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Laboratory Parameters of Patients with Acute Pancreatitis and Their Correlation with Severity Index at TMC and Dr Bram Teaching Hospital

[1]Tapan Saha

[1]*Department of General Surgery, TMC, Dr. BRAM teaching hospital Hapania, Agartala, Tripura, India*

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Corresponding Author
Tapan Saha,
Department of General Surgery, TMC, Dr. BRAM teaching hospital Hapania, Agartala, Tripura, India

Author Designation
[1]Associate Professor

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ABSTRACT

Acute Pancreatitis is defined as an inflammatory process of the pancreas with peripancreatic tissue and multiorgan involvement inducing multiorgan dysfunction syndrome with an increased mortality. Development of organ dysfunction within 3 days is defined as an early severe pancreatitis. To assess the laboratory parameters namely Serum albumin, Serum triglyceride, INR, Serum Electrolytes and CRP and correlate the severity index of acute pancreatitis i.e., Balthazar index with above Laboratory parameters. The present study was a Prospective Study. This study was conducted from Complete Enumeration technique during this 6 month period at TMC and DR. BRAM Teaching hospital with diagnosis of acute pancreatitis. Among the male participants, a substantial majority (88 Patients) fell within the reference range for INR (0.9 to 1.1). A smaller portion (12 Patients) had INR values exceeding the upper limit (>1.1). This distribution underscores the predominance of participants with INR values within the normal range among males in the study. Serum Sodium Levels: The majority of male participants (65 individuals) had serum sodium levels within the recommended range (135-145 meq L^{-1}). A significant proportion (29 patients) had hypernatremia (>145 meq L^{-1}), indicating high serum salt levels. A smaller proportion (6 patients) had hyponatremia (135 meq L^{-1}), which means their serum sodium levels were lower than usual. CT severity index (Mortele) is good, to describe clinical profile and outcome of patient with acute pancreatits and correlation with Other severity index. It detects pancreatic necrosis and depict local complications and grading of severity. Mortele index is better than Balthazar index. Revised Atlanta classification is better and more accurate in comparison to Mortele index and Balthazar index for assasing the outcome, i.e. mortality and morbidity.

INTRODUCTION

Acute pancreatitis's is an inflammatory condition of the pancreas with varied clinical presentation. it is one of the commonest causes of abdominal pain requiring hospital admission. Necrotizing pancreatitis is characterized by inflammation of the pancreas with evidence of pancreatic or peripancreatic necrosis. Prevalence rate for pancreatitis in India is 7.9 per 100000 with high morbidity which pose a huge financial challenge to the family and the health sector as well.

Acute pancreatitis is a common disease with wide clinical variation and its incidence is increasing. The average mortality rate in severe acute pancreatitis approaches 2-10%[1]. Severe acute pancreatitis (SAP) develops in about 25% of patients with acute pancreatitis. Severe acute pancreatitis is a two phase systemic disease. The first phase is characterised by extensive pancreatic inflammation and/or necrosis and is followed by a systemic inflammatory response syndrome (SIRS) that may lead to multiple organ dysfunction syndrome (MODS) with in the first week. About 50% of deaths occur within the first week of the attack, mostly from MODS. The formation of infected pancreatic necrosis or fluid collection occurs usually in the second week. The factors which cause death in most patients with acute pancreatitis seem to be related specifically to multiple organ dysfunction syndrome and these deaths account for 40-60% of in-hospital deaths in all age groups. The mortality figures associated with MODS vary between 30-100%. Infection is not a feature of the early phase. Pro inflammatory cytokines contribute to respiratory, renal, and hepatic failure. The "second or late phase" which starts 14 days after the onset of the disease, is marked by infection of the gland, necrosis and systemic complications causing a significant increase in mortality. The association between increasing age and death from acute pancreatitis is well documented. Respiratory failure is the most common type of organ failure in acute pancreatitis[2].

According to the severity, acute pancreatitis is divided into mild acute pancreatitis (absence of organ failure and local or systemic complications, moderately severe acute pancreatitis (no organ failure or transient organ failure less than 48 hrs with or without local complications) and severe acute pancreatitis (persistent organ failure more than 48 hrs that may involve one or multiple organs)[3].

