

Serum Albumin Level in Persistent Organ Failure in Acute PancreatitisAlok Kumar², Anupma Priyadarshini², Rakesh Kumar Ranjan³¹Tutor, Department of Biochemistry GMCH, Purnea²Tutor, Department of Biochemistry GMCH, Purnea³Assistant Prof.& Head, Department of Biochemistry GMCH, Purnea

Received: 18-01-2024 / Revised: 26-02-2024 / Accepted: 11-03-2024

Corresponding Author: Dr. Anupma Priyadarshini

Conflict of interest: Nil

Abstract:**Background:** The research emphasises on the association bond of Serum Albumin Level used as a marker for diagnosis of Persistent Organ Failure in Acute Pancreatitis.**Material and Methods:** The samples for the study were collected from the central lab, out-patient department and in-patient department of Department of Biochemistry, adult patients suffering from Acute Pancreatitis. The research was carried out on a total of 100 patients for 1 year which were satisfying Atlanta criteria for Acute Pancreatitis will be diagnosed based on the following symptoms; elevated serum amylase, and lipase levels, that is greater than the normal limit, findings associated with the characteristics of the radiological findings. Also, with the abdominal computerized ultrasonography and tomography.**Results:** In the present research, albumin always descends obviously in AP patients with POF ($p < 0.05$). The AUC under ROC line is 0.869. Albumin has been proved as an excellent marker of POF in AP. However, no previous study has researched into the association between albumin and incidence of POF in AP. Therefore, this study is the first time to show that the reduction of serum albumin is significantly associated with increased risk of POF in AP.**Conclusion:** Thus it can be concluded that serum albumin on admission is independently associated with POF in AP. The study suggests that albumin is a valuable tool for a rapid assessment of POF in patients with AP.**Keywords:** Serum Albumin, Persistent Organ Failure, Acute Pancreatitis.This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Acute pancreatitis is defined as an acute inflammatory process of the pancreas with variable involvement of other regional tissues or remote organ systems. Among the patients with acute pancreatitis (AP) undergoing a general course clinically, 10% to 20% of the patients are found with development of persistent failure of organ that lasts for more than 48 hours. AP is associated with the significant mortality rate of around 30%. In depth consideration is recognised with the organ failure patients persistently and is termed as the key determinant of the severity with presence or absence of local pancreatic complications. Albumin excessively tends to synthesise in the liver. The low level of serum albumin is often experienced in the elderly patients. [1] Patients with liver cirrhosis, diabetes, heart failure, malnutrition, cancer and also sepsis, coronary heart diseases, acute phase protein, initial serum albumin were also likely to be associated with the liver disease progression. Logistic regression on multivariate basis and the analysis of the subgroup were in totality determined in cases where decreased albumin was found to be associated with mortality rate that tends to take place as a side-effect of organ failure. The low serum albumin was independently associated with the

increased risks of development of the persistent organ failure and is said to be the major cause of death in acute pancreatitis. Hypoalbuminemia is also termed as a predictor of the acute pancreatitis severity marker. [2]

As the levels of serum albumin decrease, the risk associated with the persistent organ failure increases. The incidence of the organ failure was found to be 3.5%, 10%, and 41.6% successively. It was found in patients with normal to mild albumin and severe hypoalbuminaemia. Severe acute pancreatitis has a high percentage with the incidence of the mortality ratio; whereas the Non-infectious inflammation is caused by the systemic inflammation response syndrome as a result of early onset of inflammation. Most of the patients suffer from mild, self-limiting and inflammatory processes. [3] It is vital to determine therapeutic strategies to provide an early assessment of the disease severity through effective treatment. Invasive and the non-invasive techniques, the scoring system, radiological imaging, biochemical parameters are used for diagnosis and evaluation of disease severity in acute pancreatitis [3]. It is significant to determine the patients suffering from acute pancreatitis at an early stage. Also to make

the patients secured from developing persistent organ failure in the early course of time and helping out with disease recovery. [4] The accuracy of the systems helps in predicting the value associated with persistent organ failure. Complications are highly associated with the optimal management of current resources [5,6].

Materials and Methods

This was a cross sectional observational study comprising of adult patients suffering from Acute Pancreatitis correlated to tropical medicinal stream and Gastroenterology with internal medical departments, at - Department of Biochemistry at Government Medical College and Hospital Purnea. Study duration is one year. Acute Pancreatitis will be diagnosed based on the following symptoms; elevated serum amylase, and lipase levels, that is greater than the normal limit, findings associated with the characteristics of the radiological findings. Also, with the abdominal computerized ultrasonography and tomography. It is additionally termed and diagnosed as per the classification done on the basis acute pancreatitis, with local systemic complications. Severe acute pancreatitis associated with organ failure, local systemic complications and resolved between 48 hours.

