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THE EFFICACY OF ARTERIAL BLOOD GAS ANALYSIS AS A PREDICTOR FOR MORBIDITY AND MORTALITY IN ACUTE PANCREATITIS IN ADULTS IN TERTIARY CARE CENTRE

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ABSTRACT

Background: Arterial blood gas analysis (ABG) is a simple diagnostic test, and its parameters have not been evaluated enough to predict outcome and severity in pancreatitis. In this study, ABG will be used as a parameter to evaluate the efficacy in predicting the morbidity and mortality in AP. **Material and methods:** It is a prospective study. Data was collected by history taking, imaging studies and appropriate lab investigations, were followed up until patient was discharge. **Results:** The study was done on 35 cases. Of the 9 patients who had renal failure, 7 were in the HCO3 - ≤24 group and 2 patients with HCO3 - &>24 mEq/L, the difference in the group is significant (P = 0.007). Local determinant was present in 21 patients, 10 of whom had pH ≤7.35 and 11 with pH&>7.35 the difference between the group was significant (P = 0.012). In the present series, 12 patients (20%) suffered from MODS, which was present in 50% of the patients with pH levels &<7.35. Also, 20% patients with bicarbonate &<22 mEq/L experienced organ failure. **Conclusion:** ABG analysis of low arterial pH and bicarbonate level at the time of presentation predicts severe outcome of ICU admission, MODS and need for intervention.

INTRODUCTION:

It is an inflammatory disorder of the pancreas characterized by oedema and, when severe, necrosis. It is a wide spectrum disease from mild, self-limiting inflammation of the pancreas to acute illness characterised by infected pancreatic necrosis, multiple organ failure and a high mortality rate[18].

The diagnosis is usually The evaluation of the severity of AP is one of the most important in its management. Although there are multiple criteria, prognostic factors and scoring systems have been proposed to assess the severity and reliability Some of them include multiple biochemical parameters resulting in cumbersome scoring, like in case of Ranson's criteria which even take 48 hours to calculate, the delay in early detection leads to poor progression and death.

Metabolic acidosis is a common occurrence during disease progression, Detection of metabolic acidosis, usally done in a simple test like Arterial Blood gas analysis (ABG), various component of ABG are used in different scoring system such as APACHE-II, Ranson's and BISAP. Arterial pH is used as a component of APACHE-II. Also MA is one of the factors measurement of Ranson's and Modified Glasgow scoring system. Occurrence of MA in pancreatitis for multiple reasons: lactate formation due to shock, renal failure and decrease respiratory effort to wash out carbondioxide and later stage duct disruption leading to loss of bicarbonate rich pancreatic disruption. There is a paucity of data on the prognostic value of various individual parameters of arterial blood gas (ABG)analysis carried out in AP patients at admission.

METERIALS AND METHODS

Thirty five patients admitted Yenepoya Medical College Hospital from OCTOBER 2019 to OCTOBER 2021 with the diagnosis of AP, fulfilling the inclusion and exclusion criteria were enrolled in the study after obtaining informed consent. For arterial blood gas analysis 1-2ml of blood will be collected from artery(radial/femoral) into heparinized syringe on the at admission and was followed up till clinical recovery or death due to the disease. Based on clinical progression categorized upon Determinant-Based Classification of Acute Pancreatitis Severity, the severity was assessed based on the duration of hospitalization, organ failure , local complications, need for intervention and

mortality. The baseline demographic data, which includes age, sex, occupation, education status, habits, co-morbid condition were taken.

Inclusion Criteria

Patient age& >18 years with acute pancreatitis presented within 10 days after the onset of pain are included in the study any two of the three criteria are to be fulfilled to diagnose acute pancreatitis.

1. Clinical signs and symptoms suggestive of pancreatitis (acute onset upper abdomen pain with or without radiation to back, vomiting, constipation).
2. Elevated serum amylase/lipase to greater than three times the upper limit of normal.
3. Positive abdominal imaging.

Exclusion Criteria

1. Patient who do not give consent for participation.
2. Pregnant patients

Patient presenting more than 10 days after onset of pain. The patients were categorized into subgroups based on the arterial pH (pH ≤ 7.35 and & >7.35), bicarbonate levels (≤ 24 and &>24mEq/L), and base deficit values (≥ 4mEq/L and &<4mEq/L, respectively).

The study was initiated after ethical committee clearance.