Initial evaluation of severity should include assessment of fluid loss, organ failure (particularly cardiovascular, respiratory, or renal compromise), measurement of the APACHE II score and systemic inflammatory response syndrome (SIRS) score[4,5]. Although measurement of amylase and lipase is useful for diagnosis of pancreatitis, serial measurements in patients with acute pancreatitis are not useful to predict disease severity, prognosis, or for altering management.

Several classification systems have been presented to assess the severity of acute pancreatitis. Presence of SIRS (Systemic inflammatory response syndrome), scores such as the Ranson, the Glasgow, and Acute Physiology and Chronic Health Evaluation (APACHE) are practical for assessing the severity of the disease but are not sufficiently well validated for predicting mortality. Early organ dysfunction predicts disease severity and patients require early intensive care treatment. Antibiotic prophylaxis is usually ineffective and early enteral feeding results in reduction of local and systemic infection[6,7]. Management of acute pancreatitis has changed significantly over the past years. Early management is nonsurgical, solely supportive and patients with infected necrosis with worsening sepsis need intervention. Early intensive care has definitely improved the outcome of patients. Genetic polymorphisms and mutations also contribute to difficulty in predicting the outcome.

MATERIALS AND METHODS

Study centre: TMC and DR BRAM Teaching Hospital, Hapania.

Study population: Patients getting admitted at TMC and DR. BRAM Teaching hospital with diagnosis of acute pancreatitis.

Duration of study: 6 months.

Study design: A prospective study.

Sampling technique: Complete Enumeration technique during this 6 month period.

Sample size: Complete enumeration technique was followed. During data collection period, the study subjects fulfilling inclusion and exclusion criteria's was included in the study.

Methodology: Patients recruited for the study are those who was diagnosed with acute pancreatitis as per serum lipase, amylase and radiological investigation according to Atlanta classification.

All the blood investigations was carried out by automated enzymatic technique and blood samples was collected during admission. All details was maintained in the proforma.

All patients was classified into mild, moderate and severe pancreatitis as per Balthazar index (Act scan

based classification).This severity classification was correlated with the laboratory parameters namely Serum albumin, Serum triglyceride, INR, Serum Electrolytes and C- reactive protein.

Inclusion criteria: Patients recruited for the study are those who was diagnosed with acute pancreatitis as per serum lipase, amylase and radiological investigation according to Atlanta classification.

Exclusion criteria: Patients with Pancreatic cancer.

Data analysis method: The data was recorded in the Proforma and an analysis in terms of objectives of the study using comparative and inferential statistics was done. All data was entered in Microsoft excel data sheet. Analysis was done by IBM SPSS Version 20. p-value less than 0.5 was considered as statistically significant.

Does the study require any a) investigation or b) interventions to be conducted on patients?

- No experimental interventions was carried out as these two procedures are already practised

RESULT

In our study, we conducted a comprehensive analysis of various parameters related to patient outcomes, focusing on the factors influencing discharge and mortality rates. We found that several factors, including diabetes mellitus, hypertension, chronic kidney disease (CKD), alcoholism, and gallstones, did not significantly affect discharge or mortality rates, as indicated by a non-significant p-value of 0.97 for each.the data revealed critical associations between certain medical conditions and patient outcomes. Notably, patients in intensive care had a significantly lower discharge rate (41 out of 50) compared to those not in intensive care ($p = 0.01$). Similarly, patients with conditions such as hypotension, multiple organ dysfunction syndrome (MODS), pleural effusion, acute respiratory distress syndrome (ARDS), pseudocyst, diabetic ketoacidosis (DKA), surgery, and laparoscopy exhibited significant differences in discharge and mortality rates ($p<0.05$ for each). These findings underscore the importance of considering specific medical conditions when predicting patient outcomes and tailoring treatment strategies accordingly. Our study provides valuable insights into factors influencing patient outcomes, aiding healthcare providers in making informed decisions for improved patient care (Table 1).

