"SERUM CALCIUM LEVEL AS A PROGNOSTIC MARKER IN ACUTE PANCREATITIS – ONE YEAR HOSPITAL BASED CROSS-SECTIONAL STUDY"

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LIST OF ABBREVIATIONS USED

AP	–	Acute Pancreatitis
APACHE	–	Acute Physiology, Age, Chronic Health Evaluation
ARDS	–	Acute Respiratory Distress Syndrome
ALP	–	Alkaline Phosphatase
ALT	–	Alanine Transaminase
AST	–	Aspartate Aminotransferase
Ca	–	Calcium
CT	–	Computed Tomography
CBD	–	Common Bile Duct
CTSI	–	Computed Tomography Severity Index
CECT	–	Contrast Enhanced Computed Tomography
ERCP	–	Endoscopic Retrograde Cholangiopancreatography
FFA	–	Free Fatty Acids
ICU	–	Intensive Care Unit
IL	–	Interleukin
MCV	–	Mean Corpuscular Volume
MMR	–	Measles, Mumps and Rubella
SIRS	–	Systemic Inflammatory Response Syndrome
TB	–	Tuberculosis
USG	–	Ultrasonography

ABSTRACT

Background and objectives

There is no simple biomarker which can serve as the single parameter to determine the severity and prognosis in patients with Acute Pancreatitis. This study was aimed to determine the role of serum calcium level as a prognostic marker in Acute Pancreatitis.

Methodology

This one year cross sectional study was done from January 2018 to December 2018 in the Department of General Medicine, KLE's Dr. Prabhakar Kore Hospital and MRC. Based on the Revised Atlanta classification, a total of 100 patients with diagnosis of Acute Pancreatitis were enrolled and serum calcium was determined for comparison with CT Severity Index.

Results

In this study male preponderance was more (86%) than females and the ratio was 6.14:1. The commonest age group was between 20 to 40 years (64%) and the mean age was 39.21 ± 14.08 years. Ethanol (68%) was the commonest etiology for acute pancreatitis followed by gall bladder calculi (24%). Abdominal pain was the common clinical presentation (80%) and epigastric tenderness as the most common clinical sign (70%). Maximum patients had moderate CTSI score (64%). Serum calcium <8.5 mg/dl was found in 64 patients of which 45 patients had moderate pancreatitis, 14 patients had severe pancreatitis and 5 patients had mild pancreatitis. On comparing the serum calcium level with the CT severity index, we observed that there was decrease in the value of serum calcium in patients who had higher CTSI. A

significant inverse co-relation (p=0.0001) was observed between the CTSI and serum calcium levels indicating that hypocalcemia was associated with poor prognosis of Acute Pancreatitis.

Conclusion and interpretation

Serum calcium level can be used as a simple marker to assess the severity and prognosis of Acute Pancreatitis and helps determine need for intensive care management as it is easily available in primary and secondary care centers.

Keywords : Acute pancreatitis; CT Severity Index; Serum calcium; Hypocalcemia

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INTRODUCTION

Acute Pancreatitis is a relatively common and a potentially life-threatening disease. It is defined as "an inflammatory process of pancreas with possible peripancreatic tissue involvement and multi organ dysfunction syndrome with increasing mortality rate"[1]

Estimates of incidence are often inaccurate, because mild cases are often unreported, and deaths may occur in severe forms even before a diagnosis is made.

Severe Acute Pancreatitis accounts for about 20 % of the cases, and it is associated with one or more of the following: Pancreatic necrosis, distant organ failure, and development of local complications like haemorrhage, pancreatic necrosis, pseudocyst etc. Mortality in severe Acute Pancreatitis is 15-30 % and is only 0-1 % in case of mild Acute Pancreatitis.[2]

The exact mechanism of pathophysiology of Acute Pancreatitis is not clearly known, but has been attributed to abnormal activation of pancreatic enzymes within the acinar cells. Co-localization of zymogen granules and lysosomes occur resulting in activation of the enzymes, which results in auto- digestion of pancreas due to release of pro- inflammatory cytokinesand anti-inflammatory mediators.[3]

They then propagate the response systemically as well as locally. The local response increases the permeability and alters the microcirculation and worsens the disease process. However, the inflammatory response is self-limited in most of the patients, but a vicious cycle of pancreatic injury and local and systemic inflammation persists in severe forms.

Acute Pancreatitis can be classified as mild, moderate and severe form. Mild Acute Pancreatitis is characterised by interstitial oedema of the gland and is usually a self- limiting disease, whereas in the severe form, there is pancreatic necrosis, severe systemic inflammatory response and multi – organ failure which can lead to death. Hence it is prudent to identify risk stratification tools for the disease, which help in the management.

Various criteria of severity stratification have been developed to assess the severity of pancreatitis. The earliest of which was proposed by "Ranson and colleagues" in 1974.[4]It predicts the severity of the disease, which is based on 11 parameters that are obtained at the time of admission and after 48 hours. Ranson's score has a low positive predictive value (50%) and a high negative predictive value (90%). Hence its main use is to rule out Acute Pancreatitis and also predicts a severe attack.[5] The major disadvantage of Ranson's and as well as older Glasgow criteria being, many of the parameters which are components of this scoring, are not collected at admission, on a routine basis. Also, it does not predict the severity of the disease at admission, as six of the parameters are assessed only after 48 hours. Hence an early therapeutic window is missed.

The APACHE II, which is the most common scoring used worldwide, was originally developed as a risk stratification tool in intensive care setting. But it takes into account a huge list of parameters, some of which may not be related to the severity.

Computed tomography is the gold standard technique as it provides complete pathologic detail of pancreasalong with complications and is also a non-invasive investigation.

Contrast material enhanced computed tomography helps in early diagnosis and staging of severity of Acute Pancreatitis and its complications which helps in prediction of prognosis of the disease.

In many primary and secondary care centres the facility of Computed Tomography (CT) is not available which makes it difficult to assess the severity of Acute Pancreatitis.

Hence, relatively simple bedside markers are needed which are easily available at primary and secondary centres to identify patients with high morbidity as well as risk of mortality, before organ failure sets in.

Hypocalcaemia is a frequent finding in Acute Pancreatitis and has been associated with its severity. Severe hypocalcaemia can cause neurological and cardiovascular manifestations which can further increase the risk of mortality and morbidity.

Hence, we want to study the serum calcium level in Acute Pancreatitis in comparison with CT Severity Index (CTSI) as a prognostic marker.

AIMS & OBJECTIVES

1. Study of serum calcium level as a prognostic marker in Acute Pancreatitis

2. To compare the serum calcium level in Acute Pancreatitis with CT Severity Index

REVIEW OF LITERATURE

HISTORY

The pancreas was generally ignored in ancient past, as an organ and also as a seat of disease.

"Herophilus", "born in 336 BC on the Asiatic side of Bosporus in Chalcedon" was a Greek anatomist and surgeon, who first discovered pancreas[6].

The word pancreas was first mentioned in the writings of Eristratos (310-250B.C.). Then four hundred years later, "Rufus - 1st or 2nd Century AD" an anatomist and surgeon of "Ephesus", coined the name "pancreas". Written in Greek language, it means "pan: all, kreas: flesh".

"Claudius Galenus, 138-201 AD", "Physician to the Gladiators" of Rome & the Roman Emperor, taught that the pancreas serves as a shieldfor the large blood vessels that lie behind.[7]

In 1642, a German anatomist, "Johann George Wirsung" discovered the pancreatic duct. But it was named by his colleague as "The Duct of Wirsüng".[8]

Santorini, in 1734, described the accessory duct that bears his name. In 1869, "Paul Langerhans" student of the famous "Berlin Institute of Pathology", headed by the eminent "Professor Rudolph Virchow", described the islets of the pancreas that was later named "islets of Langerhans", an endocrine system which lies within the pancreas.

In 1893, Laguesse suggested that the islet cells produce a hormone. In 1909 Jean de Meyer suggested the name 'insulin' for this hormone.

Eugene Lindsay Opie (1873-1971) was able to show the association between diabetes and failure of the islet cells and in 1901, proposed his “common channel” hypothesis.[9]

ACUTE PANCREATITIS

DEFINITION

Pancreatitis is an “inflammation of glandular parenchyma lead to injury or destruction of acinar components associated with little or no fibrosis of the pancreas”.

Acute Pancreatitis is best diagnosed in a patient who has 2 of the 3 following criteria[15].

1. Epigastric pain
2. Serum lipase / amylase levels > 3 times the upper range of normal,
3. Radiologic features suggestive of pancreatitis, using USG or CECT.

The most common cause of Acute Pancreatitis is gallstones, inapproximately 50% of the patients, followed by alcohol in 20%[16]. In a study done in New Delhi, India, gall stones and alcoholism were found to be the cause in 49% and 23.6% cases, respectively[14].

ETIOLOGY

GALL STONES

Obstructive cause of Acute Pancreatitis is most frequently due to gallstones. However, only 3% to 7% of patients who have gallstones, will develop an attack of Acute Pancreatitis in their lifetime. It is seen more often in women[17]. Acute Pancreatitisis seen commonly in a patient who harbours a smaller stone, less than a diameter of 5mm, as they traverse down the cystic duct to go on to obstruct the ampulla. Intermittent and continuous obstruction of the ampullary orifice due to a gallstone or oedema induced by stone passage is the inciting factor in the pathogenesis of gallstone-induced pancreatitis. Microlithiasis refers to "aggregates <5 mm in diameter, of cholesterol mono hydrate crystals or calcium bilirubinate granules detected as "sludge" within the gallbladder" on ultrasonography or on examination of bile obtained during ERCP. An etiologic role for microlithiasis in Acute Pancreatitis remains unproved.

However, cholecystectomy or endoscopic sphincterotomy can reduce the risk of recurrent Acute Pancreatitis in patients with microlithiasis.

ALCOHOL

Excessive ethanol consumption is the next commonest cause of Acute Pancreatitis worldwide. It is more prevalent in young men (30 to 45 years of age) than in women[18]. However, only 5% to 10% of patients who drink alcohol develop Acute Pancreatitis. Heavy ethanol abuse (>100 g/day for at least 5 years), smoking, and genetic predisposition, contribute to Acute Pancreatitis. As compared with non-smokers, the relative risk of alcohol-induced pancreatitis in smokers is 4.9[19].The

nature of alcohol consumed is less important than a daily consumption of between 100 and 150 g of ethanol. In a patient with a history of consumption of alcohol, with absence of other causes, the initial attack is deemed due to alcohol.

The "secretion with blockage" mechanism shows that ethanol consumption causes increased tone of sphincter of Oddi, and, it is a metabolic toxin to pancreatic acinar cells, where it can disrupt enzyme synthesis and secretion. Ethanol causes a brief secretary increase, followed by inhibition. This causes enzyme proteins to precipitate within the duct. Calcium then precipitate within the protein matrix, resulting in multiple ductal obstructions. Ethanol also increases ductal permeability.

TUMOURS

Tumours, by possibly causing obstruction of the pancreatic duct, can cause in repeated episodes of Acute Pancreatitis, particularly in persons more than 40 years of age. The commonest neoplasm seen is intraductal papillary mucinous neoplasm (IPMN)[20]. Acute Pancreatitis may be the initial presentation in patients with adenocarcinoma of the pancreas.

Sometimes an adenoma from the papilla can also cause obstruction and subsequent acute attack of pancreatitis.

MEDICATIONS

Drugs though not a very common cause, form an important aetiology of Acute Pancreatitis. They probably make for <1 % of patients.Usually occur within 1-2 months of starting a drug. It usually does not manifest as an adverse drug reaction prior to onset of an attack of pancreatitis.

In general, drug-induced pancreatitis is mild and self-limited. The diagnosis should only be entertained after alcohol, gallstones, hypertriglyceridemia, hypercalcemia, and tumours (in appropriate-aged patients) have been ruled out.

HYPER-TRIGLYCERIDEMIA

It is probably the 3rd commonestetiology, accounting for 2% to 5% of cases. Serum triglyceride levels more than 1000 mg/dL can result in attacks of Acute Pancreatitis. However, recent studies suggest that the serum TGs may have to be even higher to precipitate Acute Pancreatitis, perhaps above2000 mg/dL, and with obvious lactecent serum due to raised levels of chylomicrons[19]. The mechanism is not clear, but the release of FFA by lipase may damage pancreatic acinar cells or endothelial cells. The hydrolysis of TGs by pancreatic lipase and release of free fatty acids that induce free radical damage can directly injure cell membranes. Disorders of lipoprotein metabolism are conventionally divided into primary (genetic) and secondary causes, including diabetes mellitus, hypothyroidism, and obesity/metabolic syndrome.[20]

INFECTIONS

The diagnosis of Acute Pancreatitis caused by an infection requires evidence of Acute Pancreatitis, evidence of an active infection, and the absence of a more likely cause of Acute Pancreatitis.[21]

Acute Pancreatitis has been implicated to be caused by viruses (mumps, coxsackievirus, hepatitis A, B, and C, and several herpesviruses), MMR vaccine, bacteria (Mycoplasma, Legionella, TB, brucellosis); fungi (Aspergillus, Candida); and parasites (Toxoplasma, Cryptosporidia, A. lumbricoides, C. sinensis).

TRAUMA

Both penetrating and blunt trauma can result in Acute Pancreatitis. Other intra-abdominal organs are also usually involved. Laparotomy is mandatory in all every case of penetrating injury for the assessment of injuries and to manage them accordingly. Blunt injury to the abdomen causes pancreatic injury by compression of pancreas against the spine

IATROGENIC

Iatrogenic pancreatitis is mainly due to ERCP, which can cause significant morbidity. Asymptomatic hyperamylasaemia occurs after 35% to 70% of ERCPs[22]. Post-ERCP pancreatitis is believed to be multi-factorial, involving a combination of chemical, hydrostatic, enzymatic, mechanical, and thermal factors.

POST-OPERATIVE STATE

Pancreatitis can be secondary to surgeries of the alimentary tract or thoracic cavity.27% of patients undergoing cardio vascular surgery develops hyper-amylasemia, and 1% develops necrotizing pancreatitis. Pancreatitis can occur following liver transplantations. Postoperative pancreatitis is associated with higher morbidity as compared to other causes.[23]

PANCREAS DIVISUM

This is the commonest congenital maldevelopment of pancreas, vast majority of who never develop pancreatitis.

Obstruction of the minor papilla is thought to the causative factor in these cases. Genetic factor has a possible role to play in patients suffering from pancreatitis, who have pancreas divisum.

MISCELLANEOUS

Crohn's disease has been associated with the development of Acute Pancreatitis. Celiac disease has an uncertain association. Hyper amylasemia in these patients have been thought to be due to disruption of small bowel mucosal barrier.

Smoking has been suggestive to be causative in Acute Pancreatitis.

Acute Pancreatitis resulting from autoimmune pancreatitis is rare, seen in type II disease, and is associated with granulocyte epithelial lesions.

PATHOPHYSIOLOGY

Acute Pancreatitis occurs in different grades of severity, the determinants of which are multifactorial. It begins with release of digestive enzymes within the acinar cells, causing cell injury. The fact that zymogen and lysosome co-localization occurs before elevation of amylase level, pancreatic oedema, and other markers of pancreatitis are evident, suggests that co-localization is an early step in the pathophysiology of pancreatitis.

