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Original Research Article

Etiology of acute pancreatitis in Northeastern India, Sikkim

Karma Doma Bhutia[1], Sangey Chhophel Lamtha[2], Tsella Lachungpa[3]*

[1]Department of Intermediate Reference Laboratory, STNM Hospital, Gangtok, Sikkim, India
[2]Department of Gastroenterology, STNM Hospital, Gangtok, Sikkim, India
[3]Department of Radiodiagnosis, Sikkim Manipal Institute of Medical Sciences, Tadong, Gangtok, Sikkim, India

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***Correspondence:**
Dr. Tsella Lachungpa,
E-mail: tsellalachungpa@gmail.com

ABSTRACT

Background: Acute pancreatitis (AP) is an inflammatory disorder of the pancreas with diverse underlying causes that vary according to regional, demographic, and lifestyle-related factors. Limited epidemiological data are available from the Northeastern Himalayan belt of India. This study was undertaken to explore the causative factors of AP in patients admitted to a tertiary healthcare facility in Sikkim.
Methods: This prospective, hospital-based study was carried out over one year (February 2023 to January 2024) in the Department of Gastroenterology at Sir Thutop Namgyal Memorial Multispeciality Hospital, Sikkim. Fifty-one patients with a clinical diagnosis of AP, meeting the revised Atlanta criteria were included. Relevant clinical profiles, laboratory investigations, and imaging findings were analyzed to establish underlying etiologies.
Results: Of the 51 enrolled patients, two-thirds (66.7%) were male. The average age at diagnosis was 41.6 years. Alcohol consumption emerged as the leading cause (45.1%), followed by gallstone disease (31.4%). Other etiologies included idiopathic (11.8%), hypertriglyceridemia-related (7.8%), and drug-induced pancreatitis (3.9%). Males were predominantly affected by alcohol-related AP, whereas gallstone pancreatitis was more frequently seen in females. Most patients reported abdominal pain and vomiting as presenting complaints. The clinical course was relatively benign, with no mortality recorded.
Conclusions: Alcohol use and gallstones were the primary contributors to AP in this regional population, with clear gender-related trends. These results highlight the importance of developing targeted, locally relevant prevention strategies.

Keywords: Acute pancreatitis, Alcohol-induced, Gallstones, Hypertriglyceridemia, Regional epidemiology, Sikkim

INTRODUCTION

The clinical range of acute pancreatitis (AP), an acute inflammatory disease of the pancreas, is wide and includes mild episodes that resolve on their own to severe, potentially deadly conditions that include organ failure and systemic inflammation.[1] According to recent global data, the incidence of AP is still on the rise, with rates ranging from 13 to 45 cases per 100,000 people per year. A growing strain on healthcare systems as a result of problems and prolonged hospital stays coincides with this increase.[2] Despite the fact that Indian research has indicated an increasing trend in both urban and semi-urban areas, complete data from remote and rural areas, like Sikkim, is still lacking.[2]

Chronic alcohol use or biliary tract disorders are the most common causes of AP. About 35-45% of cases worldwide are caused by gallstones, whereas 30-35% are caused by alcohol.

Infections, autoimmune pancreatitis, trauma, adverse drug reactions, hypertriglyceridemia, and iatrogenic causes including post-endoscopic retrograde cholangio-pancreatography (ERCP) pancreatitis are some other causes.[3] Geographical location, cultural customs, dietary preferences, and genetic predisposition all have a substantial impact on the distribution and prevalence of various etiologies.[4] For instance, male communities in northern and Northeastern India are significantly more likely to suffer from alcohol-induced AP, which has been linked to greater rates of alcohol intake, particular hereditary markers, and delayed access to healthcare.[5]

The Northeastern part of India, including the state of Sikkim, is characterized by distinct ethnic groups with diverse dietary patterns, health-seeking behaviors, and genetic backgrounds. However, there is limited epidemiological literature on acute pancreatitis (AP) from this region.[6] Therefore, understanding the local etiological distribution of AP is essential for timely diagnosis, optimal clinical management, and for mitigating the risk of recurrence or progression to chronic pancreatitic.[7] Differentiating between alcohol-induced and biliary pancreatitis is not merely of academic interest, but has direct therapeutic implications. While biliary AP often necessitates surgical or endoscopic intervention, alcohol-related AP typically requires sustained deaddiction strategies and long-term counseling. A notable proportion of idiopathic cases may reflect unrecognized genetic or autoimmune forms of pancreatitis, underscoring the need for deeper diagnostic evaluation.[8]

This study was designed to assess the etiological spectrum of acute pancreatitis in Sikkim by analyzing 51 patients who presented to the Department of Gastroenterology at Sir Thutop Namgyal Memorial Multispeciality Hospital over a one-year period. Through evaluation of demographic factors and causative patterns, the study aims to provide regional data that may improve clinical decision-making and guide future preventive and healthcare resource strategies tailored to the northeastern Indian population.