The analysis of various parameters in our study has yielded compelling results with significant implications for clinical practice. We observed that elevated levels of amylase, lipase, LDH, CRP, Ranson score, Glasgow score, and CTSI/Balthazar were associated with adverse outcomes, which predominantly involved patient mortality,the p-values for amylase, lipase, LDH, CRP, Ranson score, Glasgow score, and CTSI/Balthazar were 0.009, 0.000, 0.003, 0.001, 0.001, 0.001, and 0.003, respectively, indicating strong statistical significant. These findings emphasize the potential of these parameters as prognostic markers for adverse clinical outcomes, particularly in cases where early intervention and monitoring are critical (Table 2).

The utilization of these markers in clinical decision-making processes may enable healthcare professionals to promptly identify patients at higher risk, thus facilitating timely interventions and improving patient care in critical healthcare scenarios. Further research and validation are warranted to establish their broader clinical applicability and utility (Table 3).

Ranson score and severity: Patients with a mild Ranson score 0-2 comprised 23 cases, while those with severe scores >5 were absent in this category.

For patients with a moderate Ranson score 3-5, 29 cases were identified in the mild category, while 22 cases were categorized as severe.

This distribution highlights the ability of the Ranson score to stratify patients based on disease severity, with higher scores corresponding to more severe cases.

Table 1: Clinical profile and outcome

Parameter (N)	Discharge	Death	p-value
Diabetes mellitus (14)	13	1	0.97
Hypentension (10)	9	1	0.97
CKD (2)	2	0	0.97
Alcoholics	50	6	0.97
Gall stones	37	1	0.97
Intensive care (50)	41	9	0.01
Hypotension (2)	2	0	0.00
MODS (20)	12	8	0.00
Pleural effusion (15)	14	1	0.00
ARDS (2)	2	0	0.00
Pseudocyst (9)	9	0	0.00
DKA (2)	2	0	0.00
Surgery (15)	8	7	0.00
Laparoscopy (3)	3	0	0.00

Table 2: Lab markers and severity index

	Final outcome (N)		Mean value		
Parameter	Discharge	Death	Discharge	Death	p-value
Amylase	101	09	453.49	818.33	0.009
Lipase	101	09	538.02	956.56	0.000
LDH	97	09	494.27	666.67	0.003
CRP	72	06	2.135	2.967	0.001
Ranson score	97	09	3.95	6.56	0.001
Glasgow score	97	09	3.0	5.56	0.001
CTSI/balthazar	97	08	5.44	8.25	0.003

Table 3: Comparison of ranson's score with glasgow and CTSI

	Glasgow score		CTSI			
Ranson score	Mild	Severe	0-3	4-6	7-10	p-value
0-2	23	1	13	9	2	0.003
3-5	29	22	7	37	5	
>5	0	31	0	3	27	

Table 4: A total of 100 participants were participated in the present study

Serum albumin	3.4-5.4 g dL^{-1}		<3.4-5.4 g dL^{-1}
Male	85		15
CT severity index	Low	Middle	High
	35	25	40

Table 5: INR categories:

INR	0.9-1.1	>1.1	
Male	88	12	
Serum sodium	135-145	>145	<135 meq L^{-1}
Male	65	29	6

Table 6: Serum potassium and CRP levels among males

Serum potassium	3.5-5.5	>5.5	<3.5 meq L^{-1}
Male	60	12	28
C reactive protein	<10 mg L^{-1}		>10 mg L^{-1}
Male	35		65

Glasgow score and severity: The Glasgow score similarly demonstrated its capability to differentiate between mild and severe cases.

Among patients with mild Glasgow scores 0-3, the majority 13 cases fell into the mild CTSI category 0-3, while a smaller number 9 cases were in the severe CTSI category 4-6.

In contrast, patients with severe Glasgow scores >5 were predominantly associated with the severe CTSI category 7-10, highlighting the strong association between Glasgow score and disease severity.

CTSI and severity: CTSI, as a radiological parameter, exhibited an intuitive correlation with disease severity.

The majority of patients with mild CTSI scores 0-3 had either mild Ranson or mild Glasgow scores, aligning with their lower disease severity.

Conversely, patients with severe CTSI scores 7-10 were mainly those with severe Ranson and Glasgow scores, indicating a strong association between radiological findings and disease severity. This was statistically significant (Table 4).

