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Research article

An observational study on incidence of acute pancreatitis in different age groups and associated risk factors

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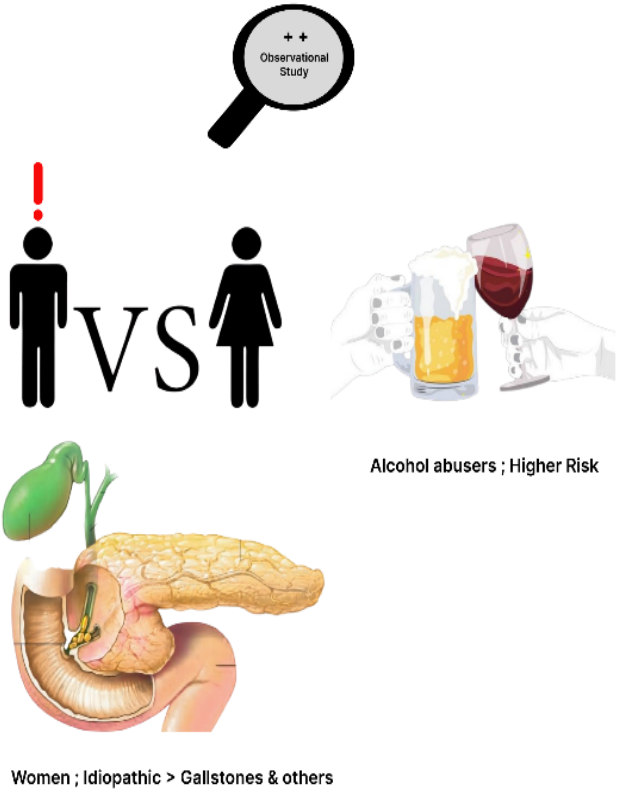
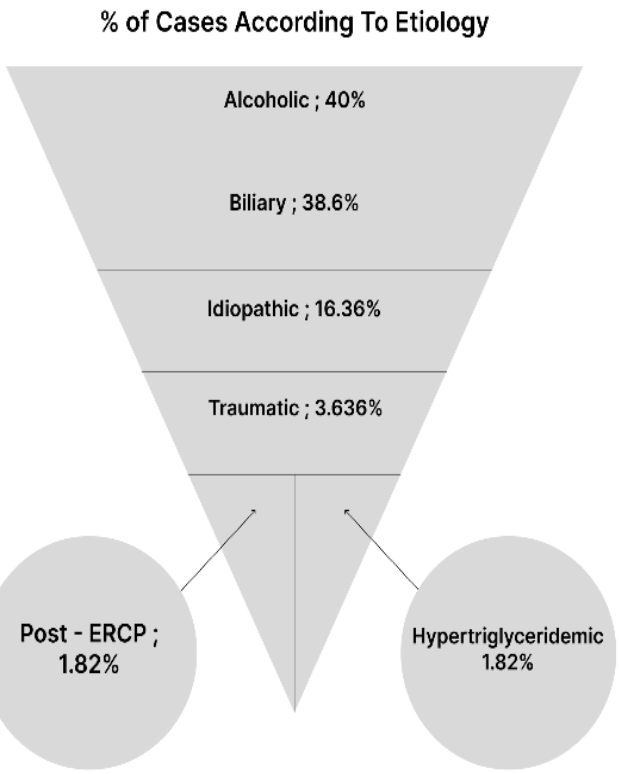
ABSTRACT

About 275,000 occurrences of acute pancreatitis (AP), an inflammatory disease of the pancreas, were recorded in the US in 2009. AP frequently results in hospitalization. It has a 1-5% mortality rate and can be caused by a variety of factors, with gallstones and excessive alcohol usage accounting for 70–80% of cases. Pancreatic hyperstimulation and bile duct obstruction are the causes of biliary pancreatitis, which is more frequent in women. Both chronic and acute pancreatitis are made more likely by alcohol use, with long-term alcohol use making the pancreas more sensitive to other variables such as smoking or high-fat diets.





