



ORIGINAL ARTICLE

The predictive validity of serum biochemical markers in case of acute biliary pancreatitis.

Adnan Riaz¹, Sumera Saghir², Roomana Anwar³, Sabeen Khalid⁴, Muhammad Shakil⁵, Tabinda Fatima⁶

Article Citation: Riaz A, Saghir S, Anwar R, Khalid S, Shakil M, Fatima T. The predictive validity of serum biochemical markers in case of acute biliary pancreatitis. Professional Med J 2024; 31 (05):689-693. <https://doi.org/10.29309/TPMJ/2024.31.05.8003>

ABSTRACT... Objective: To analyze the detection validity of serum biochemical markers in the suspicion of acute biliary disease. **Study Design:** Retrospective study. **Setting:** Department of Biochemistry, Islam Teaching Hospital, Sialkot. **Period:** January 2023 till June 2023. **Methods:** In a retrospective analysis of 70 patients, there were 35 patients suffering from acute biliary pancreatitis and 35 patients were suffering from non-biliary pancreatitis in group A and B respectively. The patients were identified based on high serum amylase levels. Age, gender, and history were examined, and patients with persistent abdominal pain and abnormal amylase levels were included. Computed tomography detected gallstones, and patients with chronic liver issues were excluded. **Results:** Comparative analysis conducted using Chi-square and Mann-Whitney tests in SPSS 15.0. A significant result was defined as a P value under 0.005. The sample collection was done from Islam teaching hospital Sialkot and the study was conducted at biochemistry lab of Islam medical college Sialkot. **Conclusion:** The study, involving 70 patients, aimed to predict acute biliary pancreatitis using serum biochemical markers. The two groups, one with acute biliary pancreatitis and other non-biliary, showed significant differences in key markers (total bilirubin, ALT, direct bilirubin, ALP, AST and serum amylase). These findings suggest the potential diagnostic relevance of these markers.

Key words: Acute Pancreatitis, Alanine Transaminase, Bilirubin, Biochemical Markers, Serum Amylase.

INTRODUCTION

Acute pancreatitis is a diagnostic condition with serious consequences that includes sepsis, systemic inflammatory response and in some cases multi-organ failure.¹ The diagnosis of this condition is due to the extent of pancreatic inflammation, necrosis, hemorrhage and abscess formation. In some cases, there is presence of peripancreatic fluid that could be one of the prognostic marker.²⁻³ Biliary pancreatitis is known to be due to movement of bile into the bile duct (common). In particular, the blockade of Ampulla of Vater due to biliary sludge or gallstones can be triggering factor for patients.⁴ The extent or degree of obstruction in both pancreatic bile duct or and the bile duct (common) have significant ramifications for the resolution of the disease. The nature of obstruction can be either chronic, mild or in some cases acute.⁵ The obstruction can be transient or temporary, and the factors like stones

or tumors are important to determine the prognosis and subsequent management of the disease. It is worth noting that the rate of complications arise if the obstruction persists beyond 48 hours. The condition takes place when the bile acids to cholesterol ratio is disturbed to abnormal levels.⁶⁻⁷ One of the most common primary bile acids are cholic acid and chenodeoxycholic acid that are called as the precursor of cholesterol. The primary bile acids undergo conversion into secondary and tertiary bile acids by the intestinal microbiota through hydroxylation and deconjugation.⁸ These reserves of bile salts are kept under a constant level by intestinal-hepatic circulation. The concentration of bile acids in the blood indicates about the hepatic activity. Under normal circumstances liver removes 20g of bile salts from the blood. Until recently it was known that the expensive and specialist methods like HPLC are used to detect bile acids in blood.⁹

1. MBBS, M.Phil (Biochemistry), MSc (Medical Education), Assistant Professor Biochemistry, Islam Medical College, Sialkot.