Serum albumin and CTSI severity: Among the male participants with serum albumin levels within the reference range (3.4-5.4 g dL^{-1}), a notable majority (85 Patients) were categorized under the "Low" CTSI severity group.

Conversely, a smaller proportion (15 Patients) with normal serum albumin levels were classified under the "High" CTSI severity group.

These findings suggest that even with normal serum albumin levels, a substantial portion of male participants exhibited a higher degree of disease severity as indicated by the CTSI. CTSI Severity Categories:

We further evaluated the distribution of participants across the CTSI severity categories.

The "Middle" CTSI severity group had 25 Patients, while the "High" CTSI severity group had the highest representation, with 40 Patients.

This distribution underscores the diversity in disease severity among the male participants, with a significant proportion presenting with high CTSI scores (Table 5).

Among the male participants, a substantial majority 88 Patients fell within the reference range for INR 0.9 to 1.1.

A smaller portion 12 Patients had INR values exceeding the upper limit (>1.1).

This distribution underscores the predominance of participants with INR values within the normal range among males in the study.

Serum sodium levels: The majority of male participants 65 individuals had serum sodium levels within the recommended range 135-145 meq L^{-1}.

A significant proportion 29 patients had hypernatremia >145 meq L^{-1}, indicating high serum salt levels.

A smaller proportion 6 patients had hyponatremia 135 meq L^{-1}, which means their serum sodium levels were lower than usual.

These findings demonstrate the variability of serum sodium levels among male participants, with the vast majority being within the normal range (Table 6).

Serum potassium categories: Among the male participants, a substantial majority 60 individuals had serum potassium levels within the reference range 3.5-5.5 meq L^{-1}.

A notable minority 12 individuals exhibited hyperkalemia >5.5 meq L^{-1}, indicating elevated serum potassium levels.A significant proportion 28 individuals experienced hypokalemia <3.5 meq L^{-1}, signifying lower than normal serum potassium levels.These findings highlight the diversity in serum potassium levels among male participants, with a significant number falling outside the reference range.

CRP categories: In terms of CRP concentrations, a majority of male participants 65 individuals had CRP levels exceeding the reference threshold >10 mg L^{-1}, suggesting the presence of inflammation or infection.A smaller proportion 35 individuals had CRP levels within the normal reference range <10 mg L^{-1}. This distribution underscores the prevalence of elevated CRP levels, indicating potential inflammatory conditions, among male participants in the study.

DISCUSSION

We conducted a thorough examination of numerous metrics related to patient outcomes in our study, concentrating on the factors impacting discharge and fatality rates. Diabetes mellitus,

hypertension, chronic kidney disease (CKD), drunkenness, and gallstones were shown to have no effect on discharge or death rates, as demonstrated by a non-significant p-value of 0.97 for each.The data indicated important links between specific medical problems and patient outcomes.

Notably, patients in intensive care had a lower discharge rate (41 out of 50) than those who were not in intensive care (p = 0.01). Patients with hypotension, multiple organ dysfunction syndrome (MODS), pleural effusion, acute respiratory distress syndrome (ARDS), pseudocyst, diabetic ketoacidosis (DKA), surgery, and laparoscopy had significantly higher discharge and mortality rates (p 0.05 for each). These findings highlight the significance of taking specific medical problems into account when forecasting patient outcomes and adapting treatment regimens accordingly. Our research gives vital insights into the factors that influence patient outcomes, allowing healthcare providers to make more educated decisions for better patient care.

Our study's investigation of several criteria produced compelling results with important implications for clinical practice. We discovered that elevated levels of amylase, lipase, LDH, CRP, Ranson score, Glasgow score, and CTSI/Balthazar were associated with negative outcomes, the p-values for amylase, lipase, LDH, CRP, Ranson score, Glasgow score, and CTSI/Balthazar were 0.009, 0.000, 0.003, 0.001, 0.001, 0.001, and 0.003, respectively, indicating strong statistical significance. These findings highlight the potential for these characteristics to serve as predictive markers for poor clinical outcomes, particularly in circumstances where early intervention and surveillance are crucial.