Significant risk factors include obesity and hypertriglyceridemia; around 10% of instances of acute pancreatitis are caused by elevated triglyceride levels, which may harm pancreatic cells. Post-procedure pancreatitis can also result from endoscopic procedures such as endoscopic retrograde cholangiopancreatography (ERCP). Despite being uncommon, drug-induced pancreatitis affects 0.1–2% of people and has a significant fatality rate, particularly in severe cases. This illness is frequently underreported and underdiagnosed, especially in older adults who take several drugs.

Understanding of the biological processes behind pancreatitis, especially the activation of digestive enzymes, has improved due to recent developments in molecular biology. The illness is still complicated, though, and a number of risk factors influence its onset and course.

Keywords: Acetazolamide, Congestive heart failure (CHF), Comorbidities, Cardiac function, MLHFQ Questionnaire.

INTRODUCTION

Acute pancreatitis (AP) is an acute inflammation of pancreas that may or may not affect distant organ systems or surrounding tissues. This illness can range in severity from minor and self-limiting to life-threatening [1]. It is a prevalent exocrine pancreatic inflammatory illness that has a 1-5% fatality rate and produces excruciating abdominal pain along with numerous organ dysfunction that can result in pancreatic necrosis and chronic organ failure [2].

AP is the most common gastrointestinal cause of hospital admissions in the United States, accounting for around 275,000 hospitalizations in 2009 (a more than two-fold increase since 1988) [3]. Because of its severe early and long-term effects, one kind of acute pancreatitis is a dangerous illness that cannot be regarded as self-limiting [2].

In 80% of cases, acute pancreatitis resolves without major consequences, but in up to 20% of cases, it can result in morbidity and death. It is a condition with several underlying causes, a complicated pathophysiology that is still poorly understood, and frequently with unpredictable results [4]. Age's impact on the death rate of 268 acute pancreatitis patients was investigated. For patients under the age of fifty, the hospital death rate was 5·9%. In patients over 75, the percentage rose to 21.3 % [5]. With 10 to 15 instances per 100,000 children, the incidence among youths is not far behind [2].

Etiology & Risk Factors

Pancreatitis is pancreatic inflammatory disease of that is typically brought on by starting factors such as gallstones and excessive alcohol usage rather than infectious pathogens. The development and progression of the illness may be triggered or impacted by intricate gene-environment interactions [6].Acute pancreatitis' etiology and pathogenesis have been the subject of extensive research for centuries all throughout the world. Although there are several known acute pancreatitis causes, pathogenetic ideas remain debatable [7]. Gallstones and alcohol addiction account for 70–80% of occurrences of acute pancreatitis [4].

Gallstones

The biliary etiology of pancreatitis is more frequent in women than in males, as evidenced by cross-sectional studies of individuals with the condition, which shows just 15% of males and 50% of females had gallbladder stones. Gallstones can affect up to 20% of adults [6, 8]. Gallstones affecting the distal common bile-pancreatic duct are the most common cause of acute pancreatitis. Most researchers agree that bile-pancreatic duct blockage and pancreatic hyper stimulation, which raise pancreatic duct pressure and active trypsin reflux, are the primary causes of acute biliary pancreatitis [7]. The blockage of the pancreatic tube's outflow due to gallstones that become lodged at the duodenal papilla causes acute pancreatitis. Although this occasionally only temporarily raises pancreatic pressure, it causes acinar cell damage and marks the onset of the disease [6].

Alcohol

Use has been connected to a number of human illness conditions. The most frequent acute pancreatitis cause after gallstones, is alcohol [6]. Pancreatitis brought on by alcohol is among the most well-known and researched conditions. Drinking alcohol over time increases the likelihood of developing chronic pancreatitis [9]. Although individual variances must be taken into account, it was hypothesized that ingestion of 50–80 g, or 4–7 drinks per day, might harm the gland when consumed. Despite evidence linking alcohol to pancreatitis, only a small percentage of drinkers experience acute or chronic cases, suggesting alcohol makes pancreas more sensitive to co-factors like high-lipid diets and tobacco smoke [6]. Recent developments in cell biology and molecular approaches have allowed us to address the intracellular events involved in the activation of digestive enzymes, which were previously thought unachievable [10].