2. MBBS, M.Phil (Biochemistry), Associate Professor Biochemistry, Rashid Latif Medical College.

3. MBBS, M.Phil (Biochemistry), Assistant Professor Biochemistry, Islam Medical College, Sialkot.

4. MBBS, M.Phil (Biochemistry), Assistant Professor Biochemistry, M. Islam Medical College, Gujranwala.

5. MBBS, M.Phil (Biochemistry, PHD Biochemistry), Associate Professor Biochemistry, King Edward Medical University, Lahore.

6. Pharm D, M.Phil (Biochemistry), Assistant Professor Biochemistry, Grand College of Pharmacy, Sialkot.

Correspondence Address:

Dr. Adnan Riaz
Department of Biochemistry
Islam Medical College, Sialkot.
dradnanriaz@gmail.com

Article received on: 16/11/2023

Accepted for publication: 17/01/2024

Total bilirubin, AST, ALP, Direct bilirubin and ALT are some of the biochemical markers used for the prognosis of acute biliary pancreatitis. Serum amylase Abdominal ultrasound is considered to be one of the ways to detect acute pancreatitis however, its sensitivity decreases up to 60-70 % as the disease severity increases as in case of acute pancreatitis. In many cases endoscopic ultrasound is used as it has a higher rate to detect acute pancreatitis as compared to abdominal ultrasound but it is not commonly found for the patients.¹⁰ There are several easy and less expensive biochemical testings' that are proposed to detect acute pancreatitis so that early prognosis and management of the disease can be done. The goal of this study was to analyze the importance of biochemical markers (serum) in detecting acute biliary pancreatitis.

METHODS

This retrospective research included 70 patients among which 35 were suffering from acute biliary pancreatitis and 35 patients were suffering from non-biliary pancreatitis, who visited tertiary care unit between the period of six months from January 2023 to June 2023. The diagnosis was made after analyzing the enhanced serum amylase levels among patients. The age, gender history of patients was studied and only those patients who fulfilled the inclusion criteria were made part of the study. Patients showing constant abdominal pain, abnormal serum amylase levels were included on the study. Computed tomography was done to detect gallstones among patients. The patients who had chronic liver issues or those who were not willing to participate were excluded from the study. Patients were asked to give consent in the written form.

The study was conducted after Ethical board approval (IMDC/ERC/2023/05) (04.01.23). Serum levels of ALT, ALP, AST, direct bilirubin, amylase and total bilirubin were measured. Results are depicted in Table-II. Patients were divided into two groups for a comparative analysis. The results were compared for both acute biliary pancreatitis and non-biliary patients. Mann-Whitney test and Chi square test were carried out for comparison of the parameters of groups. In order to analyze

the data, SPSS 15.0 was used. Probability value < 0.005 was significant.

RESULTS

The research was carried out on two groups to find the significance of serum biochemical markers for acute biliary pancreatitis. There were 35 patients in acute biliary pancreatitis and non-biliary group respectively. Acute biliary pancreatitis group had patients who were suffering from acute biliary pancreatitis who follow inclusion criteria. There were 15 males and 20 females in acute biliary pancreatitis and there were 12 males and 23 females in non-biliary group. The mean age of patients was 64.5 ± 14 and 61.4 ± 12 for acute biliary and non- biliary groups respectively. The features are shown in Table-I.

Features	Acute Biliary Pancreatitis n=35	Non-biliary Group n=35
Sex		
Male	15 (42%)	12 (34%)
Female	20 (57%)	23 (65%)
Mean Age	64.5 ± 14	61.4 ± 12