METHODS

Study design and setting

This 12-month prospective, hospital-based observational study was conducted in the gastroenterology department at Sir Thutop Namgyal Memorial Multispeciality Hospital in Gangtok, Sikkim, from February 2023 to January 2024. The hospital serves patients from both urban centers and isolated, rural areas as the state's top tertiary referral center. Through a methodical assessment of clinical symptoms, laboratory testing, and radiological imaging, the study sought to determine the underlying causes of acute pancreatitis (AP) in patients who had been admitted.

Ethical approval

The Sir Thutop Namgyal Memorial Multispeciality Hospital's Institutional Ethics Committee gave its ethical approval to the research protocol before to its start. The study complied with the Declaration of Helsinki's ethical guidelines. Prior to any data collection or clinical evaluation, written informed consent was acquired from each study participant or their legal representatives.

Patient selection criteria

The study comprised all patients admitted with a confirmed diagnosis of acute pancreatitis who were at least 18 years old. The diagnosis met the updated Atlanta criteria, which called for a minimum of two of the following: acute onset of a persistent, severe, epigastric pain often radiating to the back; serum lipase or amylase levels that are higher than three times the upper limit of normal; and radiographic confirmation of pancreatitis using MRI, ultrasound, or contrast-enhanced CT (CECT).[9] Patients with incomplete medical records, recurring episodes, or chronic pancreatitis were not included. Fifty-one eligible patients were included after fulfilling the inclusion criteria.

Data collection

Demographic and clinical information was recorded using a standardized case proforma. Parameters included age, gender, residence, alcohol and tobacco usage, comorbid conditions, symptom onset, and laboratory results. Radiological assessments (USG and CECT) were used to evaluate gallstones, necrosis, and peripancreatic fluid. Each patient underwent a thorough etiological workup, which considered biliary pathology, alcohol intake, lipid levels, medication history, and other relevant factors.

Diagnostic and laboratory procedures

Biochemical analysis included measurements of serum amylase, lipase, liver enzymes, triglycerides, calcium, and renal function. Imaging evaluations were interpreted independently by radiologists not involved in clinical decision-making. Hypertriglyceridemia was defined by fasting serum triglyceride values of ≥1000 mg/dl at presentation.[10] Drug-induced pancreatitis was considered in patients with a relevant medication history and in whom other common causes were excluded, in accordance with established literature guidance.[11]

Etiological classification

The predominant identifiable factor was used to categorize the etiologies. When liver enzyme increase and gallstones or biliary sludge were detected by ultrasonography, gallstone-related AP was identified. Patients having a documented history of continuous alcohol consumption (defined as ≥40 g/day for men and ≥20 g/day for women) for at least five years, as well as the lack of other

contributing factors, were evaluated for alcoholic AP. Idiopathic cases were defined as those who, following a thorough evaluation that included metabolic and radiological screening, had no discernible cause.

Statistical analysis

Microsoft Excel was used to organize the gathered data, and SPSS software, Version 25.0 (IBM Corp., Armonk, NY, USA), was then used for analysis. The study population's clinical characteristics and demographic distribution were described using descriptive statistics. Continuous variables were shown as means with standard deviations (SD), whilst categorical data were reported as frequencies and percentages. The Chi-square test or Fisher's exact test, if appropriate, were used for statistical comparisons in order to evaluate relationships between etiology and categorical clinical or demographic data. Statistical significance was defined as a p value of less than 0.05.

RESULTS

Demographic profile

The male-to-female ratio among the 51 patients in the study was 2:1, with 34 (66.7%) being male and 17 (33.3%) being female. Patients ranged in age from 19 to 74 years old, with a mean age of 41.6±13.2 years at diagnosis. The age group of 31-50 years old had the highest concentration of cases (n=29; 56.9%), followed by the 18-30-year-old group (n=12; 23.5%) and the 51-70-year-old group (n=9; 17.6%). There was only one patient who was beyond 70. Gallstone disease was more common in female patients; however, a sizable percentage of male participants had a history of persistent alcohol use. Table 1 provides a comprehensive overview of demographic attributes.

