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Original Research Article

Predictive factors for the mortality of acute pancreatitis at the time of admission

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ABSTRACT

Background: Acute pancreatitis (AP) is a potentially life-threatening condition with an unpredictable course. Prognosis is influenced by organ failure and secondary infections related to pancreatic necrosis. Identifying mortality predictors at the time of admission can guide management and improve outcomes. This study aimed to examine clinical, laboratory, and demographic factors associated with mortality in AP patients to identify early predictors of adverse outcomes.
Methods: A prospective observational study was conducted at Sri Aurobindo Medical College and Hospital, Indore, from September 2022 to February 2024, involving 174 patients with acute pancreatitis confirmed by clinical symptoms, elevated serum lipase/amylase levels, and CT imaging. Demographic, clinical, and laboratory data were collected, and binary logistic regression was used to identify mortality predictors. A p value of <0.05 was considered statistically significant.
Results: The cohort included 135 males (77.6%) and 39 females (22.4%), with the largest age group being 21-40 years. The overall mortality rate was 12.1%. A significant association was found between age and mortality, with the highest mortality rate (33.3%) in patients over 60 years. Serum albumin levels were significantly lower in deceased patients (p=0.001). No significant correlations were found between mortality and factors such as serum amylase, lipase, liver enzymes, or sex. Binary logistic regression confirmed age as the only independent predictor of mortality, with a 1.371 increase in mortality odds per additional year of age.
Conclusions: The cohort included 135 males (77.6%) and 39 females (22.4%), with the largest age group being 21-40 years. The overall mortality rate was 12.1%. A significant association was found between age and mortality, with the highest mortality rate (33.3%) in patients over 60 years. Serum albumin levels were significantly lower in deceased patients (p=0.001). No significant correlations were found between mortality and factors such as serum amylase, lipase, liver enzymes, or sex. Binary logistic regression confirmed age as the only independent predictor of mortality, with a 1.371 increase in mortality odds per additional year of age.

Keywords: Acute pancreatitis, Age, Clinical outcomes, Mortality, Predictive factors, Serum albumin

INTRODUCTION

Acute pancreatitis (AP) is a potentially life-threatening condition characterized by unpredictable severity. The prognosis primarily depends on the development of organ failure and secondary infections associated with pancreatic or peripancreatic necrosis.[1] While the overall mortality rate has remained relatively stable, the incidence of AP appears to be on the rise. Despite this, no pharmacological therapy currently exists to treat AP. However, best practice protocols, derived from both observational studies and randomized controlled trials, have demonstrated significant improvements in reducing morbidity and mortality.[2]

The pathogenesis of AP involves several key cellular processes, including premature trypsinogen activation, dysfunctional calcium signalling, impaired autophagy,

endoplasmic reticulum stress, and mitochondrial dysfunction.[3] Several scoring systems, such as the bedside index of severity in acute pancreatitis (BISAP) and the acute physiology and chronic health evaluation (APACHE) II, are commonly used to predict disease severity (mild, moderately severe, and severe, according to the revised Atlanta classification) and mortality. However, no single tool is universally effective for all cases of AP.[4]

Organ failure, defined as significant functional impairment of one or more organ systems critical to sustaining life, remains a key determinant of prognosis.[5] Host factors, such as age, comorbid conditions, obesity, triglyceride levels, etiology, extent of local pancreatic injury, and genetic predisposition, have been identified as predictors for the development of organ failure in patients with AP.[5] Aggressive conservative management, including fluid resuscitation, shock management, and the timely use of analgesia, plays a pivotal role in improving outcomes. Controversies persist regarding the role of antibiotic therapy, but early nutrition and minimally invasive approaches are widely recognized for reducing mortality and morbidity.[6]

The present study was initiated at our institution in response to the limited research in this region. Our goal was to investigate the predictive factors for mortality in patients with acute pancreatitis at the time of admission and to explore the clinical and medical correlates associated with the condition.