Table-I. Features of acute biliary pancreatitis and non-biliary group

Table-II presents a comparative analysis of concentration of serum biochemical markers in biliary and non-biliary patient groups. The biochemical markers used were total bilirubin, direct bilirubin, AST, ALT, ALP and serum amylase. In patients with acute biliary pancreatitis, the mean concentration of total bilirubin was 2.21 mg/dl, while in the non-biliary group, it was 1.626 mg/dl. The difference was statistically significant with a P value of 0.005. The average concentration of direct bilirubin was 1.09 ± 1.5 mg/dl in acute biliary pancreatitis patients and 0.81 ± 2.4 mg/dl in the non-biliary group, with a statistically significant difference (P value = 0.003). Patients with acute biliary pancreatitis exhibited a higher mean AST concentration of 202.1 ± 1.9 U/l, while the non-biliary group had a mean concentration of 114.7 ± 2.0 U/l. The difference was considered to be significant statistically (P value = 0.001). The mean ALT concentration was 177.8 ± 2.1 U/l in acute biliary pancreatitis patients and 99.1 ± 1.7 U/l in the non-biliary group, with a statistically significant p value (P value = 0.002).

Features	Mean Values of Acute Biliary Pancreatitis	Mean Values of Non Biliary Group	P-Value
Total bilirubin	2.21 ± 2.4 mg/dl	1.626 ± 3.4 mg/dl	0.005
Direct bilirubin	1.09 ± 1.5 mg/dl	0.81 ± 2.4 mg/dl	0.003
Aspartate Aminotransferase (AST)	202.1 ± 1.9 U/l	114.7 ± 2.0 U/l	0.001
Alanine Transaminase (ALT)	177.8 ± 2.1 U/l	99.1 ± 1.7 U/l	0.002
Alkaline phosphatase (ALP)	442.1 ± 16.3 U/l	342.9 ± 21.3 U/l	0.000
Serum amylase	3433.8 ± 21.9 U/l	1988.1 ± 19.9 U/l	0.002

Table-II. Concentration of serum biochemical markers in biliary and non-biliary patients

Patients with acute biliary pancreatitis had a higher mean ALP concentration of 442.1 ± 16.3 U/l, while the non-biliary group had a mean concentration of 342.9 ± 21.3 U/l. In patients with acute biliary pancreatitis, the mean serum amylase concentration was notably elevated at 3433.8 ± 21.9 U/l, compared to the non-biliary group, where it was 1988.1 ± 19.9 U/l. This difference was statistically significant (P value = 0.002).

DISCUSSION

The mortality rate of acute biliary pancreatitis is increasing worldwide. It is important to distinguish biliary pancreatitis from non-biliary for its proper management.¹¹ The duration between incidence of disease and ERCP is of great significance, therefore it is important to detect the biliary origin at an early stage. The sensitivity and accuracy of procedure like USG to detect biliary disease reduces as the disease severity increases.¹²⁻¹³ In case of pancreatitis the biochemical analysis presented low predictive scores. The presence of occult biliary stones indicate that majority of the idiopathic pancreatitis are originally biliary in nature.¹⁴ In some cases, the use of endoscopic ultrasonography proves to be an accurate method to detect occult stones, sand or any biliary material. As the biliary sludge is described as echogenic substance made of cholesterol, muco-glycoproteins and calcium bilirubinate. If the serum amylase levels are increased three folds that is considered as an indication of acute pancreatitis.¹⁵⁻¹⁶ In our study it was found that the total bilirubin, direct bilirubin, ALT, AST, ALP and serum amylase are the biomarkers that have different concentrations in the acute biliary pancreatitis patient and any non-biliary person. These biomarkers can be considered as prognostic markers for acute biliary pancreatitis.