CO-LOCALIZATION HYPOTHESIS

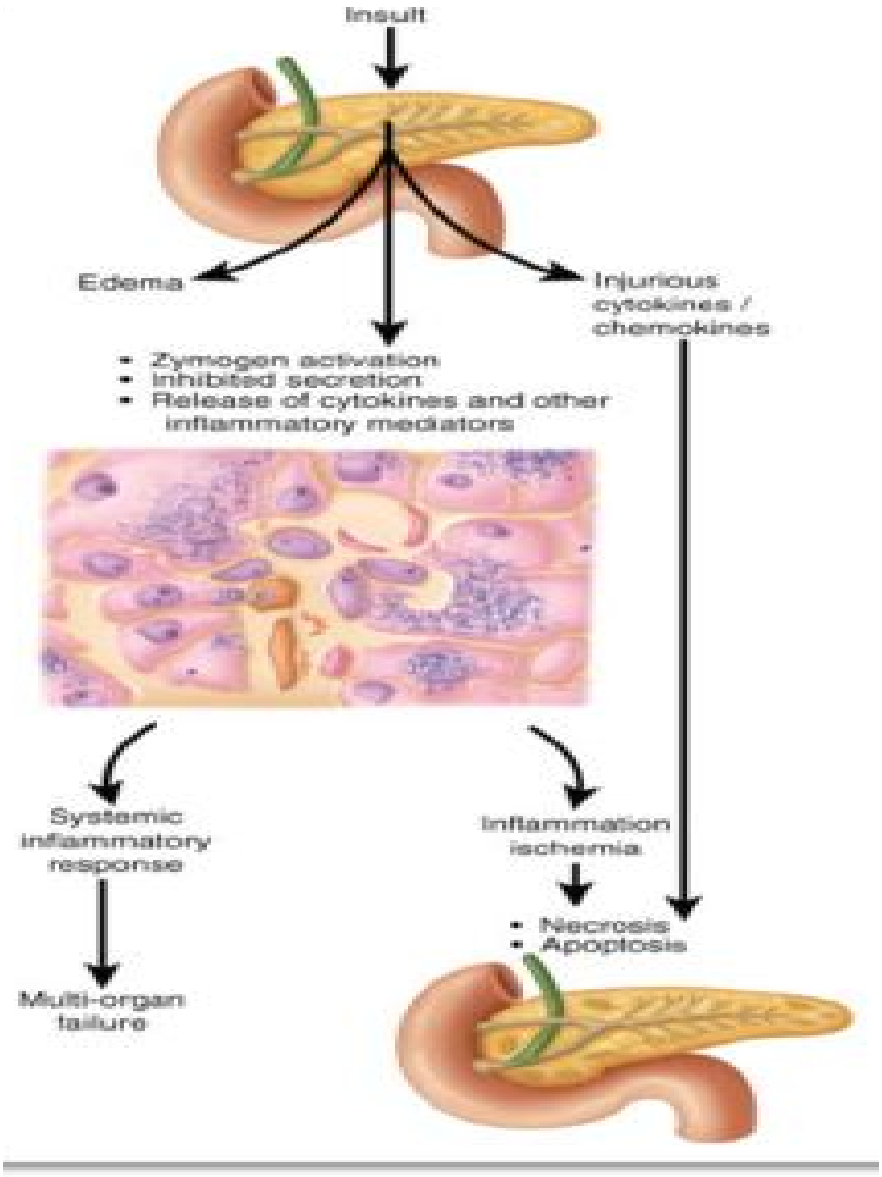


Figure 1: Co-Localization Hypothesis

The initiating factor is activation of trypsinogen inside the acinar cells. Trypsin activates other proenzymes, such as precursors of elastase, phospholipase A2 and carboxypeptidase. Active enzymes auto-digest the pancreas, causing a vicious cycle releasing further active enzymes.

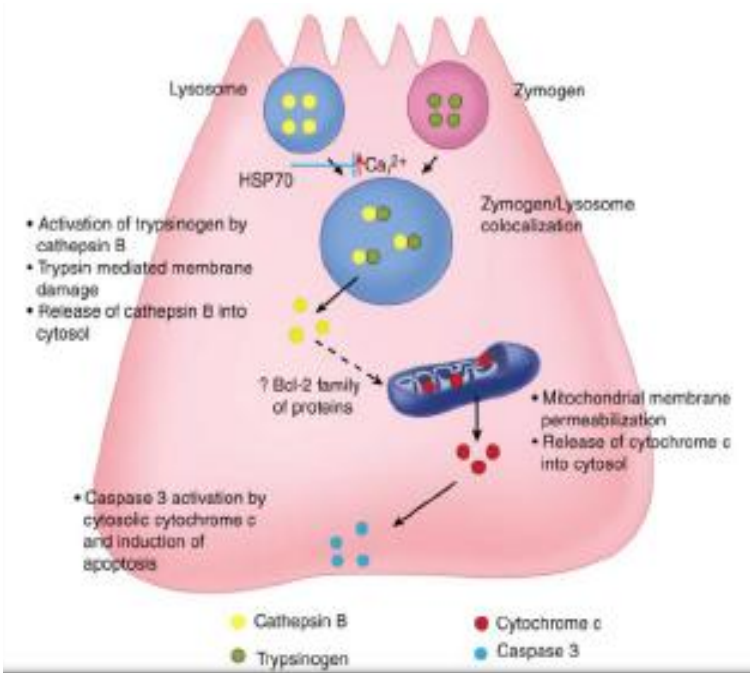


Figure 2: Activation of Enzymes

Small amounts of active trypsin which are normally produced within the pancreas are usually inactivated by trypsin inhibitors. Because exocrine pancreas produces several enzymes that are potentially injurious to it, it prevents autodigestion by intracellularly assembling the inactive precursors called proenzymes or zymogens, which are then transported and secreted outside of the gland. They are activated in the duodenum, where enterokinase activates the trypsinogen, and the trypsin then activates other zymogens. To further protect the pancreas from these potentially harmful digestive enzymes, they are segregated from the cytoplasmic space within acinar cells by being enclosed within membrane-bound organelles, referred to as zymogen granules. Another layer of protection is provided by the synthesis of trypsin inhibitors, which are transported and stored along with the digestive enzyme zymogens. These are available to inhibit small amounts of prematurely activated trypsinogen within pancreatic acinar cells.

The activation of pancreatic enzymes causes autodigestion of the pancreatic parenchyma. Due to this there is release of pro inflammatory cytokines like tumor necrosis factor, interleukins 1, 2 and 6 and anti-inflammatory mediators like IL-1 and 10 receptor antagonists.

Blockage of secretion of enzymes of the pancreas, with on-going secretion disrupts the acinar cell barrier.

This results in exudation of enzymes from acinar cells, and ductal secretion into interstitial spaces which is said to cause interstitial oedema and elevate the concentration of amylase and lipase in the serum[24]. The mechanism of gallstone induced pancreatitis is not clearly known. Bile reflux into the pancreatic duct, or ductal obstruction at the ampullary level due to stone or oedema due to passing of stone have been proposed to cause pancreatitis.

Stone impacted at the distal CBD obstructs the pancreatic duct, causing increased pressure within it, thus resulting in damage of acini and ductal epithelial cells.

Some cases of Acute Pancreatitis progress to develop systemic complications like fever, ARDS, pleural effusion, renal shutdown, shock, myocardial depression, and metabolic complications.

Systemic inflammatory response syndrome is frequently seen in Acute Pancreatitis, which is probably mediated by activated enzymes of the pancreas that are circulated through the portal system.

Acute renal failure may be the result of hypotension and decreased intra vascular volume. Other complications arehyperlipidaemia, hypocalcaemia, hyperglycaemia± ketosis,hypoglycaemia. The cause of hypocalcaemia is multiple, and includes decreased albumin, hypomagnesemia, calcium-soap formation, hormonal imbalance.

CALCIUM AND PANCREATITIS

Normally, serum calcium ranges between 8.5-10.5 mg/dl. It plays an important role in the pathophysiology of pancreas.Calcium is necessary for normal secretory function of the acinar cells, but is transient and mainly confined to apical pole. A sustained global increase in cytosolic Ca++ causes premature trypsinogen activation, vacuolization, and acinar cell death. Mechanisms involved in maintaining sustained elevated cytosolic calcium in response to stimulus (bile acids/ethanol) are pathological Ca++ release from endoplasmic reticulum stores, increased entry of extracellular calcium, and defects in calcium extrusion and re-uptake mechanisms.

It has been observed that acute pancreatitis patients have hypocalcemia as a common laboratory finding. The exact mechanism is not yet clear. Some proposed mechanisms are reduced parathyroid hormone, formation of excessive FFA, extravascular calcium soaps formation and hypomagnesemia.

FACTORS TO DETERMINE SEVERITY

Factors which determine the severity of pancreatitis are multi-factorial, but identification of these is of considerable therapeutic importance, because manipulation of these factors may lower the morbidity and mortality associated with this disease. The ultimate severity of the disease depends on the extent of the systemic

inflammatory response, and several cytokines and chemokines and their receptors that play an important role in the activation and migration of these inflammatory cells to the affected site.

The list of factors associated with pancreatitis and associated lung injury, include tumour necrosis factor alpha, monocyte chemotactic protein-1, Mob1, interleukin-1 (IL-1), platelet activating factor (PAF), substance P, adhesion molecules [intercellular adhesion molecule-1 (ICAM-1) and selectins], IL-6, IL-8, IL-10, C5a, the CCR1 receptor , granulocyte macrophage colony-stimulating factor, macrophage migration inhibitory factor, COX-2, prostaglandin E1, nitric oxide, and reactive oxygen species.

The diagnosis of Acute Pancreatitis is based on two or more of the following criteria:

1. Severe abdominal pain
2. Serum amylase or lipase more than three times higher than the institution's upper limit
3. Contrast enhanced computed tomography (CECT) findings of acute pancreatitis.

CLINICAL FEATURES

Abdominal pain is the usual presenting complaint in cases of Acute Pancreatitis. Biliary colic may persist and further develop into pancreatitis. Pain is usually felt diffusely over the abdomen, sometimes only in the epigastrium, right hypochondrium, and rarely, localised in left upper quadrant abdomen. Lower abdominal pain may be due to tracking of extravasation of pancreatic secretion to the

left paracolic gutter. It has been described as "knifing" or "boring through" to the back, and can be relieved by leaning to the front. Onset of pain is rapid, reaching its maximum intensity within 10-20 minutes. In some cases, pain is gradual in onset and progression, taking hours to reach its peak. Pain lasting for few hours indicates other intra-abdominal pathology. In 5-10% patients, pain is not present can suggest fatal disease[27].

Nausea and vomiting are present in 90% of individuals affected with Acute Pancreatitis. Patient also has associated retching, and pain does not subside on vomiting. Vomiting is either because of intractable pain or secondary to inflammation of the posterior wall of stomach.

CLINICAL FINDINGS

It depends on severity of the disease. Patients with mild disease may not appear sick.

On examination, the patient may have tachycardia, tachypnea, hypotension, and hyperthermia. The temperature is usually mildly elevated in uncomplicated pancreatitis.

Pulse rate is usually in the range of 100 to 150 /minute. Hyper or hypotension may be present secondary to third space fluid loss and decreased circulatory volume.

The temperature can be normal, but within 24-72 hours it canrise to 101°F to 103°F due to retro-peritoneal inflammation.

Tachypnoea, with painful shallow breathing may be due to exudates below the diaphragm. Dyspnea may be due to pleural effusion, atelectasis, ARDS, or congestive cardiac failure.

Tenderness may be mild without guarding in mild Acute Pancreatitis. In severe pancreatitis, patients may appear sick, and may present with distension of abdomen, more so in the epigastrium, secondary to ileus.

Epigastric guarding may be present. Tenderness and guarding can be. Rigidity is not a common feature, and when present, other causes of diffuse peritonitis should be ruled out. Bowel sounds are either decreased or not heard.

Other findings in the abdomen include ecchymosis over the flanks “Grey Turner’s sign” or in the peri-umbilical area “Cullen’s sign”, due to extravasation of secretions.

The findings are not often present and are poor prognostic factors.

Pleural effusion secondary to pancreatitis can cause a dull note on percussion, and decreased breath sounds on auscultation.

Dullness to percussion and decreased breathing sounds in the left or, less commonly, in the right hemithorax suggest pleural effusion secondary to Acute Pancreatitis.

Patients may be disoriented and agitated or in coma, may hallucinate, which may be due to alcohol withdrawal, hypotension, electrolyte imbalances like hyponatremia, hypoxia, fever, or toxic effects of pancreatic enzymes on the central nervous system.

Uncommon findings in Acute Pancreatitis include panniculitis with subcutaneous nodular fat necrosis that may be accompanied by polyarthritis.

Enlarged liver, spider angioma and Dupuytren's contracture point towards ethanol induced pancreatitis. Tendon xanthoma and lipemia-retinalis point towards hyperlipidaemia as the cause of pancreatitis.

Band keratopathy is seen in hypercalcaemic patients

DIAGNOSIS

PANCREATIC ENZYMES

In general, the diagnosis of Acute Pancreatitis relies on at least a 3-fold elevation of serum amylase or lipase in the blood[27].

SERUM AMYLASE

Pancreatic diseases cause elevated pancreatic isozyme of amylase, and specifically measuring this isozyme improves the accuracy of diagnosis. But this is not routinely used.

Total amylase is measured routinely since it cheaper and easier. It increases 6 to 12 hours after the disease onset and is cleared from the blood rapidly with a half-life of 10 hrs.

Renal clearance is less than 25 %. This enzyme rises from the first day of disease onset, persisting for about 3-5 days.

Serum amylase is neither very sensitive nor specific. Sensitivity is about 85%. It may be within normal limits or only mildly raised in severe pancreatitis, or in chronic pancreatitis due to very little remnant of acinar tissue. Hypertriglyceridemia induced pancreatitis may be associated with normal level of amylase.

Upto 50% of patients with raised amylase levels may infact have no evidence of pancreatic disease. Elevated amylase levels are suggestive, rather than diagnostic of pancreatitis. Hyper amylasemia may be present in asymptomatic patients.

SERUM LIPASE

The sensitivity of serum lipase for the diagnosis of Acute Pancreatitis is similar to that of serum amylase and is above 85%[29]. However, Lipase has higher specificity in diagnosing Acute Pancreatitis as it is not affected by other causes of hyper amylasemia. Serum lipase level is almost always raised on the first day of the disease, and it remains increased for longer, thus providing a higher sensitivity. Combining amylase and lipase does not improve diagnostic accuracy and increases cost.

ROUTINE BLOOD INVESTIGATIONS

The polymorphonucleocyte count is markedly elevated in severe disease, and is not related to a presence of infection.

The blood glucose also may be high and associated with high levels of serum glucagon.

Liver enzymes (AST, ALT and ALP) and bilirubin may also be elevated in pancreatitis induced by gallstones.

It should be stressed that the decrease in serum calcium seen in patients with Acute Pancreatitis is mainly related to the decreased serum albumin.

MCV shows some variation in ethanol and non-ethanol related causes of Acute Pancreatitis. Alcoholic patients tend to have higher MCV due to the toxic effects of alcohol on erythrocytosis in the marrow.

ULTRASOUND ABDOMEN

Abdominal ultrasound is useful in the initial 24 hours of admission, to identify gallstones, CBD dilatation due to stones and ascites.