The etiology of AP is associated with the biliary imaging, ultrasonography or computed tomography associated with endoscopic retrograde cholangiopancreatography that deals with gallbladder and stones with the common bile duct. Alcohol induced diagnosis with intake of alcohol to the onset of the symptom that can be established. It is also associated with the Traits of ERCP, hyperlipidemia, drugs, trauma and associated terms. Allied conditions like Idiopathic cases and patients with the evidence of chronic pancreatitis, malignancy, kidney and liver failure, anemia with severe infections present in the last tenure, or terms like organ transplantation were not included. At the time of the admission and hospitalization, a quick medical history and physical examination was done, like the etiology of the pancreatitis, organ failure history, demographic data, severity associated with the AP index, all were noted and marked carefully. Blood sample and urine

sample were collected and included the complete blood count. Tests like WBC, RBC, platelets count, Red cell distribution width, haemoglobin serum albumin levels, serum creatinine level, blood urea nitrogen, serum calcium, sodium, serum potassium, serum glucose etc. (CRP) arterial blood gas analysis and lactate dehydrogenase that is (LDH), etc. were also checked and analysed before proceeding for further treatment.

Inclusion Criteria

- 1) Abdominal pain consistent with AP.
- 2) Contrast-enhanced computed tomography (CECT), magnetic resonance imaging (MRI) or abdominal ultrasonography findings characteristic of AP.
- 3) Serum amylase and/or lipase elevation \geq threetimes the upper limit of normal

Exclusion Criteria

- 1) Patients younger than 18-year-old.
- 2) The time from abdominal pain onset to hospital admission \geq 72 h.
- 3) Chronic pancreatitis.
- 4) Pancreatitis induced by trauma or pregnancy.
- 5) Unavailable laboratory measurements or medical records.

Thus, a total of 100 patients diagnosed with AP were selected for the study.

Statistical Analysis: All the significant factors associated with median and inter-quartile range were compared through Mann Whitney U tests Chi-square (χ^2) and Fisher's exact probability test were performed for making a comparison. The positive-negative predictive test value was determined with the ratio (+LR -LR). The Kaplan Meier method was used to estimate the survival rate and these tests dealt with statistical significance assessed at less than 0.05 value. The factors included with independent predict AP related in-hospital mortality, multiple regression analysis, significant variables and the univariate analysis with ($P < 0.05$).

Results

Table 1: Type of POF and corresponding Mortality

	Persistent organ failure	In-hospital mortality
Solitary POF	10	9
Respiratory	10	9
Renal	0	0
Cardiovascular	0	0
Multiple POF	5	4
Respiratory + renal	2	2
Respiratory + cardiovascular	2	1
Respiratory + cardiovascular + renal	1	1
Total	15	13

As per above table, 10 patients developed solitary POF (all of respiratory system). On the other hand, 5 patients

developing multiple POF (2 of lung and kidney, 2 of lung and heart, and 1 of lung, kidney and heart). 13 patients with POF died during hospitalization. No death was observed in patients without POF.

Table 2: Comparison between patients with and without POF

	Without POF, n = 35	With POF, n = 15	P-Value
Sex (M/F)	26-M, 9-F	11-M, 4-F	NS
Age (Year)	48.5	49.2	NS
ALB (g/L)	37.9	29.1	0.000
ALT (U/L)	38.2	39.9	NS
AST (U/L)	35.9	44.8	NS
LDH (U/L)	249	468	0.000
ALP (U/L)	75.9	72.3	NS

Compared to patients without POF, patients with POF showed significantly elevated values of LDH, whereas the levels of ALB were statistically lower.

Table 3

	Univariate Analysis Odd Ratio	P-Value	Multivariate Analysis Odd Ratio	P-Value
Age (Year)	1.009	NS	-	-
ALB (g/L)	0.729	0.000	0.751 (0.644, 0.865)	0.000
LDH (U/L)	1.01	0.000	-	-

In univariate analysis, ALB and LDH were found to be significantly associated with the incidence of POF. According to Multivariate Analysis, ALB remained an independent prognostic factor for POF in AP (OR: 0.751, 95%CI: 0.644–0.865; $p < 0.05$).

Table 4:

	AUC (95%CI)	Cut-off	Sensitivity	Specificity	PPV	NPV
ALB	0.869	32.9	0.785	0.829	0.651	0.9

ALB on admission was shown to have an area under curve (AUC) of the receiver operating characteristic of 0.869(95%CI: 0.805–0.935), with specificity of 82.9%, a sensitivity of 82.9%, positive predictive value (PPV) of 65.1%, and negative Predictive value (NPV) of 90.0%. The optimal threshold was 32.9 g/L.