Obesity

Hyperlipidemia

Obesity increases the risk of negative outcomes in acute critical diseases like burns, trauma, and pancreatitis. Obese individuals with larger adipocyte volumes experience more pancreatic necrosis and organ failure. High triglycerides cause 10% of acute pancreatitis cases [11, 6].

Hypertriglyceridemia

Hypertriglyceridemia is a risk factor for acute pancreatitis, resulting from elevated triglyceride levels. Severe hypertriglyceridemia increases the risk of ischemic stroke and acute pancreatitis, with lipid levels above 5 mmol/L linked to a 10-fold increase in the likelihood of developing the condition [12].

Other Risks

Endoscopic procedures

Endoscopic retrograde cholangiopancreatography (ERCP) is a common procedure for pancreatic and biliary tract issues. However,

acute pancreatitis following ERCP is rare and severe, influenced by patient factors, operator experience, and procedural aspects [6].

Drug induced AP

Acute pancreatitis in the US causes up to 230,000 hospital admissions annually, with severe cases exceeding 30%. Drugs cause 0.1% to 2% of cases, with most mild to moderate episodes. Management involves removing the offending substance and providing supportive care, while keeping drugs with strong evidence linked to pancreatitis [13]. Acute pancreatitis caused by medication is rare, with a growing proportion going unreported due to older population polypharmacy. Pathos mechanisms include sphincter spasm, cytotoxic effects, hypersensitivity reactions, and localized angioedema. Common medications linked to acute pancreatitis include angiotensin-converting enzyme, statins, diuretics, HIV, valproic acid, oral contraceptives, and hormone replacement therapy. A recent study found similar associations in patients with inflammatory bowel disease [4].

Trauma

In Germany, 20% of polytraumatized patients have abdominal trauma, with blunt force trauma accounting for 95% of cases. Pancreatic injury is rare (6%), affecting parenchymatous organs like liver and spleen. Severe damage can lead to pancreatitis, fissures, lacerations, and detached ducts. High mortality rate [6].

Smoking

Smoking increases pancreatic cancer and chronic pancreatitis risk, but its impact on AP risk remains unknown, with mixed results from previous research [14]. Cigarette smoke contains nicotine and NNK metabolites, potentially affecting pancreatic microvasculature, zymogen secretion, and acinar cells, potentially leading to CFTR malfunction and ductal secretion [15].

Genetic factors

The understanding of disorders like pancreatitis has evolved due to genetic risk factors and modifying factors, and the fact that only a small percentage of patients consume alcohol. Six pancreas-targeting factors, including CTRC, CASR, PRSS1, PRSS2, and CFTR, are linked to increased susceptibility to pancreatitis [16].

Hypocalcemia

In acute pancreatitis cases, hypocalcemia is frequently observed. Along with cardiovascular symptoms, severe hypocalcemia can also cause neurological symptoms. Parenteral calcium infusion for hypocalcemia correction is still debatable since intracellular calcium excess is the primary cause of acinar cell damage in pancreatitis. This article discusses the science and art of calcium correction for patients with pancreatitis [17].

Infection

The pancreas is infected by Coxsackie virus type B (CVB), which results in cellular infiltration and exocrine tissue death. Acute pancreatitis risk is increased by viral hepatitis and mumps, whereas viral tropism targets acinar cells [18]. Acute Recurrent Pancreatitis (ARP) is a condition diagnosed using a comprehensive clinical history, abdominal trauma, systemic disorders, infections, alcoholism, medication use, blood calcium, triglyceride levels, liver enzymes, autoantibodies, and abdominal ultrasonography, with Helminth infestation being a prevalent cause in developing nations [19].

Pancreatic divisum

Pancreatic divisum is a developmental disorder affecting 4-14% of individuals, resulting in recurrent pancreatitis and chronic pancreatitis. Insufficient pancreatic secretion drainage causes 5% of patients to develop acute pancreatitis, while 95% have no symptoms [20, 21].