Serum lipase predominantly originates from pancreatic acinar cells. It begins to elevate 4–8 hours following symptom onset, reaching its peak at 24 hours.¹⁷ Lipase exhibits a strong correlation with levels of serum amylase, demonstrating similar kind of sensitivity and specificity. Biliary pancreatitis, unlike hypertriglyceridemia-linked and alcohol related pancreatitis, is marked by an intact pancreas suddenly impacted by biliary sludge or stones.¹⁸ In cases of alcoholic pancreatitis, amylase levels tend not to rise as significantly as in biliary pancreatitis. Approximately 25% of alcoholic pancreatitis patients exhibit normal amylase levels. A lipase-to-amylase ratio exceeding 3 may suggest alcohol linked pancreatitis, albeit with limited sensitivity. Lipase levels surge fourfold more than amylase in chronic pancreatitis. Sensitivity for lipase in acute pancreatitis can range from 55% leading to 100%. In patients with initial pancreatitis and those with post-ERCP pancreatitis, where amylase, total bilirubin, and direct bilirubin values were estimated after ERCP clearance, all these parameters showed declines post-obstruction relief in biliary ducts. The mean half-lives of amylase and lipase were prolonged in early pancreatitis, whereas the higher scores were elevated in case of pancreatitis (post ERCP). This underscores the significance of amylase, lipase, and bilirubin levels in biliary pancreatitis, along with the respective half-lives. Combining EUS with biochemical studies may enhance the biliary pancreatitis diagnosis.¹⁹ Biochemical indicators hinting at the biliary origin of pancreatitis may guide healthcare providers toward endoscopic evaluation and treatment, particularly in the absence of cholelithiasis identified by ultrasound in acute pancreatitis.²⁰ In this study, we investigated the predictivity of serum biochemical markers for acute biliary pancreatitis using two

groups. Table-II presents a comparative analysis of serum biochemical markers. Patients with acute biliary pancreatitis showed significantly higher levels of total bilirubin, direct bilirubin, ALP, ALT, AST, and serum amylase compared to the non-biliary group. These differences were statistically significant, with P values < 0.005, indicating the potential diagnostic value of these markers.

CONCLUSION

In summary, the study suggests that serum biochemical markers, particularly total bilirubin, direct bilirubin, ALP, ALT, AST, and serum amylase, have high detection validity for identifying acute biliary pancreatitis. Their distinctive patterns of elevation may aid in prompt and accurate characterization between biliary and non-biliary forms of the disease, contributing to more effective clinical management and treatment decisions.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SOURCE OF FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.






Copyright© 17 Jan, 2024.

REFERENCES

- Silva-Vaz P, Abrantes AM, Morgado-Nunes S, Castelo-Branco M, Gouveia A, Botelho MF, Tralhão JG. **Evaluation of prognostic factors of severity in acute biliary pancreatitis.** International Journal of Molecular Sciences. 2020 Jun 16; 21(12):4300.
- Ćeranić DB, Zorman M, Skok P. **Interleukins and inflammatory markers are useful in predicting the severity of acute pancreatitis.** Bosnian Journal of Basic Medical Sciences. 2020; 20(1):99.
- Lee DW, Cho CM. **Predicting severity of acute pancreatitis.** Medicina. 2022 Jun 11; 58(6):787.
- Tian F, Li H, Wang L, Li B, Aibibula M, Zhao H, Feng N, Lv J, Zhang G, Ma X. **The diagnostic value of serum C-reactive protein, procalcitonin, interleukin-6 and lactate dehydrogenase in patients with severe acute pancreatitis.** Clinica Chimica Acta. 2020 Nov 1; 510:665-70.
- Xiao W, Liu W, Yin L, Li Y, Lu G, Liu X, Gong W, Ding Y, Wang M, Yan Z. **Serum hydroxybutyrate dehydrogenase as an early predictive marker of the severity of acute pancreatitis: A retrospective study.** BMC Gastroenterology. 2020 Dec; 20:1-7.
- Silva-Vaz P, Abrantes AM, Castelo-Branco M, Gouveia A, Botelho MF, Tralhão JG. **Multifactorial scores and biomarkers of prognosis of acute pancreatitis: applications to research and practice.** International Journal of Molecular Sciences. 2020 Jan 4; 21(1):338.
- Guo X, Li Y, Lin H, Cheng L, Huang Z, Lin Z, Mao N, Sun B, Wang G, Tang Q. **A nomogram for clinical estimation of acute biliary pancreatitis risk among patients with symptomatic gallstones: A retrospective case-control study.** Frontiers in Cellular and Infection Microbiology. 2022 Aug 2; 12:935927.
- Saqeb KM. **Serum procalcitonin in the prediction of severity and outcome of acute pancreatitis.** Bangladesh Critical Care Journal. 2021 Apr 18; 9(1):16-21.
- Prakash S, Soni S, Tekwani N, Prakash Sr S. **Validity of the adapted Waterlow score as a Tool in Predicting Adverse outcomes in acute pancreatitis when compared with the Ranson score and serum CRP Levels.** Cureus. 2022 Jun 13; 14(6):e25908.
- Tang J, Chen T, Ni W, Chen X. **Dynamic nomogram for persistent organ failure in acute biliary pancreatitis: Development and validation in a retrospective study.** Digestive and Liver Disease. 2022 Jun 1; 54(6):805-11.
- Singh HB, Singh LJ, Shougrakpam P. **Serum lipase amylase ratio in predicting the etiology of acute pancreatitis.** Journal of Medical Society. 2020 May 1; 34(2):96-100.
- Jin X, Ding Z, Li T, Xiong J, Tian G, Liu J. **Comparison of MPL-ANN and PLS-DA models for predicting the severity of patients with acute pancreatitis: An exploratory study.** The American Journal of Emergency Medicine. 2021 Jun 1; 44:85-91.
- Crisu GC, Balaban VD, Gaman LE, Jinga M, Marin FS, Stoian I, Atanasiu V. **Early risk stratification in acute pancreatitis: The role of biochemical and hematological parameters.** Internal Medicine. 2020; 17(3):11-8.
- Hasan MK. **Prognostic role of biochemical markers in severe acute pancreatitis—A study of 50 cases.** SAS J Surg. 2021 Oct; 10:617-21.