Ascites is common in patients with moderate to severe pancreatitis, as protein rich fluid extravasates from the intravascular compartment to peritoneal cavity. Pancreas is uniformly enlarged and hypoechoic, and obscured by bowel gas. Ultrasound is used to serially monitor the size of pseudocyst.

CECT ABDOMEN

CECT is the most important mode of imaging in diagnosing Acute Pancreatitis as well as its intra-abdominal complications.

The 3 main indications for a CT in Acute Pancreatitis are

1. To rule out other causes of acute abdomen
2. To stage the severity of disease
3. To identify complications of acute pancreatitis

Pancreatic necrosis may not be apparent on CT upto 48-72 hours after the onset of the disease. The presence of air bubbles on CT denotes infected necrosis or pancreatic abscess.

PROGNOSTIC INDICATOR	POINTS
Pancreatic inflammation	
Normal pancreas	0
Intrinsic pancreatic abnormalities with or without inflammatory changes in peripancreatic fat	2
Pancreatic or peripancreatic fluid collection or peripancreatic fat necrosis	4
Pancreatic necrosis	
None	0
≤30%	2
>30%	4
Extrapancreatic complications (one or more of the following: pleural effusion, ascites, vascular complications, parenchymal complications or gastro-intestinal tract involvement)	2

Figure 3: Balthazar Grading of CT Severity of Acute Pancreatitis

Early CT often fails to detect an evolving necrosis, which becomes well demarcated after about 48-72 hours after the onset of symptoms. CT is not very useful in diagnosing necrosis or in predicting the severity within 24 hours of onset of symptoms of illness.

The sensitivity of identifying pancreatic necrosis using CECT scan approaches 100%, 96 hours after diagnosis.

CT scan is also useful as a diagnostic and therapeutic modality in infected pancreatic necrosis. Image guided aspiration of necrosis can be done, when the patient is not improving clinically or in patients who experience clinical decline.[30]

CLASSIFICATION OF SEVERITY

Various classification systems have been devised in the past.

The most widely accepted classification system for severity in Acute Pancreatitis, the "Atlanta classification", was reported in 1992.Atlanta 1992 classification, divides Acute Pancreatitis into two groups: mild and severe.

Severe disease is defined by the presence of organ failure, local pancreatic complications on imaging, and/or poor prognostic scores (Ranson's ≥3 and/orAPACHE-II≥8). Atlanta 1992 has offered a universally applicable classification system that successfully served clinical studies and helped in the comparison of data from different centres for over 20 years.

Due to limitations in 1992 Atlanta classification of Acute Pancreatitis, & improved understanding of the pathogenesis of Acute Pancreatitis, the 1992 classification was updated.

The revised of the Atlanta classification (Atlanta 2012) divides Acute Pancreatitis severity into three groups: mild, moderate, and severe.

Mild Acute Pancreatitis which is characterized by absence of organ failure and local or systemic complications.

Moderately severe Acute Pancreatitis which is characterized by transient organ failure (resolves within 48 hours) and/or local or systemic complications without persistent organ failure (> 48 hours).

Severe Acute Pancreatitis which is characterized by persistent organ failure that may involve one or multiple organs.

In the early phase, this is based on clinical parameters, whereas in the following weeks, this subdivision is based on a combination of clinical parameters and morphologic complications, either requiring an active intervention (surgical, endoscopic, and radiologic) or other supportive measures (like need for vasopressors, ventilatory support, or renal dialysis).

Necrotizing pancreatitis is defined as the "The presence of parenchymal necrosis and/or necrosis of peripancreatic fat."

The updated Atlanta classification, includes patients with peri-pancreatic necrosis only (that is, without necrosis of pancreatic parenchyma) in the category of Necrotizing Pancreatitis.

Oedematous interstitial pancreatitis usually runs a mild course, but a small subset of patients suffer a fulminant attack and die within 2 to 5 days; these patients have severe disease, but do not meet criteria of necrotizing pancreatitis.

EARLY AND LATE ORGAN FAILURE

Acute Pancreatitishas two phases. 1st phase is characterized by a systemic inflammatory response syndrome (SIRS) which lasts for about 2 weeks. The 2nd phase is marked by counter-active anti-inflammatory response syndrome (CARS), which is characterized by a state of immune suppression. Organ failure in the SIRS phase is considered to be due to severe systemic inflammation and not infection. Organ failure in the CARS phase is related to secondary infections, like infected pancreatic necrosis. Infections do occur in the SIRS phase, but bacteraemia and (ventilator-associated) pneumonia are common. Organ failure can affect any organ system, but thepulmonary and the cardiovascular systems are predominantly affected.

Diagnosis oforgan failure in the SIRS phase is usually 2 days after admission, but can be seen even at admission. Most of the patients who die from Acute Pancreatitis, suffer from organ failure but not from infected pancreatic necrosis.

3 typical scenarios, in which organ failure presents, include the following:

1. Early-onset organ failure (week 1), intensive care admission, followed by improvement with supportive care and intensive care treatment (weeks 2 through 3). In the weeks to follow (weeks 3 through 5), clinical deteriorationoccurs. This sequence of events is highly indicative of infected necrosis.

2. Without early organ failure, clinical stability is suddenly complicated by deterioration in 3rd to 4th week of admission.

3. If after 3 weeks of therapy, there is no improvement in early onset organ failure, in the intensive care unit. In this case, a fine-needle aspiration (FNA) of one of the collections is done to differentiate between persistent SIRS or infected necrosis and to determine the need for intervention. If, however, gas bubbles are seen on CECT scan, no further diagnostic procedure is required, and an intervention to treat the source of infection needs to be planned.

SCORING SYSTEMS

1. RANSON'S SCORING SYSTEM

The earliest scoring system designed to evaluate the severity of Acute Pancreatitis was introduced by Ranson and colleagues in 1974[32]. It predicts the severity of the disease based on 11 parameters, which are obtained at the time of

admission and or 48 hours later. The mortality rate of Acute Pancreatitis directly correlates with the number of parameters positive. Severe pancreatitis is diagnosed, if three or more criteria are fulfilled. The original criteria wereanalysed in patients of alcoholic pancreatitis, and the patients with gallstone pancreatitis were analysed after 8 years. Higher Ranson's scores predict a more severe disease.

The incidence of local and complications of Acute Pancreatitis correlates with Ranson's score. This criterion is still widely used in the US. This criterion has many setbacks, which include

1. The criteria is complicated
2. There are two different lists based on the aetiology
3. It requires 48 hours to fully calculate the criteria
4. Validation beyond 48 hours has not been studied
5. Some of the parameters in the criteria are not widely used routinely

The sensitivity and specificity of the Ranson criteria is only 45% to 85%.

2. IMRIE'S PROGNOSTIC CRITERIA:

During initial 48 hours

WBC count > 15000/mm3

Blood sugar > 10 mmol/L

Serum urea > 16 mmol/L (no response to IV fluids)

Po2 level < 60 mm Hg

Serum ca2+ level < 2 mmol/L

Lactic dehydrogenase> 600 IU/L

AST / ALT>200µm/l

Serum albumin level < 32 g/L

Ranson's and Imrie's scores indicate the severity at the time of admission and are not intended for monitoring the clinical course[33].

3. MODIFIED GLASGOW CRITERIA:

This one was useful in both alcoholic and biliary pancreatitis[27].

The score ≥ 3 means severe disease requires ICU care.

P - PaO2 <8kPa or < 60 mmHg

A - Age more than 55 years old

N - Neutrophilia with WBC count>15x109/L

C - Ca2+<2mmol/L or < 8 mg/dl

R - Renal function, Urea >16mmol/L or > 45 mg/dl

E – Enzymes: - serum LDH >600 IU/L; AST>200 IU/L

A - Albumin <3.2g/dL

S - Sugar: >10mmol/L or >180 mg/dl

4. AGA GUIDELINES

1. The American Gastroenterological Association (AGA) has issued guidelinesfor assessing the severity of pancreatitis.

A. Prediction of severe disease be performed using the APACHE II system (using a cut off of ≥ 8).

B. Patients who are suspected to have a severe disease and with severe co-morbid conditions have to be triaged to an ICU.

C. In patients with predicted severe disease (APACHE II score of ≥8) and those with evidence of organ failure during the initial 72 hours, rapid-bolus CT should be performed after 72 hours of illness to assess the degree of pancreatic necrosis. CT should be used selectively based upon clinical features in patients who do not meet these criteria.

2. Laboratory tests can be used as an adjunct to clinical judgment and the APACHE II score. A serum CRP >150 mg/L at 48 hours is preferred.

5. APACHE II SCORING

It is abbreviated as "Acute Physiology and Chronic Health Evaluation (APACHE II)".

It is probably the most widely studied scoring system in Acute Pancreatitis. It has good negative predictive value and modest positive predictive value, in predicting severity of Acute Pancreatitis and can be performed daily. Decreasing values during the first 48 hours will suggest a mild attack, whereas increasing values suggest a severe attack. Studies suggest that mortality is less than 4% with a score < 8 and is 11 to 18% with a score > 8.

APACHE II provides a general measure of severity of disease, based on the age, previous health condition, and 12 routine physiologic measurements. An APACHE II score of 8 or more defines severe pancreatitis. Its advantage is that it can be used daily and has values that are comparable with Ranson's score.

The major advantage of the APACHE II scoring system, when compared to the other systems, is that, it can be used in monitoring patient's response to therapy. However, Ranson and the Glasgow scales are mainly meant to assess the severity at presentation

"The APACHE-II system assigns points for 12 physiologic variables, for age, and for chronic health status, in generating a total point score.

The 12 variables are

1. Temperature
2. Heart rate
3. Respiratory rate
4. Mean arterial blood pressure
5. Oxygenation
6. Arterial pH
7. Serum potassium,
8. Serum sodium
9. Serum creatinine
10. Haematocrit;
11. WBC count
12. Glasgow Coma Scale"

Because age and severe chronic health problems reflect a diminished physiological reserve, they have been directly incorporated into APACHE II.

The laboratory tests which are required are simple, routine and readily available.

It takes into account all the major risk factors that influence the outcome from the disease including the acute physiological derangements, as well as the patient's ability to recover which may be diminished by advancing age or chronic disease.

The range of the APACHE II score is wide, providing a better spread between the mild and severe attacks because varying weights are assigned to increasingly abnormal values, rather than all or no judgements.

Score of ≥ 2 indicates presence of organ failure. These scores were calculated within 72 hours of hospitalisation. The organ failure wasclassified as[34]:

Transient (less than 48 hrs.)

Persistent (more than 48 hrs.)

6. BISAP (The Bedside Index for Severity in Acute Pancreatitis):

It is a newer system that was developed to detect the risk of mortality in hospitalized patients.

"The BISAP includes[38]:

1. Blood urea nitrogen (BUN) >25 mg / dl.
2. Impaired mental status (GCS < 15).
3. SIRS.
4. Age >60 years.
5. Pleural effusion

SIRS was defined by presence of two or more of the following criteria:

1. Pulse > 90/min.
2. Respiratory rate > 20/min or $PaCO_2$< 32 mm Hg.
3. Temperature>100.4For<96.8F/<36or>38°C.
4. WBC count >12,000 or < 4,000 cells/mm3, or presence of more than 10% immature blasts.

(SIRS - Systemic Inflammatory Response Syndrome)"

One point will be awarded for every variable present.

The presence of a pleural effusion was determined by a CT scan, chest X-ray or abdominal ultrasound obtained within 24 h of presentation. Imaging obtained within 24 h of presentation at the hospital of origin for transferred patients was also collected and reviewed.

A BISAP score of ≥3 is said to be a good predictor of necrosis, organ failure and mortality.[39]

ADVANTAGES:

It is simple and easy to calculate, usually done at the time of admission or within 24 hrs of hospitalization.

The scores prediction ability was tested across 390 hospitals among large number (36,248) of populations, in contrast to other studies which were based on small number patients.

METHODOLOGY

Study site

This study was conducted in the Department of General Medicine, KLE's Dr. Prabhakar Kore Hospital, Belagavi.

Study designand duration

The current study was a one year Cross-sectional study.

Study period

The study was conducted from January 2018 to December 2018.

Study population

All the proved cases of Acute Pancreatitis admitted in general medicine department at Dr.Prabhakar Kore hospital, were considered as the study population.

Sample size

The study included a total of 100 patients of Acute Pancreatitis.

Sampling procedure

The sample size was calculated by the followingformula:

Sample size (n) = $4\ PQ/D^2$

P = Prevalence of the disease

Q= 100- P

D = Absolute error taken as 10%

(P = 50; Q = 50; D=10)

$n = 4 \times 50 \times 50 / 10^2$

n = 100

All eligible patients were recruited in this study consecutively by convenient sampling till the sample size was reached.

Selection criteria

Inclusion Criteria

- All Acute Pancreatitis patients above 18 years admitted in KLE's Dr. Prabhakar Kore Hospital and MRC, Belagavi.

Exclusion criteria

- Old cases of pancreatitis
- Patients of Chronic Kidney Disease
- Patients receiving calcium supplements
- Patients undergoing chemotherapy
- Patients with parathyroid disorders

Ethical clearance

The study was approved by the Institutional Ethics Committee, Jawaharlal Nehru Medical College, Belagavi prior to the commencement.

Informed consent

The patients fulfilling the selection criteria were briefed about the study and those who expressed their willingness to participate in the study were enrolled after obtaining a written informed consent (Annexure-I).

Data collection

On admission, the demographic data of the patients along with relevant history of current illness and past medical history were documented. Further these patients underwent clinical examination followed by investigations.

Investigations

Patients were subjected to following investigations.

- Serum amylase
- Serum lipase
- CT-abdomen
- Serum Calcium

Procedure

At the time of admission, patients were assessed for symptoms and signs of pancreatitis.

"Acute Pancreatitis was diagnosed based on presence of 2 out of 3 following characteristics

1. Intense epigastric pain
2. Serum amylase or lipase 3 times higher than normal limit
3. Characteristic Acute Pancreatitis findings on USG or CT."

Statistical methods

The data obtained was coded and entered into Microsoft excel spreadsheet and data was analyzed using SPSS version 20. The categorical data was expressed in terms of rates, ratio and percentage and the continuous data was expressed in terms of mean ± standard deviation. The association between the outcome, clinical and demographic characteristics was tested using chi-square test or Fisher's exact test. Continuous data was compared using independent sample't' test. Co-relation between CT Severity index and calcium was analyzed using Spearman's rank method. Comparison of CT appearance with calcium was done using Kruskal Wallis ANOVA. A probability (p) value of ≤ 0.05 was considered as statistically significant.

RESULTS

The present one-year cross sectional study was conducted in the Department of General Medicine, KLE's Dr Prabhakar Kore Hospital and Medical Research Centre, Belagavi.

