



ELEVATION OF PANCREATIC ENZYMES IN HEAD INJURY PATIENTS ADMITTED IN INTENSIVE CARE UNIT-A PROSPECTIVE STUDY.

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Conflicts of Interest: Nil

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Abstract:

Background: Elevated amylase and lipase are commonly seen in patients admitted in intensive care unit without a previously recognised pancreatic illness, constituting a diagnostic and therapeutic challenge. The aim of the study is to find the incidence, to assess and evaluate the predictive factors in head trauma induced increase of serum amylase and lipase levels.

Methods: We conducted a prospective observational study. All adult patients admitted with head trauma were eligible for our study. On admission serum amylase and lipase were measured. Patients with and without elevated pancreatic enzyme levels were compared for age, sex, initial GCS score, ICU stay days, serum amylase and lipase levels, creatinine, C Reactive Protein and hemoglobin. We also collected data on vital signs and other biochemical findings. Statistical analyses: Chi-square test and students t test with statistical significance $p < 0.05$.

Results: Forty eight patients were included. Median (quartiles) of age was 52[32-68]. Eleven patients (23%) had increased serum amylase and lipase levels. Diabetes mellitus ($p=0.027$), serum creatinine level ($p=0.020$), Haemoglobin level ($p=0.039$) were identified as independent factors predicting increased pancreatic enzymes. Hence these factors were significantly associated with elevated pancreatic levels and were not associated with sex, age, initial GCS score, ICU stay days, hypotension.

Conclusion: Increase of pancreatic enzymes is commonly seen in patients with head trauma. Diabetes and impaired renal function are predictive factors of elevated pancreatic enzymes. Patients with increased pancreatic enzymes should be further investigated to rule out any intra abdominal pathology by doing USG abdomen, CT abdomen and repeated clinical examination so that the morbidity and mortality due to associated abdominal injury in patients with head injury can be minimised.

Keywords: Amylase, Lipase, head trauma, intensive care unit.

Introduction

Pancreatic enzymes elevation occurs in 13-66% of patients admitted to Intensive care units.(1-3).pancreatic enzymes are elevated not only due to acute pancreatitis, it may be due to other non specific reasons.Head injury, abdominal injury, acute renal failure or patients on hemodialysis can be the non specific reason for the elevation of pancreatic enzymes(2).patients admitted to ICU can develop acute pancreatitis due to variety of reasons.Pancreas suffer from ischemic injury during hypotension and hypoperfusion.Patients admitted in intensive care unit without previous history of pancreatic illness are commonly found to have elevated amylase and lipase.Severe head injury can activate pathways that will lead to increase in amylase levels in the blood, suggesting central nervous system regulation of

serum amylase levels(4).**Table 1** lists the causes of non specific pancreatic enzyme elevation in the ICU.

OBJECTIVE:

The aim of the study is to

- I) Identify the incidence of pancreatic enzyme involvement in head injury patients admitted in ICU.
- II) Assess and evaluate the predictive factors in head trauma- induced increase of serum amylase and serum lipase levels.
- III) Find the significant correlation of the predictive factors between the patients with increased pancreatic enzymes level and those with normal serum level.

METHODOLOGY:

We conducted a prospective observational study in the intensive care unit of Saveetha Medical College

and Hospital (SMCH) between 1st February 2019 and 31st July 2019. The study was approved by the ethics committee of SMCH.

PATIENTS:

All adult patients admitted with head injury were eligible for inclusion in the study. We excluded patients diagnosed with previous pancreatic illness, previously operated for perforative peritonitis and associated abdominal injury. The increase of pancreatic enzymes is defined by serum amylase level higher than 120U/L and serum lipase level higher than 200U/L.

DATA COLLECTION AND PROTOCOL OF STUDY:

For all the included patients, we collected data such as demographic details (age, gender, comorbid illness), indications for admission to the ICU, initial

Glasgow coma scale (GCS), the length of ICU stay, vitals at the time of admission (systolic and diastolic pressure, pulse, respiratory rate and SpO₂), laboratory investigation at the time of admission to ICU (complete blood count, creatinine, CRP, Urea, SGOT, SGPT, urine albumin, amylase, lipase), therapeutic interventions during the ICU stay (IVF, blood transfusion, ionotrops, Nasal O₂, endotracheal tube), any surgery done and the outcome (death/survival).