15. Wang X, Zhu L, Tao K, Bi C, Qin M, Tang G, Huang J, Liu S. **Red cell distribution width to serum albumin ratio as an early prognostic marker for severe acute pancreatitis: A retrospective study.** Arab Journal of Gastroenterology. 2022 Aug 1; 23(3):206-9.
16. Zver T, Calame P, Koch S, Aubry S, Vuitton L, Delabrousse E. **Early prediction of acute biliary pancreatitis using clinical and abdominal CT features.** Radiology. 2022 Jan; 302(1):118-26.
17. Chen Y, Li Q, Ma L, Cai Z, Zhou J. **Development and internal validation of a practical model to predict 30 days mortality of severe acute pancreatitis patients.** Annals of Medicine. 2023 Dec 12; 55(1):2236648.
18. Khalid MU, Ashraf MA, Zia SA, Zainab A, Muhammad AI, Naqvi SR. **Comparison of serum procalcitonin levels with glasgow score to predict severity of acute biliary pancreatitis.** Pakistan Armed Forces Medical Journal. 2023 Oct 30; 73(5):1467-70.
19. Gezer NS, Bengi G, Baran A, Erkmen PE, Topalak ÖS, Altay C, Dicle O. **Comparison of radiological scoring systems, clinical scores, neutrophil-lymphocyte ratio and serum C-reactive protein level for severity and mortality in acute pancreatitis.** Revista da Associação Médica Brasileira. 2020 Jul 20; 66:762-70.
20. Haiyan Z, Na P, Jialin H, Qingjian L, Jianying B, Xiumei B. **Acute pancreatitis in pregnancy: A ten-year noninterventonal, retrospective cohort experience.** Gastroenterology Research and Practice. 2022 Jun 9; 2022.

AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Adnan Riaz	Main reseracher and Author	
2	Sumera Saghir	Research methods and experimentation.	
3	Roomana Anwar	Experimentation and sample collection.	
4	Sabeen Khalid	Analysis of data.	
5	Muhammad Shakil	Idea conception and writing of manuscript.	
6	Tabinda Fatima	Sample collection and analysis of data.	