The use of these indicators in clinical decision-making processes may allow healthcare workers to quickly identify individuals at higher risk, allowing for quicker interventions and enhancing patient care in critical care circumstances. More study and validation are needed to determine their wider clinical application and utility.

Ranson score and severity: Patients with a modest Ranson score 0-2 made up 23 of the cases, while those with severe scores >5 were absent.

For patients with a moderate Ranson score 3-5), 29 cases were classified as mild, while 22 were classified as severe.

This distribution demonstrates the Ranson score's capacity to stratify patients depending on disease severity, with higher scores indicating more severe instances.

The glasgow score and severity: The Glasgow Score also revealed the ability to distinguish between mild and severe instances.

The majority 13 cases of patients with mild Glasgow scores 0-3 were classified as having mild CTSI 0-3, while a lesser number 9 cases were classified as having severe CTSI 4-6.

Patients with severe Glasgow scores >5, on the other hand, were primarily connected with the severe CTSI group 7-10, showing the substantial correlation between Glasgow score and disease severity.

CTSI AND SEVERITY: As a radiological metric, CTSI demonstrated an intuitive association with disease severity.

The majority of individuals with moderate CTSI 0-3 had mild Ranson or mild Glasgow scores, which corresponded to their lower illness severity.

Patients with severe CTSI scores 7-10 had a higher proportion of severe Ranson and Glasgow scores, showing a substantial correlation between radiological findings and illness severity. The difference was statistically significant.

CTSI Severity and Serum Albumin: A significant majority (85 Patients) of the male participants with blood albumin levels within the standard range (3.4-5.4 g dL^{-1}) were classified as having "Low" CTSI severity.In contrast, only 15 patients with normal serum albumin levels were classed as having "High" CTSI severity. These data imply that, even with normal blood albumin levels, a significant proportion of male individuals had a higher level of illness severity as measured by the CTSI.

CTSI severity categories: We looked at how participants were distributed throughout the CTSI severity categories.

The "Middle" CTSI severity group had 25 patients, whereas the "High" CTSI severity group had the most patients 40.

This distribution highlights the range of disease severity among male participants, with a considerable number presenting with high CTSI scores.

INR categories: The vast majority of male participants 88 Patients fell within the INR standard range 0.9-1.1. A smaller proportion 12 patients had INR values that were higher than the upper limit >1.1. This distribution emphasizes the study's male participants' majority of INR levels within the normal range.

Serum sodium levels: The majority of the male participants 65 people had serum sodium levels that were within the acceptable range 135-145 meq L^{-1}. A considerable proportion 29 individuals developed hypernatremia (serum salt levels greater than 145 meq L^{-1}). Six individuals exhibited hyponatremia 135 meq L^{-1}, which indicates their serum sodium levels were lower than normal. These findings show that

serum sodium levels vary across male participants, with the great majority being within the normal range.

Male serum potassium and CRP levels

Potassium in serum categories: The majority of the male participants 60 had serum potassium levels within the standard range 3.5-5.5 meq L^{-1}.

A significant minority (12 people) had hyperkalemia >5.5 meq L^{-1}, indicating high serum potassium levels.A considerable proportion (28 people) had hypokalemia 3.5 meq L^{-1}, which means their serum potassium levels were lower than usual.These data emphasize the wide range of serum potassium levels found in male participants, with a considerable number falling outside the standard range.

CRP levels: The majority of male participants 65 individuals had CRP levels that exceeded the reference criteria >10 mg L^{-1}, indicating the presence of inflammation or infection.A smaller proportion 35 people had CRP levels that were within the normal reference range 10 mg L^{-1}. This distribution emphasizes the prevalence of increased CRP levels, which indicate probable inflammatory diseases, among male research participants.

CONCLUSION

CT severity index is good, to describe clinical profile and outcome of patient with acute pancreatits and correlation with severity index. It detects pancreatic necrosis and depict local complications and grading of severity. Mortele index is better then Balthazar index. Revised Atlanta classification is better and more accurate in comparison to Mortele index and Balthazar index for assasing the outcome, i.e. mortality and morbidity.

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