Discussion

Acute pancreatitis is one of the most serious emergencies in abdominal surgery department. The proposed design is based on 2012 revision of the Atlanta Classification of acute pancreatitis and found that the level of albumin in acute pancreatitis patients with POF is much lower than patients without POF. Albumin is a stable and very flexible heart-shape- molecule. It's a natural plasma protein with median half-life of 18 to 19 days and synthesized only by liver at a rate of 9 to 14 g per day in healthy individuals. Albumin has well-known effects on maintaining fluid balance, being responsible for 75 to 80% of colloid osmotic pressure in the basal physiological state. The binding characteristic of Albumin to an extremely wide range of endogenous and exogenous ligands, enables it to transport them to specific tissues and organs, to increase their solubility in plasma, or to dispose of them when they are toxic.

In the progress of many diseases, infection, inflammation, a low-level of serum albumin has been identified. It is because of abnormal metabolism of

albumin led by inflammation response, as well as a low intake of albumin. Although there is no clear mechanism behind it, IL-6 and other inflammatory cytokines may play an important role. Similarly, this phenomenon has also been found in AP, especially obvious in severe acute pancreatitis patients. This is because (a) The reaction in the progress of SAP, including infection, will lead to insulin resistance, which may at last result in metabolic disorders. Thus, the degradation of albumin gets much more for the reason of lower using-rate of glucose and fat; (b) The ability of biosynthesis of albumin in liver is weak for low intake and stimulate of inflammatory factors; (c) In the progress of stress response, vaso permeability become higher so that albumin will permeate into tissue space. POF is the most important cause of death within the first 2 weeks of disease onset. It's critical to have the ability to assess the risk of AP patients developing. Lots of invasive or non-invasive methods, including biochemical parameters, severity scores and radiological imaging modalities have been applied for predicting POF in patients with AP. In a systemic review for prospective studies, the Bedside Index of Severity in Acute Pancreatitis (BISAP) and the Japanese Severity Score were identified as the best predictors evaluating predictors of POF within 48 h of admission. However, they were too cumbersome to be applied in the individual patient. This highlights the need to develop approaches to prediction of POF that have early practical utility while still providing a performance sufficient to be applied in the individual

patient. Another study found that the Glasgow score is the best classifier at 48 h of admission for predicting POF in patients with AP by using a head-to-head comparison between the Ranson, APACHE II, Glasgow and the BISAP scoring systems. Mounzer et al. compared several existing clinical scoring systems and found that these scores showed modest accuracy and seemed to have reached their maximal efficacy to predict POF in patients with AP. In the present research, albumin always descends obviously in AP patients with POF ($p < 0.05$). The AUC under ROC line is 0.869. Albumin has been proved as an excellent marker of POF in AP. However, no previous study has researched into the association between albumin and incidence of POF in AP. Therefore, this study is the first time to show that the reduction of serum albumin is significantly associated with increased risk of POF in AP.

Conclusion

Thus, it can be concluded that serum albumin on admission is independently associated with POF in AP. The study suggests that albumin is a valuable tool for a rapid assessment of POF in patients with AP.

References

1. Hong W, Lin S, Zippi M, Geng W, Stock S, Basharat Z, Cheng B, Pan J and Zhou M. Serum Albumin Is Independently Associated with Persistent Organ Failure in Acute Pancreatitis. *Canadian Journal of Gastroenterology and Hepatology*. 2017; 10:1155: 10. 1
2. Hu X, Zhang L, Advances in antibiotic therapy for acute pancreatitis. *Journal Article*. 20 18; 30:7: 08-711.
3. Hassan AE, Rehim A DESA, Kobiesy, AM, Ashmawy MA, Sayed AAEZ, Ameen SR. Early Predictors of Acute Pancreatitis Related In-Hospital Mortality: How Practical Are They? *Scientific Research*. 2018; 8:3: 67-68.
4. Li¹ S, Zhang Y, Li² M, Xie C and Wu H. Serum albumin, a good indicator of persistent organ failure in acute pancreatitis. *BMC Gastro*. 2017; 17:59: 0615-0618.
5. Li S, Wu H, Zhang Y. Serum Albumin: A Good Indicator of 28-Day-Mortality in Acute Pancreatitis. *JACS. Journal of the Am Coll of Surg*. 2017; 225:4:2: 128.
6. Mounzer R, Langmead JC, Wu UB, Evans CA, et al. Comparison of Existing Clinical Scoring Systems to Predict Persistent Organ Failure in Patients with Acute Pancreatitis. *Gastroenterology*. 2012; 142:7: 1476-1482.