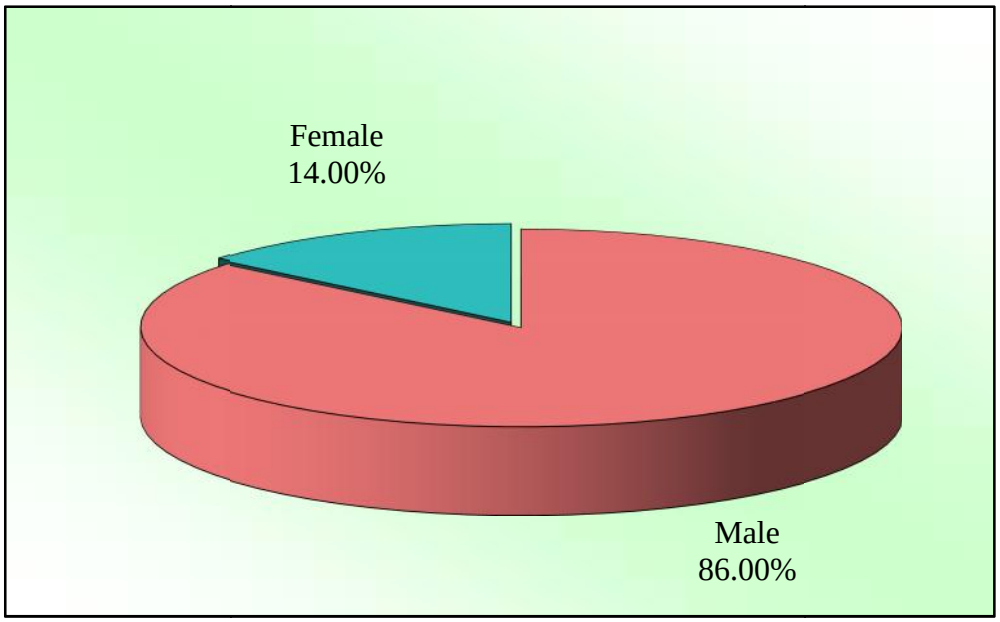
A total of 100 adult patients with the diagnosis of Acute Pancreatitis who met the inclusion and exclusion criteria were enrolled in this study after obtaining an informed consent.

The data obtained was analyzed and the final results were tabulated and interpreted as below.

Table 1: Gender wise distribution of acute pancreatitis patients

Gender	No of acute pancreatitis patients	% of acute pancreatitis patients
Male	86	86.00
Female	14	14.00
Total	**100**	**100.00**

Figure 1: Gender wise distribution of acute pancreatitis patients

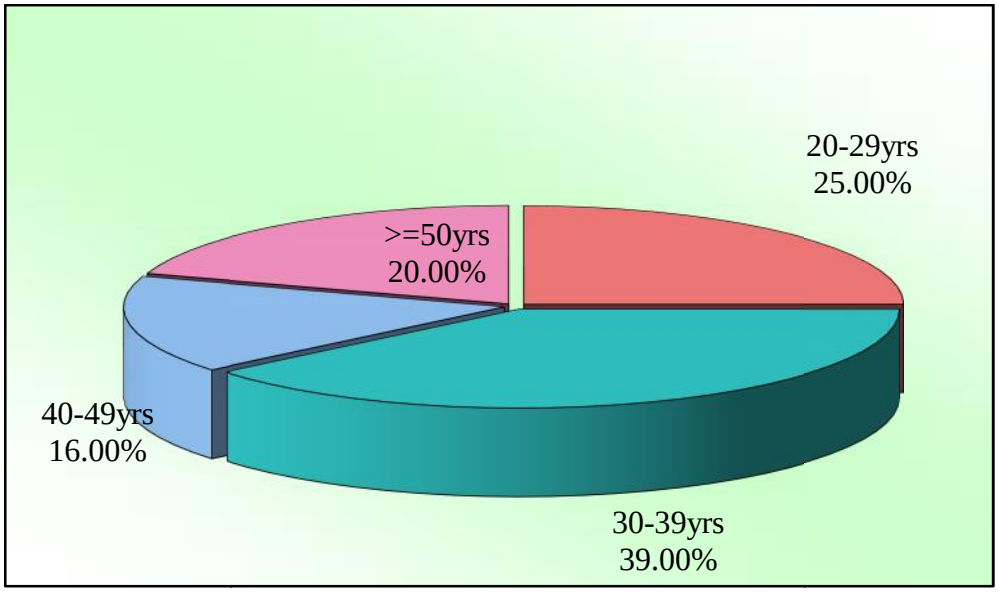


In the present study 86% patients were male and 14% patients were female. The male to female ratio was 6.14:1.

Table 2: Age wise distribution of acute pancreatitis patients

Age groups	No of acute pancreatitis patients	% of acute pancreatitis patients
20-29yrs	25	25.00
30-39yrs	39	39.00
40-49yrs	16	16.00
>=50yrs	20	20.00
Total	100	100.00
Mean	39.21	
SD	14.08	

Figure 2: Age wise distribution of acute pancreatitis patients

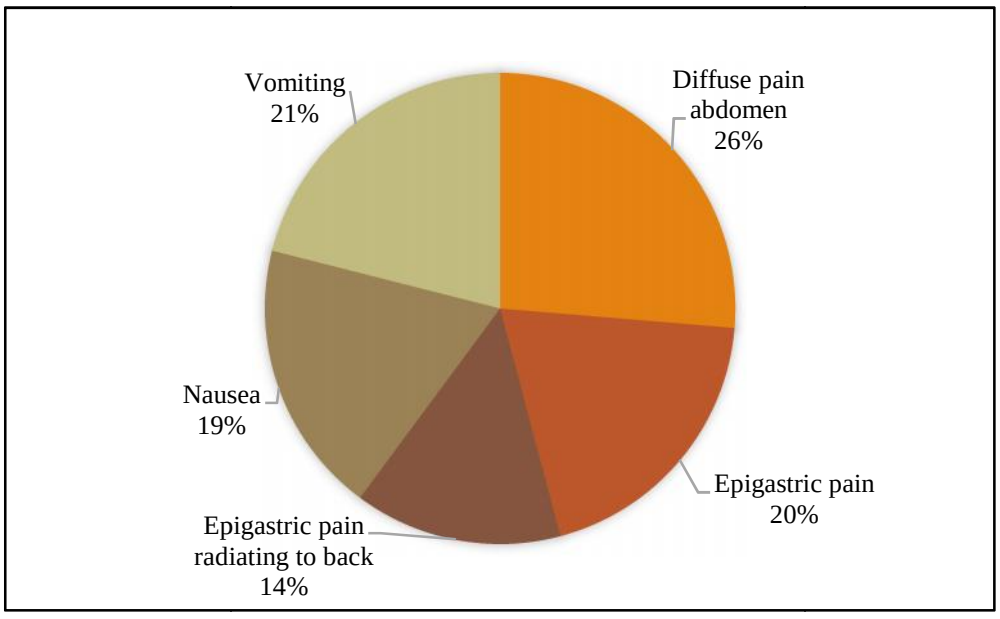


In this study 39% of the patients were aged between 30 to 39 years, 25% were aged between 20 to 29 years, 20% were aged above 50 years and 16% were aged between 40 and 49 years.

Table 3: Symptoms wise distribution of acute pancreatitis patients

Symptoms	No of acute pancreatitis patients	% of acute pancreatitis patients
Diffuse pain abdomen	35	35.00
Epigastric pain	26	26.00
Epigastric pain radiating to back	19	19.00
Nausea	25	25.00
Vomiting	28	28.00

Figure 3: Symptoms wise distribution of acute pancreatitis patients

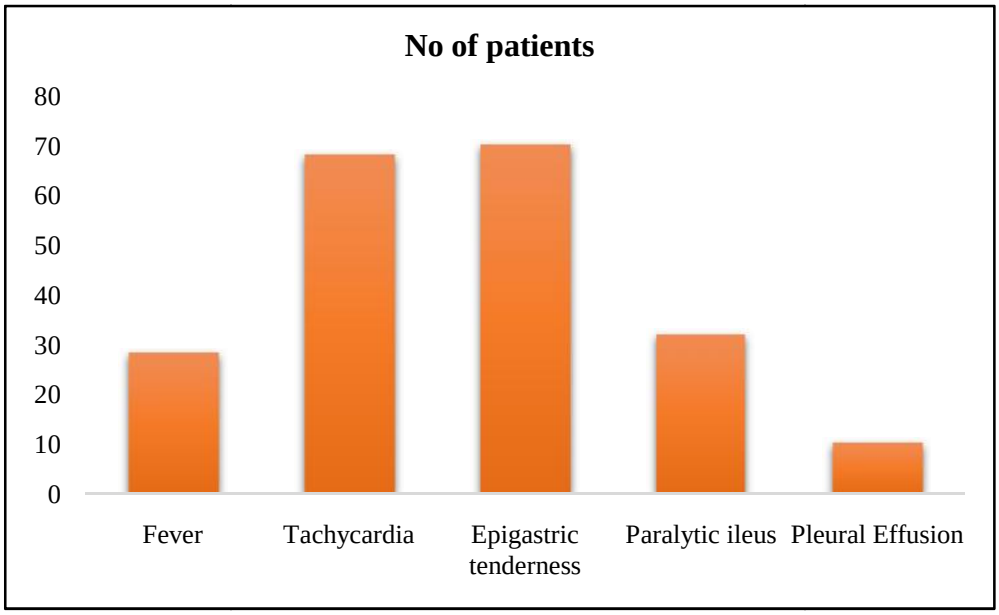


In this study pain in abdomen was the commonest clinical presentation followed by nausea and vomiting.

Table 4: Clinical signs wise distribution of acute pancreatitis patients

Clinical signs	No of patients	Percentage of patients
Fever	28	28.00
Tachycardia	68	68.00
Epigastric tenderness	70	70.00
Paralytic ileus	32	32.00
Pleural effusion	10	10.00

Figure 4: Clinical signs wise distribution of acute pancreatitis patients

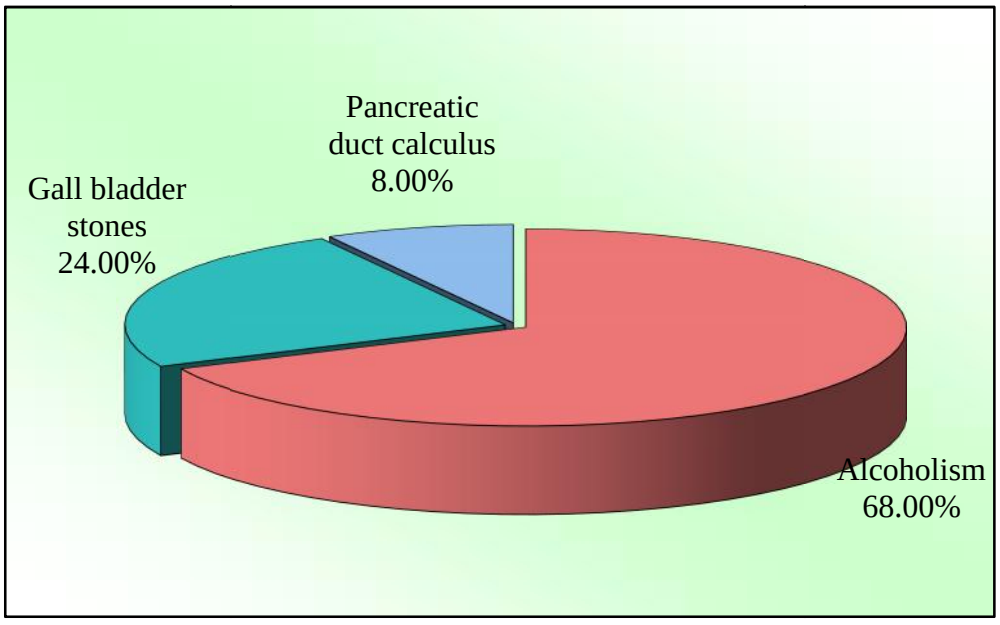


In the present study 70 patients had Epigastric tenderness, 68 patients were found to have tachycardia, 32 patients had paralytic ileus, 28 patients had fever and 10 patients were found to have pleural effusion.

Table 5: Etiology wise distribution of acute pancreatitis patients

Etiology	No of acute pancreatitis patients	% of acute pancreatitis patients
Alcoholism	68	68.00
Gall bladder stones	24	24.00
Pancreatic duct calculus	8	8.00
Total	100	100.00

Figure 5: Etiology wise distribution of acute pancreatitis patients

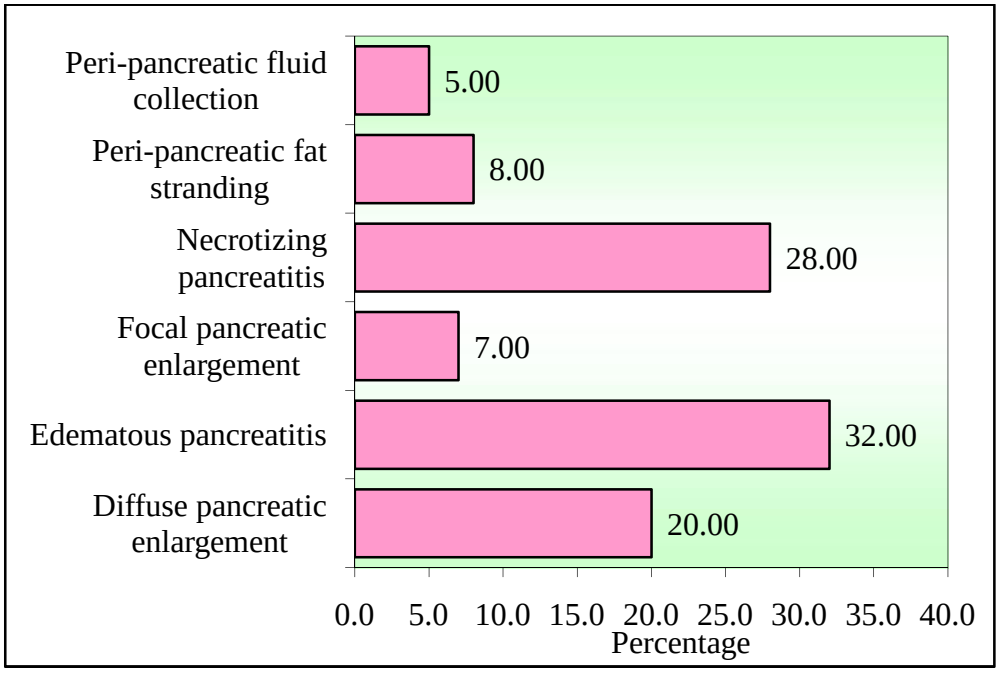


In the present study, history of consumption of alcohol and the possibility of it being the etiological factor was found in 68 patients. Gall stone disease was attributed in 24 patients. Pancreatic duct calculus was the causative factor in 8 patients.