STATISTICS:

The patients were categorised into two groups Group 1 and Group 2. Group 1 includes patients with increased amylase and lipase and Group 2 includes patients with normal amylase and lipase. Two groups were compared. Data were expressed in graphical representation and as percentage for the qualitative variables and for quantitative variables it is expressed as median (quartiles). The variables were compared by using the chi-square test or Fisher's exact test and students 't' test as appropriate.

RESULTS:

Baseline characteristics:

Forty eight patients were included in the study. Median (quartiles) age is 42 (18-70). Sex ratio (M/F) is 1.82. Thirty three patients (68.7%) were diabetic. Thirty one patients (64.5%) have previous history of hypertension. On admission to the intensive care unit (ICU) median systolic blood pressure was 94.5 (80-110) mmHg and median diastolic blood pressure was 52 (40-60) mmHg. **Charts 1 represent** the age wise

distribution of patients. **Chart 2** represent the gender wise distribution of patients. There was no difference in the age or sex of the patients, initial GCS score, ICU admission days between Group 1 and Group 2 (Table 2). The study also showed that the incidence of Diabetes Mellitus was significantly higher in increased pancreatic enzymes Group ($p=0.027$; Table 2).

Biological findings:

Out of forty eight patients, Eleven patients (23%) had increased serum amylase and serum lipase levels. Median of increased serum amylase level is 280 (124-512). Median of increased serum level is 443 (168-824). The analyses of the biological findings showed that Group 1 patients had a greater incidence of anaemia and renal failure ($p<0.05$; Table 3). There is no significant difference in CRP levels between the two groups.

Table 1: Causes of non specific pancreatic enzyme elevation in the ICU

Craniotomy
Intracranial bleed
Head injury with GCS less than 10
DKA
Renal failure
TEN/SJS
NS ICU

GCS: Glasgow coma scale, NS: neurosurgical, ICU: intensive care unit, DKA: Diabetic ketoacidosis, TEN: Toxic epidermal necrolysis, SJS: Steven Johnson syndrome.

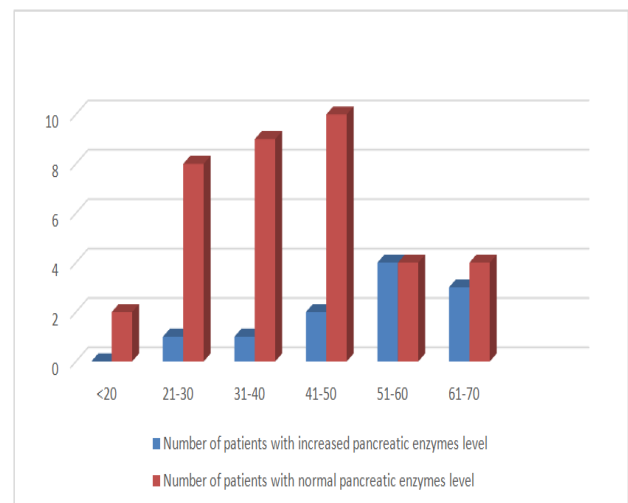


Chart 1: Age wise distribution of patient

X axis=represent age group; y axis= represent number of patients.

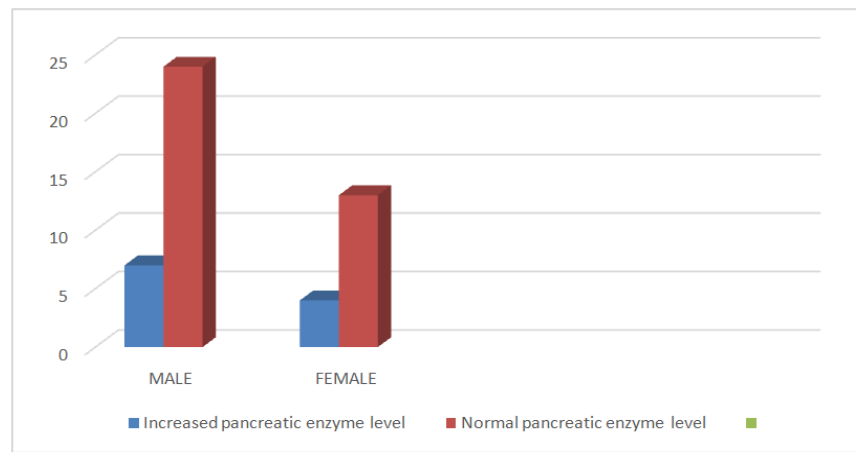


Chart 2: Gender wise distribution of patients

X axis= represent gender; Y axis= represent number of patients

Table 2: Comparison of the baseline characteristics between patients with and those without increased pancreatic enzymes

