failure had a higher mortality rate than those without organ failure. The development of organ failure during a stay in the intensive care unit was also associated with similar or higher mortality. Multisystem organ failure and chronic organ failure were associated with the highest mortality rates (36%). Pulmonary dysfunction was the major component of multiorgan failure and contributed to the premature death of SAP patients (Singh et al., 2012). Similar to the study that studied the course of AP cases in the ICU, respiratory failure was the most common systemic complication. 90% of the patients required mechanical ventilation. All patients with respiratory failure received lung-protective mechanical ventilation. Acute renal failure was estimated to occur in up to 42% of AP patients (Zhang et al., 2008).

It was reported in a study that mortality due to AP was 25%, and despite protracted hospitalization and many problems, long-term functional outcomes for survivors were rather satisfactory. Compared to their counterparts, the results of the SF-36 survey indicated that these individuals had no substantial physical or emotional limits. The respondents indicated that their overall health was poorer than it was one year ago as per SF-36 (Soran et al., 2000).

CONCLUSION

This retrospective data revealed a significant incidence of morbidity and mortality among AP patients requiring ICU hospitalization. Patients with severe AP were frequently admitted to ICU. But this study concluded that ICU admissions were associated with longer hospital stays and increased mortality rates. Survivors required long-term care after hospital discharge and continued to be at risk for complications and mortality. In addition, the biochemical investigation had the efficacy of simple bed sites measures, such as BUN, amylase and creatinine, in predicting prognosis and determining the appropriate level of care and severity of the disease. Gallstones served as the foremost and avoidable cause of the AP patients presented to the hospitals.

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