Table 6: CT abdomen appearance wise distribution of acute pancreatitis patients

CT abdomen appearance	No of acute pancreatitis patients	% of acute pancreatitis patients
Diffuse pancreatic enlargement	20	20.00
Edematous pancreatitis	32	32.00
Focal pancreatic enlargement	7	7.00
Necrotizing pancreatitis	28	28.00
Peri-pancreatic fat stranding	8	8.00
Peri-pancreatic fluid collection	5	5.00
Total	**100**	**100.00**

Figure 6: CT abdomen appearance wise distribution of acute pancreatitis patients

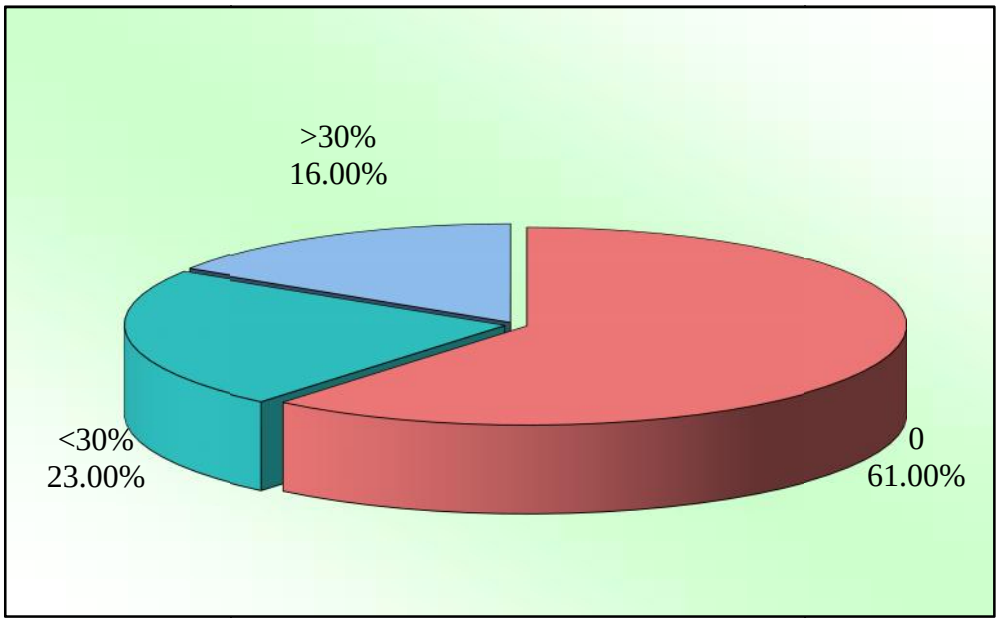


This study shows that 32% patients had edematous pancreatitis, 28% patients had necrotizing pancreatitis, 20% had diffuse pancreatic enlargement, 8% had peri-pancreatic fat stranding.

Table 7: Necrosis percentage wise distribution of acute pancreatitis patients

Necrosis	No of acute pancreatitis patients	% of acute pancreatitis patients
0%	61	61.00
<30%	23	23.00
>30%	16	16.00
Total	**100**	**100.00**

Figure 7: Necrosis percentage wise distribution of acute pancreatitis patients

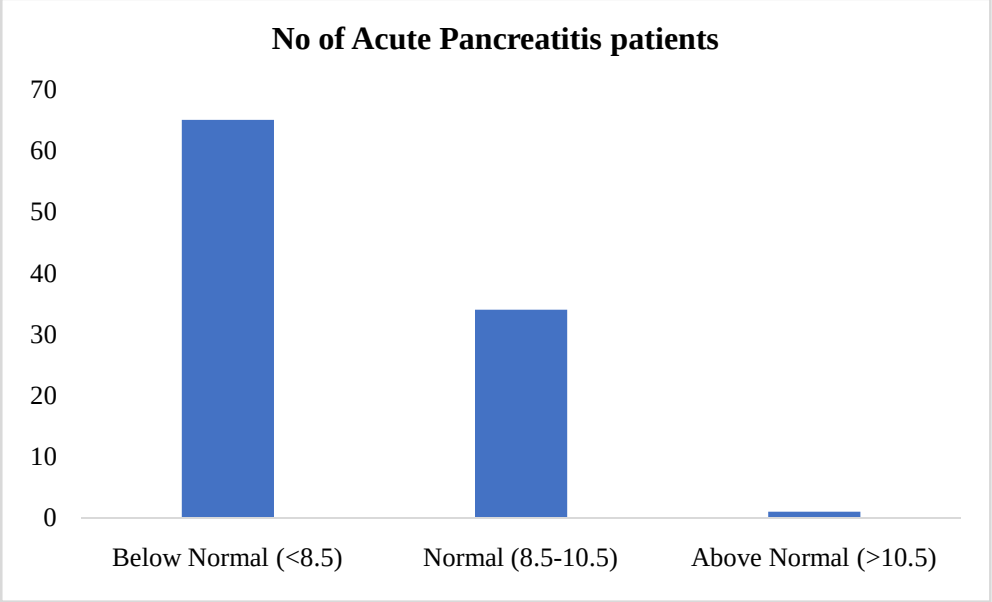


In this study, 61% patients didn't have any pancreatic necrosis. 23% patients had necrosis <30% and 16% patients had necrosis >30%.

Table 8: Serum calcium wise distribution in Acute Pancreatitis patients.

SERUM CALCIUM	No of Acute Pancreatitis patients	% of Acute Pancreatitis patients
Below Normal (<8.5)	64	64
Normal (8.5-10.5)	35	35
Above Normal (>10.5)	1	1
TOTAL	**100**	**100.00**

Figure 8: Serum calcium wise distribution in Acute Pancreatitis patients.

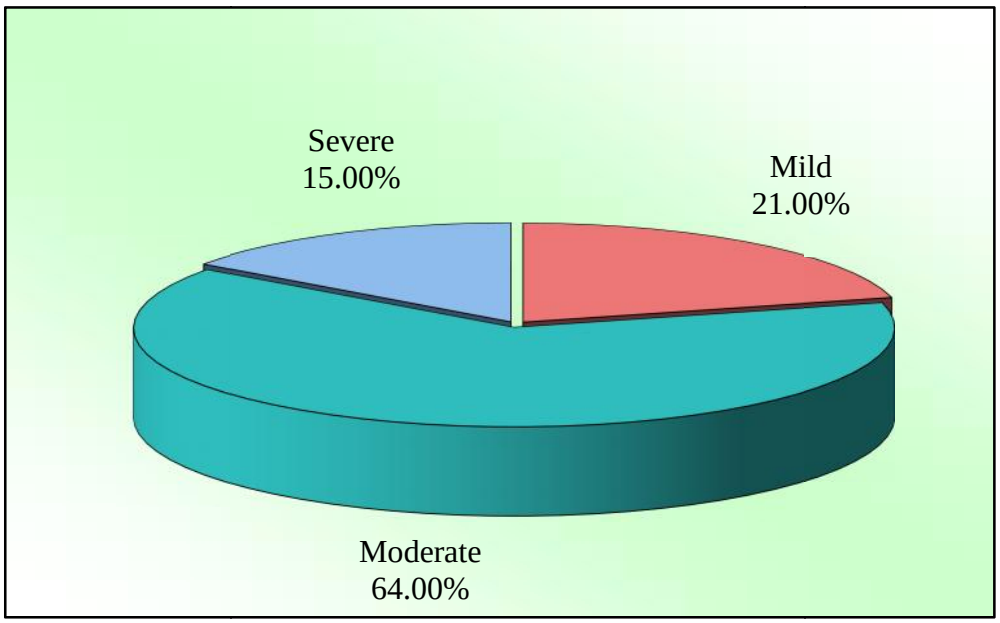


In this study, 64% patients had serum calcium <8.5 mg/dl, 35% patients had serum calcium 8.5-10.5 mg/dl and only 1% had calcium >10.5 mg/dl.

Table 9: CT severity Index wise distribution of acute pancreatitis patients

CT severity Index	No of acute pancreatitis patients	% of acute pancreatitis patients
Mild	21	21.00
Moderate	64	64.00
Severe	15	15.00
Total	**100**	**100.00**

Figure 9: CT severity Index wise distribution of acute pancreatitis patients



In this study, 21% patients had mild pancreatitis, 64% had moderate pancreatitis and only 15% had severe pancreatitis.

Table 10: CT severity Index wise distribution of serum calcium in acute pancreatitis patients

CT Severity Index	SERUM CALCIUM (mg/dl)			TOTAL
	<8.5	8.5-10.5	>10.5	
MILD (2)	5	15	1	21
MODERATE (4,6)	45	19	0	64
SEVERE (8,10)	14	1	0	15
TOTAL	64	35	1	100

In the present study, we observed that of the 21 patients with mild pancreatitis 5 patients had calcium <8.5 mg/dl, 15 patients had normal calcium between 8.5-10.5 mg/dl and 1 patient had calcium >10.5 mg/dl.

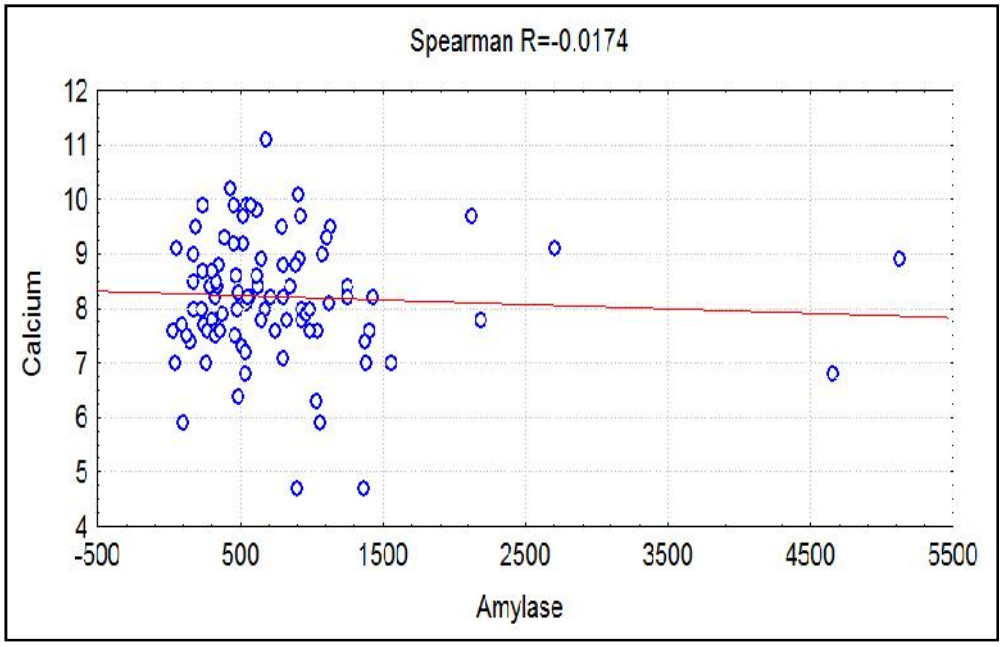
In moderate pancreatitis, 45 patients had calcium <8.5 mg/dl, 19 between 8.5-10.5 mg/dl and no patients >10.5 mg/dl.

In severe pancreatitis, 14 patients had calcium <8.5 mg/dl, 1 between 8.5-10.5 mg/dl and none >10.5 mg/dl.

Table 11: Correlation between amylase and calcium scores by Spearman's rank correlation method

Variables	Correlation between amylase scores with			
	N	Spearman R	t-value	p-value
Calcium scores	100	-0.0174	-0.1720	0.8638

Figure 10: Scatter diagram of correlation between amylase and calcium scores

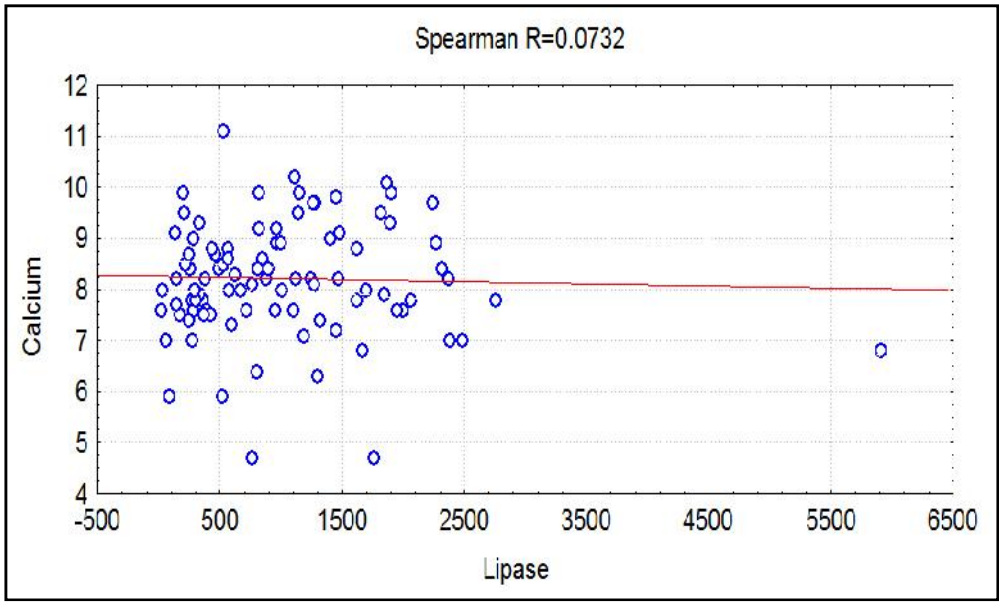


The present study showed no co-relation between Amylase and Calcium(p=0.8638).

Table 12: Correlation between lipase and calcium scores by Spearman's rank correlation method

Variables	Correlation between lipase scores with			
	N	Spearman R	t-value	p-value
Calcium scores	100	0.0732	0.7262	0.4694

Figure 11: Scatter diagram of correlation between lipase and calcium scores



The present study showed no co-relation between serum Lipase and serum Calcium(p=0.4694).

Table 13: Correlation between CT severity Index and calcium scores by Spearman's rank correlation method

Variables	Correlation between CT severity Index scores with			
	N	Spearman R	t-value	p-level
Calcium scores	100	-0.7108	-10.0027	**0.0001***

*p<0.05

Table 14: Correlation between CT severity Index and calcium scores

CTSI SCORE	MEAN CALCIUM
2	9.03
4	8.56
6	7.82
8	7.09
10	5.6

Figure 12: Correlation between CT severity Index and calcium scores

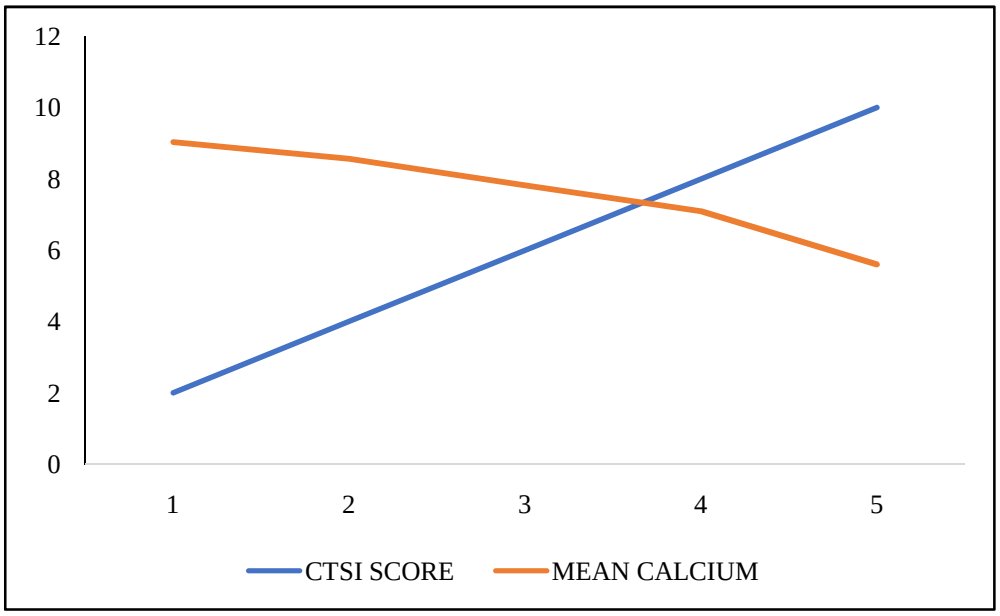
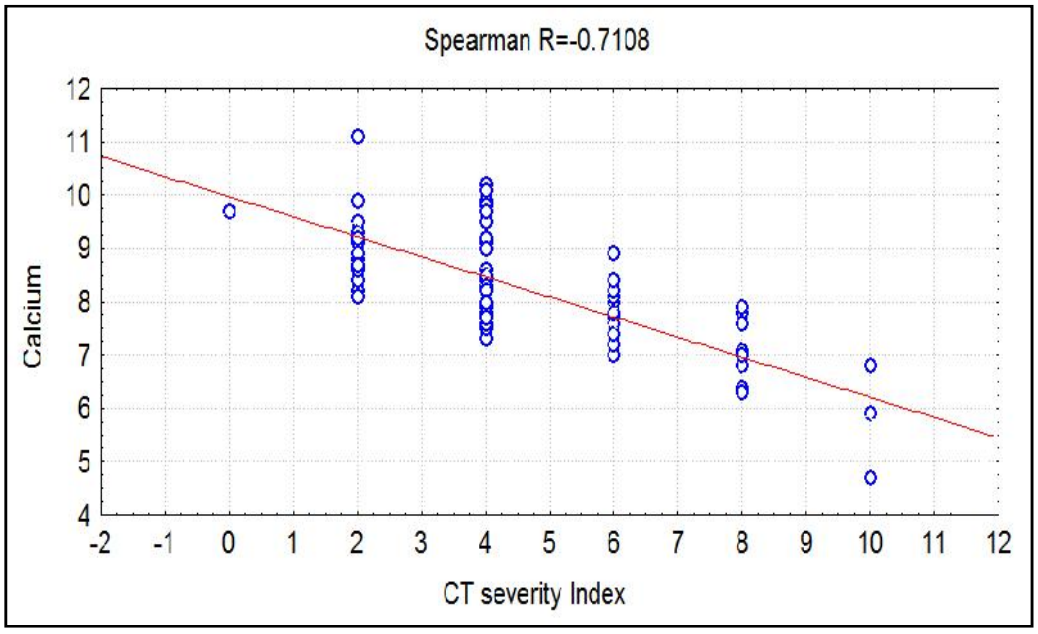