RESULTS

Majority of the patients are in the age group of 26-35 years(60%), The mean age was 35.17. Around 88.6 %(N= 31) of study population were Males and only 11.4(N=4) are female. The majority of cases were alcohol induced(65%). Followed by Gall stones(28.6%) while only one case of acute pancreatitis was drug(zamivudin) [2.9%]induced and Carcinoma (2.9%). Majority of the patient didn't have any comorbidities(71.4%) and only Diabetic association is 4 (11.4%)among the 35 patients.

Table 1: Distribution Of The Subjects Based On Co-morbidities

CO-MORBIDITIES	Frequency	Percent
CLD, CARDIAC	1	2.9
DIABETIC	4	11.4
DM, RVD IHD	1	2.9

HBSAG +	1	2.9
HTN, DM	1	2.9
NIL	25	71.4
RVD reactive	2	5.7
Total	35	100.0

20 out of 35 patients required more than 12 days of hospital (57%), where as 15 out of 35 patients recovered with 12 days of hospital stay. Nearly half of the patient required ICU care (51%). Around two third (n=25, 71%) of the patient diagnosed pleural effusion at the time of admission with by chest x-ray or CT imaging. Among the CT studies, nearly half the patient have acute necrotizing pancreatitis (n=17, 48%), followed by acute interstitial pancreatitis (n=15, 43%). Small amount of patient diagnosed Acute necrotizing emphysematous pancreatitis (n=2, 6%) and one patient had pancreatic mass with pancreatitis. Majority of the patient didn't have any local complication (n=15, 43%). One fifth patient developed peripancreatic collection (n=7, 20%), followed by Portal and SMV thrombosis, Pseudoaneurysm of splenic artery (n=3, 8%). Around one third patient did not present with any systemic complication (n=12, 34%).13 (37%) patient presented with systemic complication persistent more than 48 hours and only 10(29%) patients had systemic complication less than 48 hours . Majority presented with moderate severity (n=16, 46%). One fifth (n=7,20%) of the patients presented with critical pancreatitis. Most common systemic complication presented was Respiratory failure (n=14, 24%), followed by shock & MODS (both n=12, 20%) and by renal failure(n=9, 15%).

Table 2: Intervention Done In Patients Of Acute

Intervention	Frequency	Percent
PIGTAIL	2	14.3
CYSTOGASTROSTOMY	3	21.4
ERCP +/- CBD EXPLORATION	4	28.5
EMBOLISATION of PSEUDOANEURYSM	2	14.3
LAPRASCOPY CHOLECYSTECTOMY	2	14.3
IVC FILTER	1	7.14
NO INTERVENTION	21	60

Table 3: Arterial Ph At The Time Of Admission

Ph	Frequency	Percent
≤7.35	11	31
>7.35	24	69

The patients with evidence of pH >7.35 had more admission in ICU, duration in hospital stay, detection necrosis in CT, more local compilation, respiratory failure, shock and underwent intervention. There is equal no. of patients in both category of pH under the complication of MODS. There are more of Renal failure noted in more in pH ≤7.35 . Local determinant was present in 21 patients, 10 of whom had pH ≤7.35 and 11 with pH>7.35 the difference between the group was significant (P = 0.012). Of 9 patients in whom renal failure was present, 6 patients had arterial pH ≤7.35 and 3 patients with pH>7.35 the difference between the group is significant (P = 0.008). Interventions were required in 18 patients. Seven patients from the group with pH ≤ 7.35 needed intervention, compared with 11 patients from the second group (P = 0.01).

We compared outcomes in the two base deficit groups, that is, those with base deficit ≥ 4 and base deficit < 4 mEq/L. A total of 14(40%) patients had base deficit ≥ 4, whereas 21(60%) patients had base deficit < 4 mEq/L. The patients with evidence of B.E. <4 had more, prolong hospital stay, detection necrosis in CT, more local compilation, MODS, renal failure. There are equal no. of patients in both category of base deficit under admission of ICU care, respiratory failure and intervention. There Are more patients of shock noted in more among the B.E. ≥4 Of the 9 patients who had renal failure, 8 were in the lesser base-deficit group and one patient with base deficit with <4 group, the difference is significant (P = 0.04).

We compared outcomes in the two bicarbonate groups, that is, those with arterial HCO3 - ≤24 versus those >24 mEq/L. A total of 14(40%) patients had HCO3 - ≤24 whereas 21 patients had HCO3 - >24 mEq/L. The patients with evidence of HCo3 >24 had more ICU admission, prolong hospital stay, more local compilation, respiratory failure, shock and intervention. There are equal no. of patients in both category of base deficit under pancreatic necrosis There Are more of renal failure and mods noted in more in HCO3   ≤24 .Of the 9 patients who had renal failure, 7 were in the HCO3   ≤24 group and 2 patients with HCO3 - >24 mEq/L, the difference in the group is significant (P = 0.007).