Vascular ischemia

The pancreas is vulnerable to ischemia/reperfusion damage, leading to acute pancreatitis. Factors contributing to this include oxygen free radicals, leukocyte activation, cellular acidosis, microvascular perfusion failure, and intracellular homeostasis disruption. Diagnosing ischemia pancreatitis is challenging, especially postoperatively, and is managed similarly to other acute pancreatitis [22].

Pathophysiology

Acute pancreatitis is a severe condition characterized by loss of intracellular and extracellular compartmentation, obstruction of pancreatic transport, and activation of pancreatic enzymes. It is caused by outflow obstruction, bile salts, alcohol, and alterations in plasma membranes. The disease progresses through interstitial edema, inflammatory infiltration, accumulation of polymorphonuclear granulocytes, and leukocyte enzyme release, leading to systemic complications [23].

Clinical Presentations

Symptoms

Acute pancreatitis is primarily characterized by abdominal discomfort, often in the epigastrium, with moderate to severe pain. It can spread to the lower abdomen, shoulders, chest, and flanks, and is consistent, dull, and non-colicky [24]. While the pain associated with pancreatitis caused by alcohol, metabolism, and genetics is poorly localized and less abrupt in onset, gallstone pancreatitis is typified by sudden, acute pain [25]. Usually, pain is linked to nausea and vomiting [24, 26].Some individuals have vomiting and distension in their abdomens due to localized or widespread paralytic ileus [24].

Signs

Physical examinations for AP can reveal respiratory distress, fever, hypotension, guarding, and intense stomach pain. Patients may exhibit restlessness and knee-chest positions to alleviate pain. Necrotic pancreatitis can cause exudates from the falciform ligament, causing retroperitoneum bruises in the penis. These symptoms indicate severe pancreatitis with a 37% fatality probability [27].

Laboratory Investigations/ Diagnosis

Elevated lipase and amylase levels are crucial diagnostic markers for pancreatitis, but their degree cannot predict pancreatitis severity. The optimal laboratory test for determining AP severity is still being sought.

Tests for Diagnosis of Pancreatitis

Amylase is the most common laboratory test for AP diagnosis, used in both serum and urine. A cutoff point three times higher than normal Somogyi Units (60-160 SU/100 mL in serum) or International Units (110-300 IU/L in serum)] is recommended for diagnosis. A CT scan can confirm AP diagnosis if severe abdominal discomfort and normal lipase and amylase levels are present. Urine amylase testing is used to rule out macroamylasemia, but normal results do not rule out pancreatitis [28, 29, 30, and 26].

Lipase

Amylase and lipase are regarded as the initial laboratory tests for the diagnosis of AP[31].After pancreatitis begins, lipase increases 4–8 hours later, peaks 24 hours later, and returns to normal in 8–14 days [32]. Since lipase is more sensitive than amylase in cases of alcoholic pancreatitis and in patients who arrive 24 hours after the onset of pancreatitis, it is preferable [33]. Both lipase and amylase have comparable sensitivity and specificity within 24 hours after the beginning of symptoms [34]. Thus, there would be no benefit in doing both tests in such case. It plays no part in determining the extent of AP [26].

Imaging in AP

Abdominal ultrasound

Abdominal ultrasonography is the most popular imaging test for assessing pancreatitis due to its affordability, accessibility, and portability. It can detect gallstones with 95% sensitivity, but CT is more precise for pancreatic necrosis and inflammation [35, 36].

Endoscopic ultrasound (EUS)

Endoscopic ultrasound (EUS) offers higher spatial resolution and minimal invasiveness compared to CT and MRI scans, making it a crucial method for evaluating pancreatobiliary illness. EUS is useful in diagnosing suspected chronic pancreatitis and determining the acute pancreatitis causes, in addition to biliary pancreatitis with persistent choledocholithiasis [37].

CT-scan

The best imaging modality overall for the clinical therapy of acute pancreatitis is computed tomography (CT). It can identify adverse effects such bleeding, abscess and pseudocyst formation, and phlegmonous expansion outside the gland. Dynamic CT scanning can be used to diagnose pancreatic necrosis following an iodinated contrast media bolus injection. When necessary, the information acquired can be applied to guide therapeutic therapy and give anatomic detail for surgical intervention or percutaneous aspiration and drainage [38].