Figure 13: Scatter diagram of correlation between CT severity Index and calcium scores

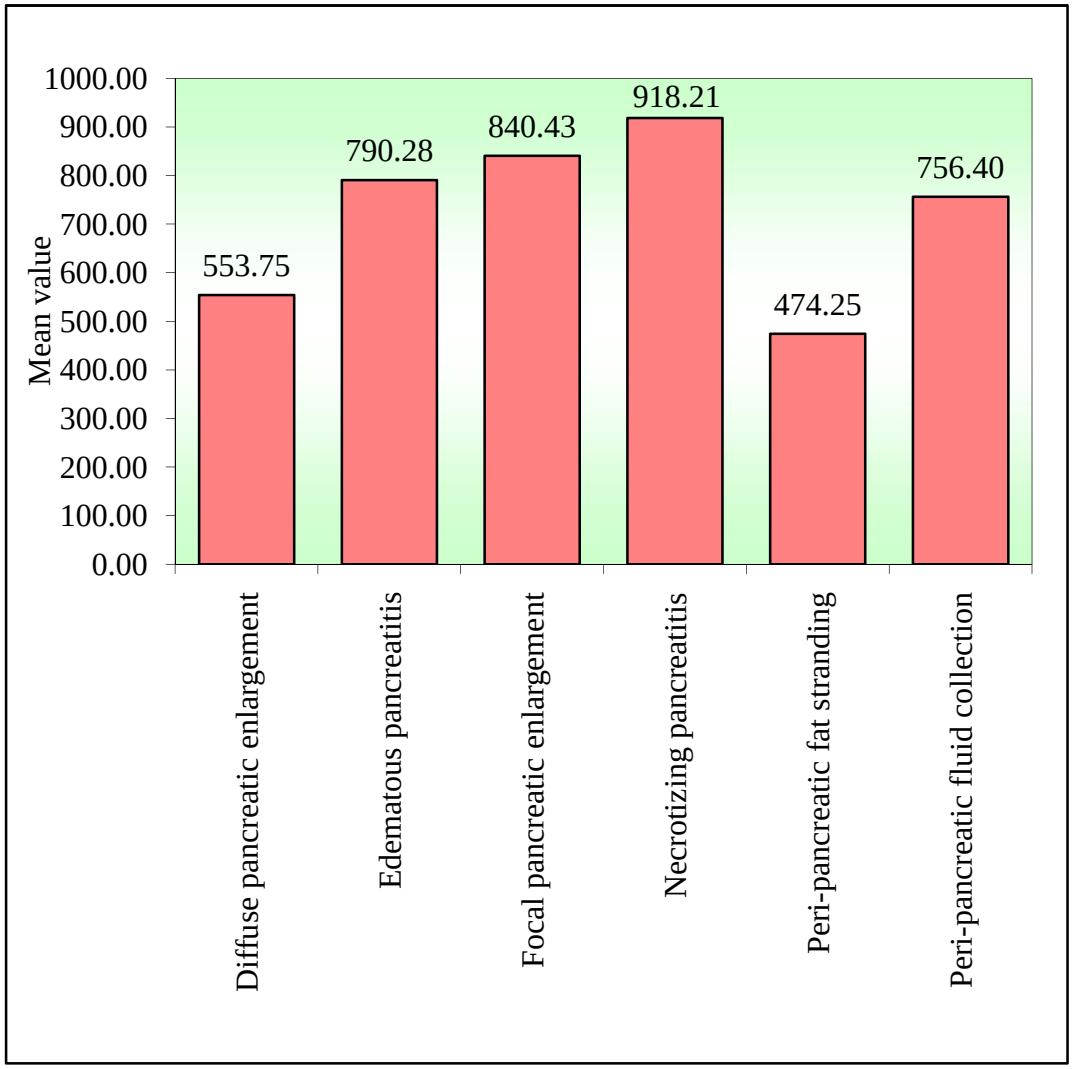


The present study showed a significant inverse co-relation between CT Severity Index and Calcium($p<0.0001$). This implies that with severity of pancreatitis, the value of serum calcium decreases.

Table 15: Comparison of CT abdomen appearances with respect to amylase scores by Kruskal Wallis ANOVA

CT abdomen appearances	Means	Std.Dev.	Sum of ranks
Diffuse pancreatic enlargement	553.75	461.97	791.00
Edematous pancreatitis	790.28	854.22	1703.00
Focal pancreatic enlargement	840.43	836.00	362.00
Necrotizing pancreatitis	918.21	903.59	1598.00
Peri-pancreatic fat stranding	474.25	243.63	315.00
Peri-pancreatic fluid collection	756.40	478.33	281.00
H-value	5.9490		
P-value	0.3112		

Figure 14: Comparison of CT abdomen appearances with respect to amylase scores

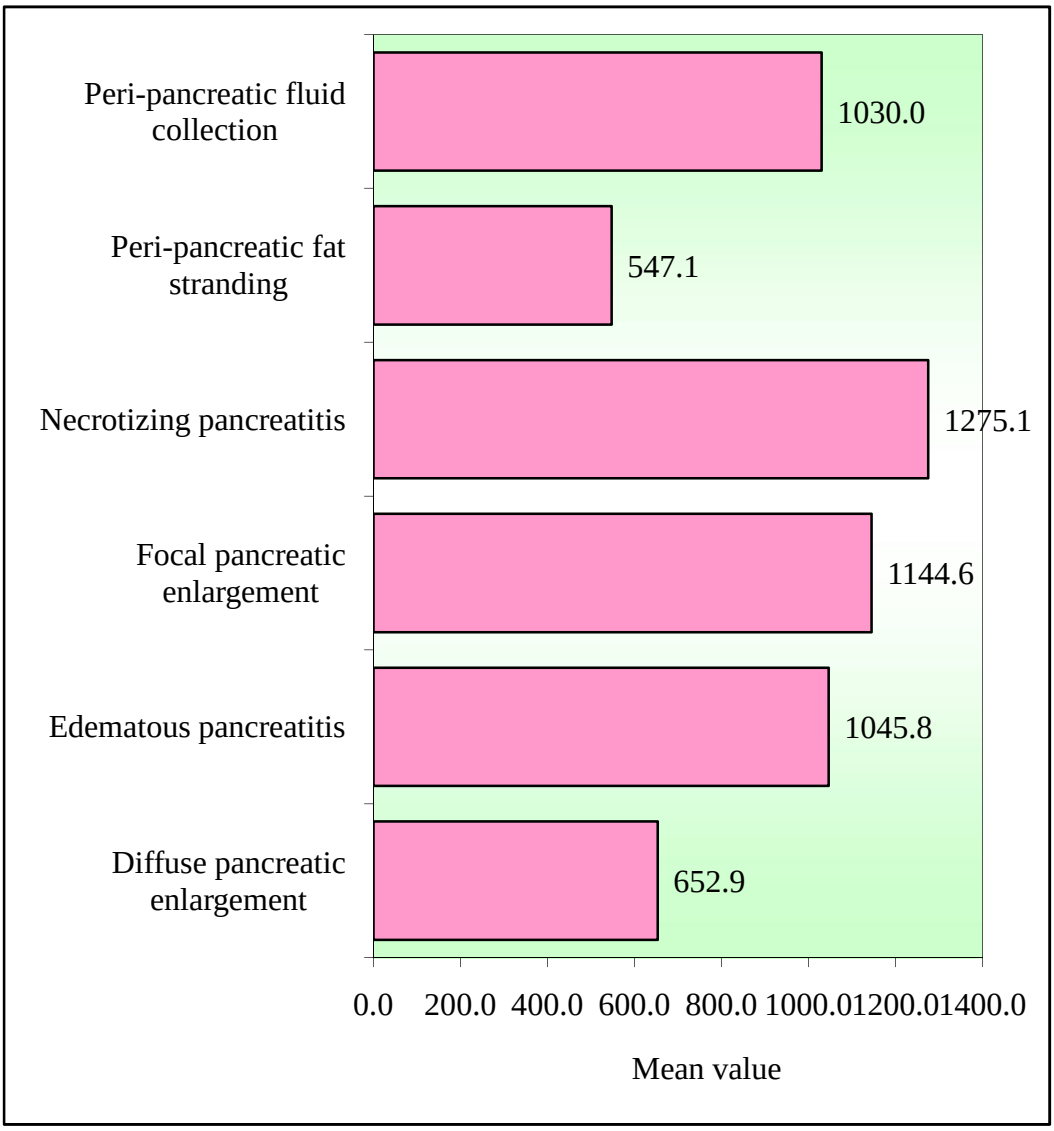


In the present study, the values of serum amylase were found to be higher in necrotizing pancreatitis as compared to other CT appearance of pancreas but the p value was not significant (p=0.3112).

Table 16: Comparison of CT abdomen appearances with respect to lipase scores by Kruskal Wallis ANOVA

CT abdomen appearances	Means	Std.Dev.	Sum of ranks
Diffuse pancreatic enlargement	652.90	587.49	740.00
Edematous pancreatitis	1045.81	638.92	1781.00
Focal pancreatic enlargement	1144.57	526.35	428.00
Necrotizing pancreatitis	1275.11	1216.88	1569.50
Peri-pancreatic fat stranding	547.13	359.88	269.50
Peri-pancreatic fluid collection	1030.00	834.42	262.00
H-value	10.0182		
P-value	0.0748		

Figure 15: Comparison of CT abdomen appearances with respect to lipase scores



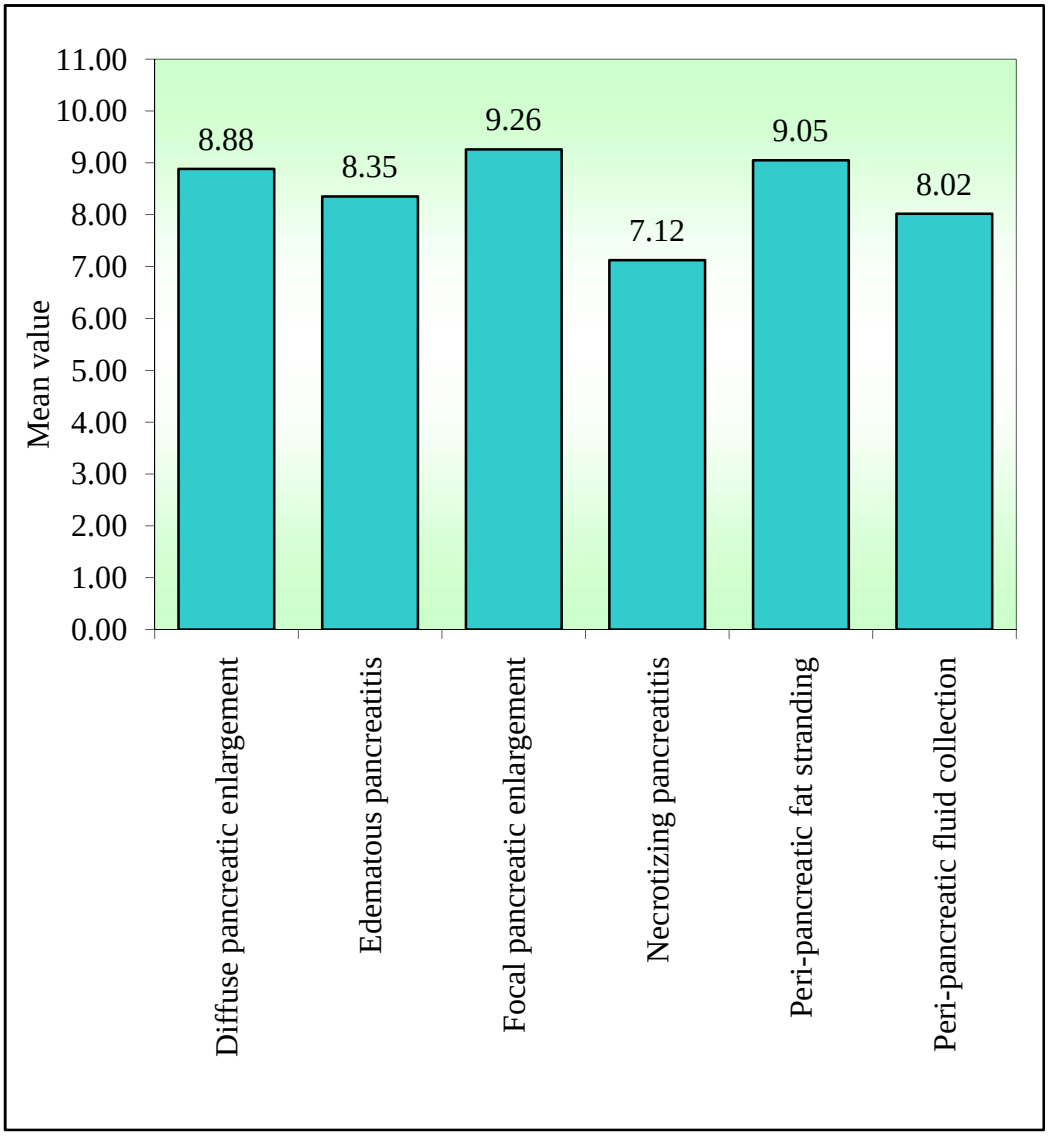
In the present study, the values of serum lipase were found to be higher in necrotizing pancreatitis, focal pancreatic enlargement and edematous pancreatitis as compared to other CT appearance of pancreas but the p value was not significant (p=0.0748).