METHODS

The present prospective observational study was conducted in the department of surgery, Sri Aurobindo Medical College and Hospital, Indore (MP) from September 2022 to February 2024 on 174 patients with complaints of abdominal pain suggesting acute pancreatitis, fulfilling the inclusion and exclusion criteria.

Inclusion and exclusion criteria

All the patients of any age and gender with abdominal pain suggestive of acute pancreatitis (confirmed on computed tomography), with elevation of serum lipase or amylase of more than 3-fold the upper limit of the normal range were included in the study. Patients who did not undergo confirmation of acute pancreatitis on computed tomography and those who did not provide voluntary written informed consent for participation in the study, were excluded.

The study was approved by the institutional ethics committee and scientific review committee. All the patients were included in the study after obtaining a voluntary written informed consent from them. All the ethical considerations were upheld during the study period and all the patients were explained about their rights during the study period. The present study was not funded by any pharmaceutical company or any institution.

Patients eligible for the study were identified from those attending regular outpatient sessions or admitted for treatment. A general consent form was obtained from all participants. After the procedure, all selected patients were assessed for postoperative outcomes.

The investigations conducted included a complete blood count (CBC), liver function tests (LFT), prothrombin time/international normalized ratio (PT/INR), amylase, lipase, and CT scan findings. These tests were performed to evaluate the patient's overall condition and to monitor any changes.

Statistical analysis plan

The information was first recorded in the specialized form and then moved to Microsoft excel for evaluation. Descriptive statistics was presented in the form of numbers and percentages. Binary logistic regression analysis was conducted to identify the predictors of mortality on admission. A p value of <0.05 was considered as statistically significant.

RESULTS

We included 174 patients with acute pancreatitis in our study. 16 (9.2%) patients were in the age group of ≤20 years; 85 (48.9%) in the 21-40 years age group; 61 (35.1%) in the 41-60 years age group and 12 (6.9%) were in the age group of more than 60 years. The youngest patient was 4 years old, while the oldest one was 75 years old.

Table 1: Association between age and outcomes.

Age group (years)	Outcome (%)		Total (%)
	Other	Mortality	
≤20	16 (100.0)	0 (0.0)	16 (100.0)
21-40	81 (95.3)	4 (4.7)	85 (100.0)
41-60	48 (78.7)	13 (21.3)	61 (100.0)
>60	8 (66.7)	4 (33.3)	12 (100.0)
Total	153 (87.9)	21 (12.1)	174 (100.0)

Pearson chi-square value=16.562, df=3, p value=0.001, Significant

There were 135 (77.6%) males and 39 (22.4%) females, with a male preponderance.

The mean amylase in acute pancreatitis patients was 553.86±997.28 U/l, serum lipase was 2503.69±5787.77, serum SGOT was 81.63±117.03, serum SGPT was 74.15±127.48, serum ALP was 152.29±122.22, total serum protein was 6.27±1.36, mean serum albumin was 3.43±3.28, and mean serum globulin was 3.08±0.69.

Table 2: Comparison of mean hematological parameters in relation to the outcomes.

Hematological parameters	Outcome		't' value, df	P value
	Others	Mortality		
Serum amylase	536.59±1013.07	681.73±892.33	-0.528, df=124	0.599, NS
Serum lipase	2497.56±6062.95	2545.81±3468.75	-0.031, df=124	0.975, NS
Serum SGOT	79.92±120.98	94.24±84.12	-0.472, df=140	0.638, NS
Serum alkaline phosphatase	148.37±120.91	195.44±135.76	0.165, df=141	0.869, NS
Serum total proteins	6.42±1.35	5.02±0.58	-1.107, df=106	0.271, NS
Serum albumin	3.57±3.46	2.41±0.47	3.952, df=132	0.001*
Serum globulin	3.13±0.71	2.68±0.32	1.339, df=136	0.183, NS
PT	15.58±4.17	16.94±4.14	-1.262, df=136	0.209, NS
INR	1.47±6.53	1.09±0.59	0.266, df=172	0.791, NS

Unpaired 't' test applied. A p value <0.05 was considered as statistically significant.