Prognosis

Early evaluation and risk stratification are crucial for distinguishing mild and severe acute pancreatitis patients, with scoring systems predicting severity, with recent research examining their predictive powers [39].The Ranson criteria [40], the Acute Physiology and Chronic Health Evaluation (APACHE II) scale [39], the CT Severity Index (CTSI) score [39] and BISAP score [41] are highly used in prognoses of AP.

Treatment/Plan

Having acute pancreatitis is a prevalent gastroenterology illness, with 10-46 cases per 100,000 people. Improved diagnostic test sensitivity has increased incidence, but distinguishing between severe and mild cases is crucial. 80% of cases involve gallstone disease or excessive alcohol use [42,43]. Patients with acute pancreatitis should be admitted to the hospital and treated with basic medical care, such as pain medication, oxygen, IV fluid replacement, and fasting. Given the condition's unstable nature, the etiology and severity should be determined by imaging and blood tests, and the patient should be reassessed within 48 hours after admission. In case of severe acute pancreatitis (SAP), there are high chances of development of multiorgan failure and necrosis of pancreatic tissue. The necrosis could be sterile or infected which can be managed with surgical laparotomy along with prompt debridement and removal of damaged tissue. However, mortality was higher in people who received early surgery than in delayed or postponed ones. Early surgery might worsen the prognosis of SAP. People with SAP should get proper intensive care which is shown in detail in **Error! Reference source not found.**[43, 44].

Table 1: Principles of intensive monitoring and systemic support

Parameters
Invasive monitoring of vitals
Analgesics
Fluid resuscitation with monitoring of central venous pressure
Electrolyte solutions
Plasma expanders
Humidified O_2 administration
Catecholamine's (dobutamine, dopamine)
Early nutrition support
Early treatment of systemic complications
Mechanical ventilation with positive end-expiratory pressure
Catecholamines (epinephrine)
Hemofiltration, dialysis
Insulin & calcium substitution

METHODS

This was an observational prospective study conducted over 55 patients admitted in Ganni Subba Lakshmi general hospital (GSLGH), a tertiary care center, Rajanagaram over 6 months period (from October 2023 to February 10, 2024) to estimate the incidence and associated risk factors of acute pancreatitis in different age groups. Informed consent was taken from patients and study protocol followed all ethical guidelines.

In order to create research groups, all data pertaining to the risk factors associated with acute pancreatitis were analyzed. We presented the results as mean ± standard error. Utilizing SPPS and

Microsoft excel for Windows, a chi square test was used for statistical analysis. Less than 0.05 was considered a statistically significant p-value.

Study Criteria

Inpatients visiting to the department of general medicine (Gastroenterology) are included in the study by considering the following inclusion and exclusion criteria.

Inclusion Criteria

All the inpatients and outpatients visiting to the general medicine department of GSL General Hospital with acute pancreatitis condition are included.

All patients above 18 years of age of both sexes are included.

All the patients who were clinically diagnosed with acute pancreatitis are included.

All the patients with USG evidence of acute pancreatitis are included.

All the patients whose laboratory investigations shows elevated levels of serum amylase and serum lipase are included.

Exclusion Criteria

Patients who are not willing to participate in the study will be excluded.

Females who were pregnant and lactating mother will be excluded.

RESULTS

GENDER: This study was conducted over 55 cases; 45 patients were males and 10 patients were females. In our study males found to be more affected by acute pancreatitis than females (Table 2&