Parameters *	Increased pancreatic enzymes (N=11)	Normal pancreatic enzymes (N=37)	P value
Age(years[quartiles])	52(32-68)	40(18-70)	0.191 ⁺
Gender(M/F)	7/4	24/13	0.940 ⁺
ICU stay(days)	5(4-10)	7(2-15)	0.293 [#]
Initial GCS score	10(8-15)	12(9-15)	0.128 [#]
Diabetes(N/%)	9/81.8	24/64.8	0.027 ⁺
Hypertension (N/%)	8/72.7	23/62.1	0.520 ⁺

*Data presented as median and (N%); ⁺represent values compared with chi square test, [#]represent values compared with 't' test, ICU=intensive care unit, GCS=Glasgow Coma Scale.

Table 3: Comparison of the laboratory findings on admission between patients with and those without increased pancreatic enzymes.

Parameters*	Increased pancreatic enzymes (N=11)	Normal pancreatic enzymes (N=37)	P value
Amylase(UI/L)	280(124-512)	56(34-76)	<0.0001 [#]
Lipase(UI/L)	443(168-824)	82(21-124)	<0.0001 [#]
Creatinine(mg/dl)	5(45.4)	4(10.8)	0.020 ⁺
CRP(mg/L)	4(36.3)	17(45.9)	0.733 ⁺
Hb(mg/dl)	4(36.3)	3(8.10)	0.039 ⁺

*Data presented as median and (N%);⁺represent values compared with chi square test,

[#]represent values compared with 't'test,CRP-C-Reactiveprotein>10mg/L;Hb=hemoglobin<10mg/dl;serum creatinine level >1.5mg/dl

Discussion:

Elevated pancreatic enzymes are frequently observed in patients admitted to the ICU without an identifiable pancreatic lesion (5,6).In our study of 48 patients from ICU, elevated pancreatic enzymes were observed in 23% of the patients. Previous studies have reported that the incidence of increased

pancreatic enzymes were observed in 15% among 75 patients from surgical ICU(7).In a study with 74 patients with severe head injury with GCS less than 10,there was 38% increase in total amylase level(8).Elevation of pancreatic enzymes among these patients has led to the theory of centrally activated pathway leading to enzyme elevation. This

mechanism is vagally mediated. This central activation mechanism maybe responsible for increase in exocrine pancreatic secretion due to head trauma or other intracranial damage(9). The vagal stimulation may also be responsible for exocrine pancreatic enzyme secretion as it may be suppressed by vasoactive intestinal polypeptide neutralisation as well as antagonist of cholinergic receptor or gastrin releasing peptide receptor(10). Loss of sympathetic tone with resultant hyperperfusion can lead to increase in amylase production after head trauma(11).

Justice *et al* reported that 45% of patients diagnosed with intracranial bleeding had elevated amylase levels and 66% of patients had elevated lipase enzyme activity (12). Vitale *et al* demonstrated that there was 38% increase in amylase level in patients with head injury (13).

Our study showed there is significant relationship between the impairment of renal function with head injury related increase of pancreatic enzymes. Previous studies have showed that acute kidney injury is a common complication of increase in pancreatic enzyme level(14,15)

Our study also showed another factor predicting trauma related increase of pancreatic enzymes to be diabetes mellitus. Previous studies have reported that patients with type 2 diabetes have higher risk of acute pancreatitis (16,17,18,19).

According to our study, level of pancreatic enzymes was not correlated with the length of ICU stay and the GCS score. However, Manjuck *et al*. reported that the pancreatic enzyme level was not correlated to mortality(20)

To the best of our knowledge, our study is to identify the predictive factors of head trauma induced increase in pancreatic enzymes and the patients with increased pancreatic enzymes should be further investigated to rule out any other pathology.

CONCLUSION:

To summarise, the increase in pancreatic enzymes is seen in patients with head injury. Although because of the sample size, statistically significant conclusions could not be reached. The study showed that the findings were related to Diabetes, renal failure and anemia but were not related to age or sex, duration of stay, GCS score, hypotension.

Patients with increased pancreatic enzymes should be further investigated to rule out any intra

abdominal pathology by doing ultrasound abdomen, CT abdomen and repeated clinical examination of the patient so that the morbidity and mortality due to associated abdominal injury in patients with head trauma can be minimised.

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