1 (0.6%) patient went absconding; 8 (4.6%) requested for discharge; 15 (8.6%) patients went LAMA, while 129 (74.1%) were discharged in well condition. There were 21 (12.1%) deaths in our study.

Predictive factors for mortality

In our study, among the 174 patients studied, deaths were reported in 21 (12.1%) patients. A statistically significant association was seen between age of the patients and mortality (χ^2=16.562, df=3, p=0.001). The death rate was highest in patients of age more than 60 years (33.3%), followed by 41-60 years (21.3%) and 21-40 years (4.7%), while no deaths were reported in patients of age 20 years or less.

No significant association was seen between sex of the patients and the mortality (χ^2=0.521, df=1, p=0.471).

The hematological data was not available for all the patients. The mean serum albumin was found to be significantly lower in patients who expired compared to others ('t' value=3.952, df=132, p=0.001).

The factors that were found to be significantly affecting the mortality were age (>60 years) and low serum albumin level, while no other factors were found to be significantly affecting the mortality.

DISCUSSION

In the present study, most of the patients were in the age group of 21-40 years with a male preponderance.

The mean serum amylase, serum lipase, serum SGOT, SGPT, serum alkaline phosphatase were significantly higher, while serum albumin was much lower than the normal in patients with acute pancreatitis. Serum total proteins and serum globulin were found to be within the normal limits. The elevated serum amylase, lipase, SGOT and SGPT are consistent with acute pancreatitis, while low serum albumin could be due to inflammation or fluid shifts, that are also commonly seen in acute pancreatitis.

Age of the patients more than 60 years was significantly associated with mortality.

Binary logistic regression analysis considering the outcome as mortality also showed that age was an independent predictor of mortality in patients with acute pancreatitis. With increase in each one-year, the odds of mortality increased by a factor of 1.371. Hence, age was the only predictive factor of mortality in patients with acute pancreatitis on admission. Study done by Jinno et al, the predictive factors identified were hematocrit $\geq$40%, BUN$\geq$40 mg/dl, base excess <-3.0 mmol/l and inflammation extending to the rectovesical excavation on admission.[7] In another study on severe acute pancreatitis by Company et al reported a mortality rate of 31.3% and found that age, upper digestive tract bleeding, acute renal failure, respiratory failure and shock were the factors significantly related to mortality.[8] A study by Hassan et al reported an in-hospital mortality rate of 10.9% in patients with acute pancreatitis. They found that RDW, serum creatinine, albumin and glucose even with borderline level changes were good predictors of in-hospital mortality in these patients.[9] A study by Wu et al showed that BUN>25 mg/dl, impaired mental status, systemic inflammatory response syndrome (SIRS); age >60 years or the presence of a pleural effusion were identified as the variables for the prediction of in-hospital mortality in acute pancreatitis patients.[10]

In our study, age was the only predictor of mortality in acute pancreatitis patients, which is supported by Company et al and Wu et al.[8,10]

The limitation of the study was that we could not take into consideration many other factors which were analyzed by other studies. Only one parameter (age) could be identified in our study as the predictor of mortality on admission in acute pancreatitis patients.

Given the limitations of this study, including its single-center design and focus on a limited set of predictors, future research should aim to incorporate a broader range of clinical, laboratory, and radiological variables to

develop more comprehensive mortality prediction models. Additionally, further multi-center studies with larger sample sizes are necessary to validate these findings and refine the clinical management strategies for AP, ultimately improving patient outcomes.

CONCLUSION

In this prospective observational study of 174 patients with acute pancreatitis (AP), we identified age and serum albumin levels as significant predictors of mortality at the time of admission. Patients aged over 60 years had a notably higher mortality rate, with age emerging as the only independent predictor of mortality, as supported by previous studies. Low serum albumin levels were also found to be significantly associated with worse outcomes, likely reflecting the underlying inflammatory processes and fluid shifts typical of AP.

While other clinical and biochemical factors, such as serum lipase, amylase, and liver enzymes, were not significantly linked to mortality in our cohort, these findings underscore the importance of early identification of high-risk patients, particularly those of advanced age and with low albumin levels, in managing AP.

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