Graph *1*: Gender wise distribution

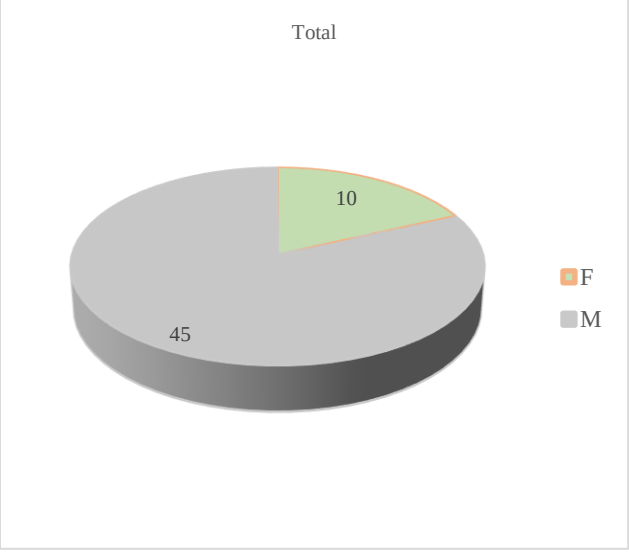


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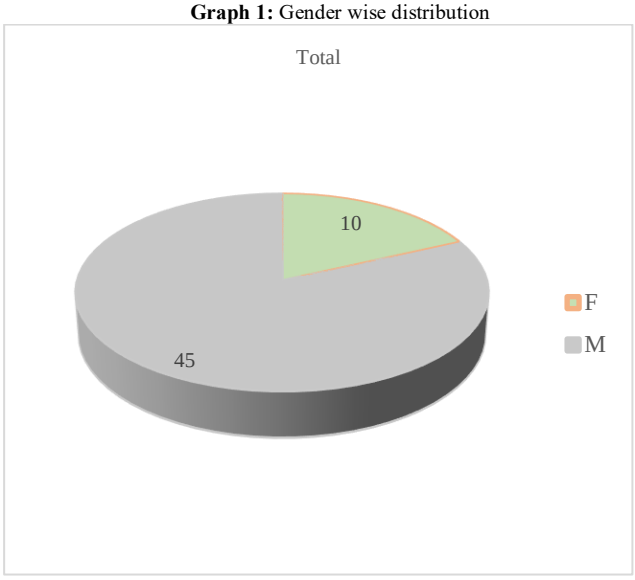
Table 2: Gender wise distribution

GENDER	NO OF PATIENTS(n=55)	%
Female	10	18
Male	45	82
Total	55	100

Graph 1: Gender wise distribution



Mean age of our study group (n=55) is 41.1 years. All the 55 patients were grouped in age of 18-29, 30-39, 40-49, 50-59, and >60 years. Maximum no of acute pancreatitis patients was in the age group of 18 - 29 years when compared with other age groups (Table 3 &

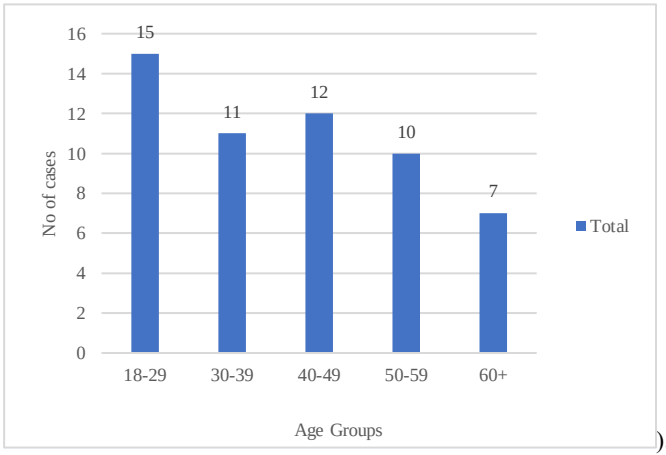


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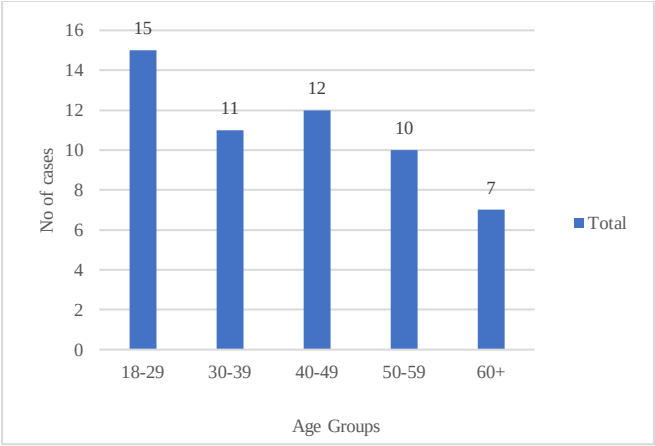
Table 3: Age wise distribution