Table 17: Comparison of CT abdomen appearances with respect to calcium scores by Kruskal Wallis ANOVA

CT abdomen appearances	Means	Std.Dev.	Sum of ranks
Diffuse pancreatic enlargement	8.88	0.80	1382.50
Edematous pancreatitis	8.35	0.73	1720.50
Focal pancreatic enlargement	9.26	0.76	562.50
Necrotizing pancreatitis	7.12	0.93	578.50
Peri-pancreatic fat stranding	9.05	0.97	581.50
Peri-pancreatic fluid collection	8.02	0.72	224.50
H-value	50.6857		
P-value	**0.0001***		

*$p<0.05$

Figure 16: Comparison of CT abdomen appearances with respect to calcium scores



In the present study, on comparison of CT abdomen appearance with respect to serum calcium level it was observed that hypocalcemia was observed with more severe CT abdomen appearance of pancreatitis and necrosis and the p value was significant. (p=0.0001)

DISCUSSION

Acute pancreatitis is a common disease which has a broad range of illness. Severe acute pancreatitis has a high mortality and morbidity rate.

Early hospitalization and management according to disease severity maybe helpful to identify patients who are at risk and need aggressive interventions to prevent the severe complications of pancreatitis.

There are many scoring systems to determine the severity of the disease but they are usually cumbersome to determine. Some of the investigations are not easily available at the primary and secondary health centers.

Hence in the present study our objective was to analyze a simple lab parameter i.e. the level of serum calcium as a severity and prognostic marker in acute pancreatitis in comparison with the CT Severity Index.

AGE AND GENDER

In the present study we found that most patients were in the age group of 20 to 40 years.

The minimum age of presentation was 20 years and maximum age of presentation was 75 years. 39 patients (39%) were in the age group of 30-39 years, 25 patients (25%) were in the age group of 20-29 years, 20 patients (20%) were above 50 years and 16 patients (16%) were in the age group of 40-49 years. Their mean age presentation was 39.21 ±14.08 years.

In this study, 86 patients (86%) were male and only 14 patients (14%) were females. We also found that acute pancreatitis was about 6 times (6.14:1) more common in males than in females which can be due to consumption of alcohol being more common in males in India.

These resultsare comparable with other studies like Vikesh K. Singhet et al[44] (6:1, 49.6 years), Papachristou et al (5.1:1, 51.7 years) and Sarath et al (40.8 years) who also had similar results.

"No association of age and gender was noted with severity of pancreatitis in our study which was similar to that of a study conducted by Lankish et al[52] on 602 patients of acute pancreatitis."

ETIOLOGY

The commonest etiology in the present study was alcohol (68%) followed by gall bladder calculi (24%) and pancreatic duct calculi (8%).

"A study by Wongnai et al conducted in 90 patients showed 60% patients of alcohol, 18% patients of CBD calculi. Our data also matches with a study by Bidarkundi et al[45], but didn't correlate with results of Vikesh K. Singh et al[44] (21.4%), Papachristou et al (14%) in which gallstone disease was found to be the most common cause, 27% & 36% respectively."

CLINICAL FEATURES

The commonestsymptom was pain in abdomen (80%) which was either diffuse (35%) or radiating to back (19%), followed by nausea and vomiting (45%).

The most common clinical finding in our study was Epigastric tenderness (70%), followed by tachycardia (68%), paralytic ileus (32%), fever (28%) and pleural effusion (10%).

"This data is comparable to the study by Wu B U et al and Kaushik MR et al in which abdominal pain (80%) was the most common presenting complaint and epigastric tenderness (86%) was the most common sign."

CT ABDOMEN

Based on the CT abdomen appearance, Edematous pancreatitis (32%) was the most common finding, followed by Necrotizing pancreatitis (28%), Diffuse pancreatic enlargement (20%) patients, focal pancreatic enlargement (7%) patients, peri-pancreatic fat (8%), peri-pancreatic fluid collection (5%) patients.39 patients(39%) showed evidence of pancreatic necrosis, of these 23 patients had <30% necrosis and 16 patients had >30% necrosis.

"A study conducted in 90 patients by Wongnai et al showed similar results.A study by Bollen et al andCasas et al identified necrosis in 18 % and 15 % patients with Acute Pancreatitis respectively."

The patients severity were given scores 2, 4, 6, 8 and 10 based on the CT Severity Index. We grouped the CTSIscores into mild (grade 2), moderate (grade 4 & 6) and severe (grade 8 & 10).

The maximum number i.e. 64 patients were seen to fall in the moderate category (64%), 21 patients in mild category (21%) and minimum patients i.e. 15 (15 %) were seen in severe category.

"According to the study by Bollen et al the morphologic severity of pancreatitis was graded as mild in 86 (44%), moderate in 75 (38%), and severe in 35 (18%) cases."[47]

LABORATORY INDICES

In the present study, it was observed that 64 patients (64%) had serum calcium <8.5 mg/dl, 35 patients (35%) had calcium between 8.5-10.5 mg/dl and only 1 patient (1%) had calcium above 10.5 mg/dl. The minimum calcium level was 4.7 mg/dl and maximum was 11.1 mg/dl. The mean calcium was 8.21±1.10 mg/dl.

The mean serum amylase level was 755.60 U/L. The minimum amylase level was 22 U/L and maximum was 5118 U/L.

The mean serum lipase level was 997.66 U/L. The minimum lipase level was 21 U/L and maximum was 5888 U/L.

In the present study, it was observed that there was no correlation between serum amylase and serum calcium (p=0.8638) and serum lipase and serum calcium (p=0.4694).

Also, comparison of CT abdomen appearance with respect to serum amylase (p=0.3112) and serum lipase (p=0.0748) did not show any significant correlation.

In this study, we observed that of 21 patients who had mild pancreatitis 5 patients had calcium <8.5 mg/dl, 15 patients had normal calcium between 8.5-10.5 mg/dl and 1 patient had calcium >10.5 mg/dl. In moderate pancreatitis, 45 patients had calcium <8.5 mg/dl, 19 between 8.5-10.5 mg/dl and no patients >10.5 mg/dl. In severe pancreatitis, 14 patients had calcium <8.5 mg/dl, 1 between 8.5-10.5 mg/dl and none >10.5 mg/dl.

In the present study, on comparing the serum calcium level of all the patients with the CT severity index we observed that there was decrease in the value of serum calcium of patients who had higher CT Severity Index. A statistically significant inverse co-relation (p=0.0001) was observed between the CT Severity Index and serum calcium levels by Spearman's rank correlation method indicating that hypocalcemia was associated with poor prognosis of Acute Pancreatitis.

On comparison of CT abdomen findings with respect to serum calcium level it was observed that more hypocalcemia was observed with more severe CT abdomen appearance of pancreatitis and necrosis.

"A study done by A.A. Gutiérrez-Jiménez et al to study Serum Calcium and Albumin Corrected Calcium obtained within the first 24 h of hospital admission concluded that they are useful predictors of severity in Acute Pancreatitis and have S_n, S_p, and predictive values that are comparable with those of the traditional prognostic scales. With an adequate interpretation of their cut-off points, they are valuable for identifying the patients that require intensive care support, even in primary and secondary care centers."

CONCLUSION

Based on the findings of this study it may be concluded that, Serum calcium level can be used as a simple marker to assess the severity and prognosis of Acute Pancreatitiswhich helps to determine need for intensive care management as it is easily available in primary and secondary care centers but further large-scale studies are needed.

SUMMARY

Despite vast research, there is no simple biomarker which can serve as the single parameter to determine the severity and prognosis in patients with Acute Pancreatitis. This study explored the feasibility of serum calcium as a prognostic marker in patients of Acute Pancreatitis.

This was a one-yearcross sectional study done in the Department of Medicine, KLES Dr. Prabhakar Kore Hospital and MRC, Belagavi from January 2018 to December 2018. A total of 100 patients who presented with the diagnosis of Acute Pancreatitis as defined by Atlanta Classificationwere studied. Serum calcium was evaluated for all patients at admission and was compared with CT Severity Index.

Most of the patients were males (86%) and male to female ratio was 6.14:1. The commonest age group was between 20 to 40 years (64%) and the mean age was 39.21 ± 14.08 years.

Ethanol (68%) was the commonest etiology for acute pancreatitis followed by gall bladder calculi (24%).

Abdominal pain was the common clinical presentation (80%). Most of the patients had epigastric tenderness as the most common clinical sign (70%). 68% patients had pulse rate of >100 /minute, 28% of the patients had temperature of ≥ 98.6^0F.

Based on the CT abdomen appearance, Edematous pancreatitis (32%) was the most common finding, followed by Necrotizing pancreatitis (28%).

Maximum patients were found to have moderate severity on the CTSI score (64%).

Serum calcium <8.5 mg/dl was found in 64 patients of which 45 patients had moderate pancreatitis, 14 patients had severe pancreatitis and 5 patients had mild pancreatitis.

In the present study, on comparing the serum calcium level of all the patients with the CT severity index we observed that there was decrease in the value of serum calcium of patients who had higher CT Severity Index. A significant inverse co-relation (p=0.0001) was observed between the CT Severity Index and serum calcium levels indicating that hypocalcemia was associated with poor prognosis of Acute Pancreatitis.

On comparison of CT abdomen appearance with respect to serum calcium level it was observed that more hypocalcemia was observed with more severe CT abdomen appearance of pancreatitis and necrosis. In the present study, it was observed that there was no correlation between serum amylase and serum calcium (p=0.8638) and serum lipase and serum calcium (p=0.4694).

Also, comparison of CT abdomen appearance with respect to serum amylase (p=0.3112) and serum lipase (p=0.0748) did not show any significant correlation.

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ANNEXURE I – CONSENT FORM

TITLE OF RESEARCH STUDY: "STUDY OF SERUM CALCIUM LEVEL AS A PROGNOSTIC MARKER IN ACUTE PANCREATITIS – ONE YEAR HOSPITAL BASED CROSS-SECTIONAL STUDY."

Principal Investigator **Guide: -**

Introduction and Purpose: -

The present study is conducted among patients with Acute Pancreatitis admitted in the medicine wards and ICU in KLE's Dr Prabhakar Kore Hospital and Medical Research Centre, Belgaum and they will be investigated to determine the prognosis of the disease and compare it with serum level of calcium.

Procedure:

If you agree to be part of the research study, you will be asked the relevant history and will be subjected to relevant clinical examination and investigations. You will also have to give blood samples for the necessary investigations.

Risk and Benefits:

The only risk and possible discomfort you might get is while taking blood from your arm for the investigations. It may cause swelling, pain, redness (rarely happens) at the site from where the blood is drawn.

You may also be benefitted by these investigations and you will be part of this study which is going to be useful to others in the future.

Alternatives:

Taking part in this study is voluntary. You may choose not to take part in this study. If you decide to take part you can later change your mind and withdraw from the study. Your decision will not change the present or future health care or other services that you receive. The study doctor or sponsor may stop your participation in this study at any time. If you choose not to take part in the study, you will receive the standard treatment for patients with your condition.

Privacy and Confidentiality:

All information collected about you during the course of this study will be kept confidential to the extent permitted by law. The code numbers will identify you in this research record. Information from this study may be published but your identity will be confidential in any publication.

Institution / Sponsor's policy:

Does not apply to this research

Financial incentives for participation:

You will not be paid / offered any gifts /incentives for participating in the study.

Authorization to publish the results:

The results of the study would be forwarded to the KAHER, Belagavi as part of requirement towards the completion of MD degree, review and publishing.

In case of the queries during study or in future you may contact following persons,

1. Dr. Roopa Bellad, Chairman, J.N.M.C Ethical Committee for Human Research

CONSENT FORM

I voluntarily agree to take part in this study by signing below. I may withdraw at any time. I am not giving up any of my legal rights by signing this form. My signature below indicates that I have read this consent form, or it has been read to me, and have had all the questions answered.

Signature / Left Thumb print of the Participant or legally authorized representative

Participant's name: ……...

Signature / Left thumb impression ……...

of the participant:

Name of the legally authorized ……...

representative / guardian:

Signature / Left thumb impression: ……...

Witness name: ……...

Signature / Left thumb impression: ……...

Investigator's name and signature: ……...

Date:

Place:

ANNEXURE-II

PROFORMA

"SERUM CALCIUM LEVEL AS A PROGNOSTIC MARKER IN ACUTE PANCREATITIS- ONE YEAR HOSPITAL BASED CROSS-SECTIONAL STUDY"

NAME		CASE NO	
IP NO		AGE/SEX	
DIAGNOSIS			

CHIEF COMPLAINTS:

O/E:

Pulse rate: Blood Pressure:

RR: Temperature:

General Physical examination:

Systemic examination:

P/A: CVS:

RS: CNS:

INVESTIGATIONS:

Serum Amylase	
Serum Lipase	
Serum Calcium	
CT Abdomen	
CT Severity Index(CTSI) score	

OTHER REMARKS:

ANNEXURE-III- ETHICAL CLEARANCE LETTER

K.L.E.UNIVERSITY'S
JAWAHARLAL NEHRU MEDICAL COLLEGE,
NEHRU NAGAR, BELAGAVI-590010 (KARNATAKA-INDIA)
(Accredited 'A' Grade by NAAC)

Website: http//www.jnmc.edu
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Phone: (+ 91-(0)831 Office : 2471350
Principal: 2471701
Fax No. +91 (0)831 – 2470759

Ref: MDC/DOME/ 41 **Date: 22/11/2017**

To,

REG. NO.:BG0117015

Sub: Institutional Ethical Clearance for the study.

With reference to the above, we wish to inform you that your proposed research project titled **"SERUM CALCIUM LEVEL AS A PROGNOSTIC MARKER IN ACUTE PANCREATITIS –A ONE YEAR HOSPITAL BASED CROSS SECTIONAL STUDY",** is ethical and justifiable. The proposed research project has been cleared by the JNMC Institutional Ethics Committee on Human Subjects Research.

(Dr. Arathi Darshan)
Member Secretary
JNMC Institutional Ethics Committee
on Human Subjects Research,
J.N.Medical College, Belagavi.

(Dr. Roopa M Bellad)
Chairman,
JNMC Institutional Ethics Committee
on Human Subjects Research,
J.N.Medical College, Belagavi.