DISCUSSION:

In this study we have compared all the scoring systems, biochemical and radiological markers for prediction of morbidity and mortality in acute pancreatitis. We confirmed that single biochemical markers can be used as a reliable indicator for early stratification of severity of acute pancreatitis within 24 hours of admission.

Acute pancreatitis is an inflammatory process of the pancreas with possible peripancreatic tissue and multi-organ involvement inducing multi-organ dysfunction syndrome leading to mortality. The course of the disease is unpredictable. It may resolve with appropriate management or may lead to complications which may end in fatality. The clinician is at pain to predict such complications at the preventable stage with a view to reducing morbidity and mortality in such patients. Development of various scoring systems is steps taken to achieve this goal. This study was undertaken to evaluate Ranson's, APACHE II, BISAP, and MCTSI in predicting severity, organ failure, and mortality in acute pancreatitis.

This study group consisted of 35 patients diagnosed as acute pancreatitis over a period of 2 years.

In our study, the prevalence of acute pancreatitis was higher in males (88.6%) than in females (11.4%) which is in accordance with other studies in which the males were more affected than females [1,2,3,4].

Acute pancreatitis was seen below 30 years of age. High incidence of alcohol consumption in the younger patients could be the reason for this difference which is seen.

In a study by Melanta K et al. (2017) [1]it was observed that the most common cause of acute pancreatitis was alcohol consumption, followed by the biliary pathology. In our study also, alcohol consumption was the most common etiological factor which was followed by biliary disease.

In the present series, 18 patients (51%) required intensive care. 9 patients (15%) developed renal failure, 14 patients (24%) developed respiratory failure, and 12 patients (20%) developed shock. 7 patients (20%) developed peripancreatic collection, 14 patients (40) required some kind of intervention. None of the patient succumbed to their illness.

In the present series, 12 patients (20%) suffered from MODS, which was present in 50% of the patients with pH levels <7.35. Also, 20% patients with bicarbonate <22 mEq/L experienced organ failure. 7 out of 35   (20%) with a lower base deficit suffered organ failure, which was significantly less than the group with higher base deficit (14%) were the studies conducted by Sharma V et al., (2014) [4] and Melanta K et al. (2017)showed higher base deficit showing more incidence. The association between acidosis and an increase in multiple organ failure and mortality for intensive care patients has long been known.

A meta-analysis by the Dutch Pancreatitis Study Group [80] which included 384 patients, reported that the presence of organ failure and infected pancreatic necrosis could predict

the need for intervention. A subset of patients among those managed by the step-up approach will still require surgery.

In the current series none of the patient have succumbed to their, in contrast in other studies by Sharma V et al., (2014) [4] and .Varshney A et al., (2018)[3] , around 10 % mortality were noticed, the study poplutation majority not having acidosis(14 out of 25 having pH> 7.35), these could be one the reason having nil mortality in the current study Although many parameters, including serum procalcitonin, and D-dimer, C-reactive protein, have been studied previously, the present study is important because a detailed evaluation of ABG in AP has not previously been reported.

In our study, it has suggested that low pH, low bicarbonate and higher base deficit at the time of admission predicts an adverse outcome and poor prognosis in patients with AP, including the occurrence of organ failure, need for intervention and mortality. Therefore, carrying out an ABG in patients with AP not only helps in the management of patients but also may predict the outcome.

CONCLUSION

ABG is s a simple diagnostic test, helps in predicting the clinical outcomes of patient suffering from acute pancreatitis, ABG analysis of low arterial pH and bicarbonate level at the time of presentation predicts severe outcome of ICU admission, MODS and need for intervention.

Though these are preliminary studies where increase mortality and severity has been found but further studies are required to assess the importance of ABG markers for severe pancreatitis.

Limitations

Less numbers of patient(n=35), Study duration was two years, the study did not compare the other scoring tool or laboratory markers and no control group was taken in the study .

One of the study's shortcomings is a smaller sample size which could be attributed to the fact that this study was carried out during the covid-19 period. Hence, to have a definite conclusion about the prognosis of the outcome of the modified technique, a study should be carried out with larger sample size.

Ethical Approval: Yenepoya Ethics Committee, YMCH.

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