Age Groups	No of patients (n=55)	%
18-29	15	27.27
30-39	11	20
40-49	12	21.81
50-59	10	18.18
>60	7	12.72
Grand Total	**55**	**100**

Graph 2 : Age wise distribution



Acute pancreatitis causes; most frequent cause of acute pancreatitis in this study is alcohol (40%), followed by biliary pancreatitis (Table 4).

Age wise distribution of causes of acute pancreatitis: Alcohol is the most common cause and it was highly observed in age group of 40-49 years (31.81%) followed by age group of 30-39 years (27.27%). Biliary pancreatitis was the second common cause in our study and it was mostly observed in age groups of 18-29 & 50-59 years (25%). 2 cases of Traumatic pancreatitis seen in 24- and 34-years men. 1 case of hypertriglyceridemia and post ERCP was observed (

Table 5).

Gender wise distribution of cause's acute pancreatitis: In males' alcohol was the leading cause seen in 49% males followed by biliary pancreatitis in 35% cases. 4 cases of idiopathic cause, 2 cases of traumatic pancreatitis and 1 case of hypertriglyceridemic pancreatitis was observed. In female's idiopathic pancreatitis was most commonly seen in 50% females followed by biliary pancreatitis in 40% cases 1 case of post ERCP pancreatitis was observed Table 6.

Table 4: Acute pancreatitis causes

Causes	No. of patients (n=55)	%
Alcohol	22	40
Biliary Pancreatitis	20	36.36
Idiopathic	9	16.36
Trauma	2	3.63
Hyper triglyceridemic Pancreatitis	1	1.81
Post-ERCP Pancreatitis	1	1.81

Table 5: Age wise distribution of acute pancreatitis causes

Causes	18-29	30-39	40-49	50-59	>60	Total
Alcoholic Pancreatitis	4	6	7	2	3	22
Biliary Pancreatitis	5	4	3	5	3	20
Idiopathic	3	1	2	2	1	9
Traumatic Pancreatitis	1	1	-	-	-	2
Hyper triglyceridemic Pancreatitis	1	-	-	-	-	1
Post-ERCP Pancreatitis	-	-	-	1	-	1

Table 6: gender wise distribution of acute pancreatitis causes

Causes	M	F
Alcoholic Pancreatitis	22	-
Biliary Pancreatitis	16	4
Idiopathic	4	5
Traumatic Pancreatitis	2	-
Post-ERCP Pancreatitis	-	1
Hyper triglyceridemic Pancreatitis	1	-

Table 7: Age wise distribution of according to exposed risk factors

Age groups	Alcohol	Smoking	Obesity/ Overweight	Hypertension	Diabetes mellitus	Gall Stones
18-29	8	6	7	1	1	4
30-39	9	7	6	2	3	5
40-49	10	6	9	1	2	3
50-59	6	6	9	6	5	5
60+	4	4	4	1	1	3
Total	37	29	35	11	12	20

Gender	MILD AP (N=37)	Moderate AP (N=13)	Severe AP (N=5)
Female	6	3	1
Male	31	10	4
Total	**37**	**13**	**5**

Age wise distribution of according to exposed risk factors: 40-49 age group (18%) people in this age group had high exposure to alcohol. 40-49 and 50-59 age group AP people had High BMI and overweight and obesity was observed in subjects in this age groups. Comorbidities like hypertension, diabetes mellitus and gall stones were high in 50-59 years age group (**Error! Reference source not found.**).

Gender wise distribution of mild, moderate, and severe acute pancreatitis cases as per CTSI score: as per CTSI score, 37 patients (67.27%) had acute mild pancreatitis, 13 patients (23.63%) were in moderate stage of pancreatitis, and 5 patients (9%) had severe pancreatitis in this study. Males were in majority in all forms of acute pancreatitis (Table 7).