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ANNEXURES IV - MASTER CHART

CASE NO.	IP NO.	AGE	SEX	SYMPTOMS	DIAGNOSIS	ETIOLOGY	PR	BP	AMYLASE	CALCIUM	LIPASE	CT ABDOMEN appearance	Necrosis percentage	CTSI SCORE
1	850167	49	M	Ep, N	AP	alcoholism	100	110/70	930	7.8	2061	Edematous pancreatitis	>30	6
2	852880	33	F	Dif pain ab	AP	g b stones	92	120/70	713	8.2	377	Edematous pancreatitis	0	4
3	853532	70	M	N, V	AP	g b stones	86	140/90	347	8.8	559	Diffuse pancreatic enlargement	0	2
4	856980	39	M	Ep r to b	AP	alcoholism	96	100/60	330	7.8	275	Necrotizing pancreatitis	>30	6
5	857929	32	M	Ep, N	AP	alcoholism	84	120/80	285	8.4	256	Focal pancreatic enlargement	0	2
6	860099	29	F	N, V	AP	g b stones	88	100/70	568	8.2	1242	Necrotizing pancreatitis	>30	6
7	861387	53	F	N, V	AP	g b stones	80	130/80	1253	8.4	2317	Peri-pancreatic fluid collection	0	4
8	866314	28	M	Ep r to b	AP	alcoholism	86	110/70	321	8.2	375	Edematous pancreatitis	0	4
9	850167	49	M	Dif pain ab	AP	alcoholism	100	110/70	930	7.8	2061	Necrotizing pancreatitis	>30	8
10	852880	33	F	Dif pain ab	AP	g b stones	92	120/70	713	8.2	377	Edematous pancreatitis	0	4
11	869008	33	M	Ep r to b	AP	alcoholism	120	110/70	425	10.2	1106	Focal pancreatic enlargement	0	4
12	873166	26	M	Ep, N, V	AP	alcoholism	80	120/80	44	7	53	Necrotizing pancreatitis	>30	8
13	873536	46	M	N, V	AP	alcoholism	88	100/70	22	7.6	21	Necrotizing pancreatitis	<30	6
14	876652	26	M	Ep r to b	AP	alcoholism	76	130/80	260	7	268	Peri-pancreatic fluid collection	<30	6
15	877448	48	M	Ep, N	AP	alcoholism	88	140/90	1378	7	2481	Necrotizing pancreatitis	>30	8
16	877603	31	M	N, V	AP	pancreatic duct calculus	100	130/70	897	4.7	765	Necrotizing pancreatitis	>30	10
17	880256	66	M	Ep, N, V	AP	alcoholism	110	140/90	240	7.7	333	Peri-pancreatic fluid collection	<30	6
18	881650	32	M	Dif pain ab	AP	alcoholism	68	100/70	540	9.9	1896	Focal pancreatic enlargement	0	2
19	887754	33	M	Dif pain ab	AP	alcoholism	88	130/70	449	9.9	813	Diffuse pancreatic enlargement	<30	4
20	888660	49	M	N, V	AP	alcoholism	84	120/80	1430	8.2	2369	Edematous pancreatitis	>30	6
21	894121	40	M	Dif pain ab	AP	alcoholism	78	100/70	1072	9	1404	Edematous pancreatitis	<30	4
22	924534	60	M	N, V	AP	g b stones	74	100/70	796	7.1	1180	Necrotizing pancreatitis	>30	8
23	919653	36	M	Ep, N, V	AP	alcoholism	84	110/70	742	7.6	950	Necrotizing pancreatitis	<30	6

24	921017	45	M	Dif pain ab	AP	alcoholism	92	110/70	925	8	669	Necrotizing pancreatitis	<30	6
25	922372	56	F	N, V	AP	g b stones	120	100/70	486	6.4	800	Necrotizing pancreatitis	<30	8
26	922389	38	M	Ep, N, V	AP	pancreatic duct calculus	78	90/60	960	7.9	1838	Necrotizing pancreatitis	<30	8
27	922888	68	F	N, V	AP	g b stones	96	90/50	1120	8.1	1270	Peri-pancreatic fluid collection	<30	6
28	924718	32	M	Dif pain ab	AP	alcoholism	68	100/60	1403	7.6	1989	Necrotizing pancreatitis	<30	8
29	926271	18	M	N, V	AP	g b stones	74	100/60	1133	9.5	1812	Edematous pancreatitis	0	4
30	931247	26	M	Ep, N, V	AP	alcoholism	102	120/80	1250	8.2	1462	Edematous pancreatitis	<30	6
31	933975	45	M	Dif pain ab	AP	alcoholism	100	110/70	4657	6.8	1663	Necrotizing pancreatitis	<30	10
32	935187	61	M	N, V	AP	alcoholism	98	140/80	301	7.8	354	Diffuse pancreatic enlargement	0	4
33	937218	23	M	Ep, N, V	AP	g b stones	78	110/70	467	8.6	842	Edematous pancreatitis	0	4
34	938419	40	M	Dif pain ab	AP	alcoholism	108	100/70	1037	7.6	1095	Edematous pancreatitis	<30	6
35	853567	35	M	Ep r to b	AP	alcoholism	94	90/60	169	8.5	214	Diffuse pancreatic enlargement	0	4
36	852880	33	F	N, V	AP	g b stones	110	130/70	713	8.2	377	Diffuse pancreatic enlargement	0	4
37	887754	33	M	Dif pain ab	AP	alcoholism	78	110/70	449	9.9	819	Diffuse pancreatic enlargement	0	4
38	886335	21	M	N, V	AP	g b stones	84	100/70	2125	9.7	2240	Diffuse pancreatic enlargement	0	4
39	889345	22	M	Dif pain ab	AP	g b stones	95	110/70	5118	8.9	2262	Edematous pancreatitis	<30	6
40	892670	36	M	Dif pain ab	AP	alcoholism	128	120/80	320	7.6	380	Necrotizing pancreatitis	<30	6
41	892858	57	M	Ep r to b	AP	alcoholism	94	150/90	849	8.4	810	Edematous pancreatitis	0	4
42	893199	69	M	N, V	AP	alcoholism	82	120/90	337	8.4	484	Necrotizing pancreatitis	<30	6
43	895320	26	M	Dif pain ab	AP	alcoholism	80	120/80	371	7.9	332	Edematous pancreatitis	0	4
44	903401	42	M	Ep r to b	AP	alcoholism	90	150/90	237	9.9	192	Diffuse pancreatic enlargement	0	4
45	933185	75	M	N, V	AP	pancreatic duct calculus	74	110/70	168	8	293	Diffuse pancreatic enlargement	0	4
46	934348	30	M	Dif pain ab	AP	alcoholism	80	110/70	909	8.9	962	Peri-pancreatic fluid collection	0	2
47	935457	28	M	N, V	AP	alcoholism	110	130/70	668	8	569	Diffuse pancreatic enlargement	0	4
48	899368	54	M	Ep, N, V	AP	alcoholism	106	120/80	1030	6.3	1293	Necrotizing pancreatitis	>30	8
49	905462	39	M	Dif pain ab	AP	alcoholism	90	120/80	479	8	1003	Edematous pancreatitis	0	4
50	907217	29	M	N, V	AP	alcoholism	74	90/60	612	9.8	1445	Focal pancreatic enlargement	0	4

51	910871	18	M	Ep r to b	AP	g b stones	106	100/70	677	11.1	523	Peri-pancreatic fat stranding	0	2
52	920467	46	M	Ep, N, V	AP	alcoholism	118	90/50	270	7.6	283	Necrotizing pancreatitis	<30	4
53	896784	60	M	Dif pain ab	AP	pancreatic duct calculus	80	120/80	498	8.2	141	Peri-pancreatic fat stranding	0	2
54	898145	62	M	Ep r to b	AP	alcoholism	88	120/80	2702	9.1	1475	Focal pancreatic enlargement	0	4
55	898935	34	M	Ep r to b	AP	alcoholism	78	130/70	531	6.8	5909	Necrotizing pancreatitis	>30	8
56	900575	30	M	Dif pain ab	AP	alcoholism	95	120/80	461	7.5	420	Edematous pancreatitis	0	4
57	903475	34	M	N, V	AP	alcoholism	74	150/90	511	7.3	591	Edematous pancreatitis	0	4
58	903556	28	M	Ep, N, V	AP	alcoholism	80	120/80	388	9.3	332	Peri-pancreatic fat stranding	0	2
59	904593	24	M	Dif pain ab	AP	g b stones	108	90/50	530	7.2	1447	Edematous pancreatitis	<30	6
60	906655	23	M	N, V	AP	g b stones	78	100/70	230	8.7	457	Peri-pancreatic fat stranding	0	2
61	907144	30	M	Ep, N, V	AP	alcoholism	98	120/80	320	7.5	361	Necrotizing pancreatitis	0	4
62	831715	27	M	Dif pain ab	AP	g b stones	110	130/70	149	7.4	243	Necrotizing pancreatitis	<30	6
63	910608	58	M	N, V	AP	alcoholism	80	130/70	2182	7.8	2760	Necrotizing pancreatitis	<30	6
64	921021	29	M	Dif pain ab	AP	alcoholism	78	120/80	539	8.1	764	Peri-pancreatic fat stranding	0	2
65	920917	50	M	Ep r to b	AP	alcoholism	82	110/70	799	8.2	875	Focal pancreatic enlargement	0	4
66	825068	38	M	Ep, N, V	AP	alcoholism	92	100/70	619	8.4	897	Peri-pancreatic fat stranding	0	2
67	917150	22	F	Dif pain ab	AP	g b stones	98	120/80	520	9.2	959	Focal pancreatic enlargement	0	4
68	917178	32	M	Ep r to b	AP	alcoholism	104	120/80	920	9.7	1275	Diffuse pancreatic enlargement	0	4
69	859901	34	M	Ep, N, V	AP	alcoholism	89	150/90	173	9	281	Edematous pancreatitis	0	4
70	915960	34	M	Dif pain ab	AP	alcoholism	70	140/90	906	10.1	1857	Edematous pancreatitis	0	4
71	915461	20	M	Ep r to b	AP	pancreatic duct calculus	96	120/80	793	9.5	1133	Peri-pancreatic fat stranding	0	2
72	912837	37	M	Dif pain ab	AP	alcoholism	110	140/90	329	8.5	525	Edematous pancreatitis	0	4
73	911849	28	M	Ep r to b	AP	alcoholism	94	120/80	50	9.1	130	Peri-pancreatic fat stranding	0	2
74	909192	28	F	Dif pain ab	AP	g b stones	128	100/70	188	9.5	207	Diffuse pancreatic enlargement	0	4
75	909189	35	F	Ep, N, V	AP	g b stones	79	120/80	1366	4.7	1756	Necrotizing pancreatitis	>30	10
76	909201	30	M	N, V	AP	alcoholism	108	90/50	520	9.7	1256	Edematous pancreatitis	0	2
77	813067	30	M	Dif pain ab	AP	alcoholism	98	100/70	520	9.7	1256	Edematous pancreatitis	0	4

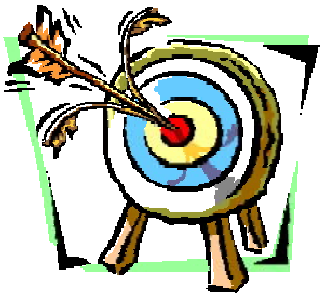
78	849116	69	M	N, V	AP	pancreatic duct calculus	80	140/90	1059	5.9	514	Necrotizing pancreatitis	>30	10
79	848538	73	M	Dif pain ab	AP	pancreatic duct calculus	72	120/80	820	7.8	1616	Edematous pancreatitis	>30	6
80	842602	30	M	Dif pain ab	AP	alcoholism	104	90/50	985	8	1689	Edematous pancreatitis	0	4
81	841174	38	M	N, V	AP	alcoholism	76	100/70	617	8.6	567	Edematous pancreatitis	0	2
82	833423	20	F	Ep r to b	AP	g b stones	100	90/60	796	8.8	1621	Edematous pancreatitis	0	2
83	839727	44	M	Dif pain ab	AP	alcoholism	98	100/70	644	7.8	304	Diffuse pancreatic enlargement	0	4
84	834213	31	M	Dif pain ab	AP	alcoholism	92	100/70	887	8.8	433	Diffuse pancreatic enlargement	0	2
85	908243	49	F	Ep r to b	AP	g b stones	94	100/70	982	7.6	1948	Necrotizing pancreatitis	<30	4
86	928989	34	M	Ep, N, V	AP	alcoholism	76	120/80	1102	9.3	1894	Diffuse pancreatic enlargement	0	2
87	900575	30	M	Dif pain ab	AP	alcoholism	82	110/70	120	7.5	167	Edematous pancreatitis	0	4
88	943308	33	M	Ep, N, V	AP	alcoholism	70	140/90	643	8.9	997	Edematous pancreatitis	0	2
89	942634	35	M	Ep, N, V	AP	alcoholism	92	130/70	449	9.2	813	Diffuse pancreatic enlargement	0	2
90	943184	65	F	Dif pain ab	AP	g b stones	98	100/70	1374	7.4	1316	Necrotizing pancreatitis	<30	6
91	946386	33	M	Ep, N, V	AP	alcoholism	88	100/70	569	9.9	1151	Diffuse pancreatic enlargement	0	2
92	948836	26	M	Dif pain ab	AP	alcoholism	76	120/80	480	8.3	617	Edematous pancreatitis	0	4
93	942194	54	M	Ep r to b	AP	alcoholism	84	120/80	549	8.2	1121	Edematous pancreatitis	0	4
94	941989	45	M	Ep r to b	AP	alcoholism	108	90/60	93	5.9	86	Necrotizing pancreatitis	>30	10
95	940211	35	M	Ep r to b	AP	alcoholism	92	100/70	168	8	24	Diffuse pancreatic enlargement	0	4
96	938080	73	M	Ep, N, V	AP	pancreatic duct calculus	98	100/70	223	8	286	Diffuse pancreatic enlargement	0	4
97	949181	28	F	Dif pain ab	AP	g b stones	100	90/60	1559	7	2383	Necrotizing pancreatitis	>30	8
98	948599	34	M	Ep, N	AP	alcoholism	72	100/70	299	8.7	241	Diffuse pancreatic enlargement	0	2
99	951004	47	M	Ep, N, V	AP	alcoholism	108	90/50	356	7.6	714	Edematous pancreatitis	0	4
100	950510	48	M	Dif pain ab	AP	alcoholism	86	120/80	90	7.7	143	Edematous pancreatitis	0	4

ANNEXURE-V

KEY TO MASTER CHART

	Sex:	
1	M	Male
2	F	Female
	Complaints:	
3	Ep	Epigastric pain
4	Dif pain ab	Diffuse pain abdomen
5	N	Nausea
6	V	Vomiting
7	Ep r to b	Epigastric pain radiating to back
	Diagnosis	
8	AP	Acute pancreatitis
	Etiology	
9	g b stones	Gall bladder stones
	Examination:	
10	PR	Pulse rate
11	BP	Blood Pressure
	Investigations:	
12	CT	Computed Tomography
	Scoring:	
13	CTSI	Computed Tomography Severity Index

Introduction



Objectives

Review of Literature

Methodology

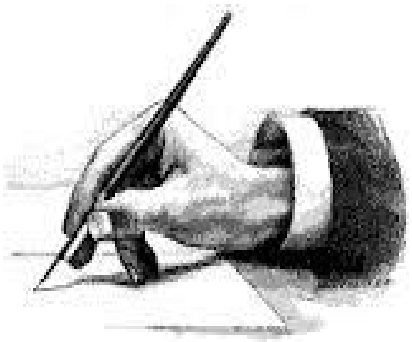
Results

Discussion

Conclusion

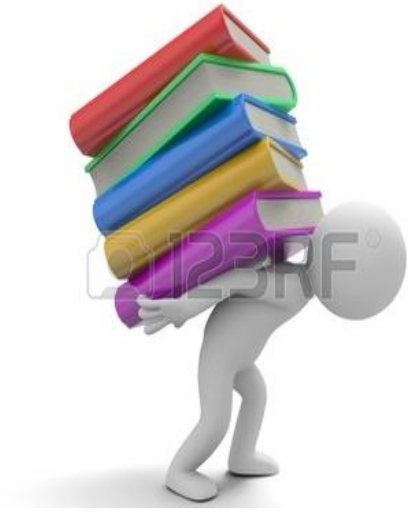
Summary

Bibliography



Annexure-I

Annexure-II



Annexure-III

Annexure-IV

Annexure-V