Table 7: gender wise distribution of stages of acute pancreatitis according to CTSI score

Chi-square test between different age groups and risk factors at 0.05 significance level: When Pearsons chi-square test was performed between different age groups and exposed patient risk factors (n=55) in this study, risk factors like Hypertension and Diabetes Mellitus showed significant association (Table 8).

Table 8: Association between different age groups and risk factors

Risk factors	Significance level	Degrees of freedom	P value
Alcohol	0.05	4	0.77

Gall stones	0.05	4	0.62
Hypertension	0.05	4	0.01
Diabetes Mellitus	0.05	4	0.01
Overweight/ Obese	0.05	4	0.19
Smoking	0.05	4	0.19

DISCUSSION

This was prospective cohort study, conducted in GSL General Hospital, a tertiary care Centre in Rajanagaram, Rajahmundry, over a 6 months period to know the incidence of AP in different age groups and associated risk factors.

This was an observational study, involving 55 diagnosed cases of acute pancreatitis, which includes 45 (82%) male patients and 10 (12%) female patients. As per the study on 1068 patients in five European countries by Gullo et al the maximum incidence of acute pancreatitis was in males (64.8%), which was similar to our study [45].

In this study, the mean age of patients was 41.1 years. The maximum number of patients being in 18-29 years (27.27%) age group followed by age groups of 40-49 years (21.8%), 30-39 years (20%), 50-59 years (18.18%) and least number of patients were from above 60 years age group (12%). This disease appears more prevalent in 18-29 years followed by 40-49 years which was somehow in contrast to that of previous study conducted by Lankisch P et al which showed the maximum incidence of acute pancreatitis in the age group of 31-40 years, which was studied on 602 patients [46].

In this study alcohol consumption (alcoholic pancreatitis-40%) was the most common cause of AP followed by biliary pancreatitis (due to caliculi in gall bladder/CBD) - 38.6%, idiopathic pancreatitis-16.36%, traumatic pancreatitis-3.636%, hypertriglyceridemic pancreatitis-1.82% and post ERCP pancreatitis-1.82%. In the study conducted by Uomo G et al, biliary pancreatitis was responsible for higher prevalence of AP than alcoholic pancreatitis [47].

In males out of 45 patients, 37 patients (82.2%) were alcoholics, followed by 40% had gallstones in association with alcohol consumption as a comorbidity. In this study 4 cases were idiopathic pancreatitis; 2 cases were traumatic pancreatitis and 1 case of hypertriglyceridemic pancreatitis.

In females out of 10 patients 50% had Idiopathic pancreatitis, 40% of AP was caused by gall stones. A single case of post-ERCP pancreatitis was observed. In the study conducted by Yadav D et al. and Chang NC et al. biliary pancreatitis was more common when compared to idiopathic pancreatitis in females and alcoholic pancreatitis were more common in males mainly in middle aged groups which was similar to our study.

When chi square test of independence was performed between different age groups and their associated risk factors including social habits (alcohol consumption & smoking), BMI (obesity/overweight) and comorbid conditions like hypertension, diabetes mellitus & gall stones to check the association of AP with these factors, Hypertension (p=0.01) & Diabetes Mellitus (p=0.012) showed significant association suggesting both are contributing factors for the incidence of AP in different age groups.

CONCLUSION

Acute pancreatitis is an unexpected inflammation of Pancreas, which is a gastrointestinal emergency condition that requires prompt recognition of clinical signs and symptoms. Early diagnosis is required for better management. It commonly occurs in subjects with gallstones and those on alcohol consumption. Trauma and post-infectious states are other causes. We conducted a prospective cohort study in GSL General Hospital, a tertiary care centre, where males had a high prevalence of AP than females. Middle aged men consuming alcohol are at higher risk of acute pancreatitis. Patients with comorbid conditions such as hypertension and cholelithiasis/choledocholithiasis are also more susceptible to AP. The higher incidence of AP in this region can be attributed to frequent alcohol consumption followed by biliary stones as the next common condition.

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