Table 1: Demographic characteristics of patients with acute pancreatitis (n=51).

Characteristic	N (%)
Gender	
Male	34 (66.7)
Female	17 (33.3)
Age group (years)	
18-30	12 (23.5)
31-50	29 (56.9)
51-70	9 (17.6)
>70	1 (2.0)
Mean age (±SD)	41.6±13.2 years

Etiological spectrum

In this cohort, alcohol consumption emerged as the leading cause of acute pancreatitis, contributing to 23 of 51 cases (45.1%), with 20 males and 3 females affected. Gallstones were identified as the second most common cause (n=16; 31.4%), with a higher frequency among female patients (n=10). Six cases (11.8%) were classified as idiopathic after exhaustive evaluation. Hypertriglyceridemia was confirmed in 4 patients (7.8%), each with serum triglyceride levels above 1000 mg/dl. Drug-induced pancreatitis occurred in two patients (3.9%), both of whom had a history of long-term azathioprine use for underlying autoimmune conditions. A comprehensive breakdown of etiological categories is provided in Table 2 and visually represented in Figure 1.

Table 2: etiological spectrum of acute pancreatitis.

Etiology	N (%)
Alcohol	23 (45.1)
Gallstones	16 (31.4)
Idiopathic	6 (11.8)
Hypertriglyceridemia	4 (7.8)
Drug-induced	2 (3.9)

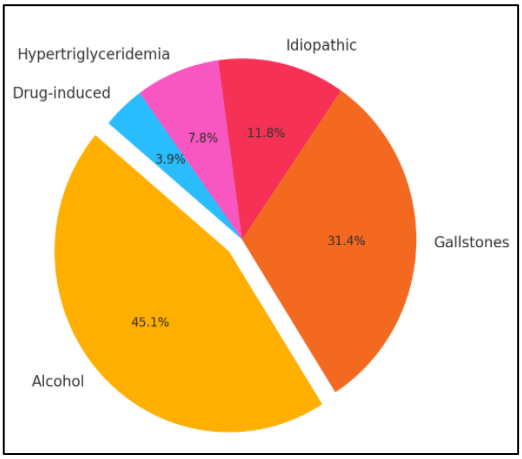

Figure 1: Etiological distribution of acute pancreatitis (n=51).

Gender-wise etiological trends

The gender-specific analysis of etiologies revealed a clear trend: alcohol-related AP was significantly more prevalent in males (58.8% of male patients), whereas gallstone-induced AP was predominant among females (58.8% of female patients). Hypertriglyceridemia and idiopathic causes were more evenly distributed across both genders. This trend is summarized in Table 3.

Table 3: Gender-wise distribution of etiological factors.

Etiology	Male (n=34)	Female (n=17)
Alcohol	20 (58.8)	3 (17.6)
Gallstones	6 (17.6)	10 (58.8)
Idiopathic	4 (11.8)	2 (11.8)
Hypertriglyceridemia	3 (8.8)	1 (5.9)
Drug-induced	1 (2.9)	1 (5.9)

Clinical presentation

All 51 patients (100%) presented with characteristic epigastric or upper abdominal discomfort, frequently extending to the back. Vomiting was the second most commonly reported symptom and was present in 39 individuals (76.5%). Additional manifestations included fever in 15 patients (29.4%), abdominal bloating in 6 (11.7%), and jaundice in 3 (5.8%). The mean duration between onset of symptoms and hospital admission was 2.8±1.9 days.

Biochemical parameters

Serum levels of both amylase and lipase were elevated in all cases. The average serum amylase concentration was 679±312 IU/l, while the mean lipase level reached 821±378 IU/l. Gallstone-associated pancreatitis was linked with higher lipase values in comparison to alcohol-related and idiopathic cases. Triglyceride levels were significantly raised in four patients, each surpassing 1000 mg/dl, confirming hypertriglyceridemia as the underlying cause. Liver enzyme assays revealed mild increases in bilirubin and alkaline phosphatase among individuals diagnosed with biliary pancreatitis. Laboratory findings for the entire cohort are detailed in Table 4.

Table 4: Laboratory and imaging findings in acute pancreatitis.

Parameter	Value/observation
Mean serum amylase (IU/l)	679±312
Mean serum lipase (IU/l)	821±378
Patients with triglycerides >1000 mg/dl	4 (7.8%)
Elevated LFTs in gallstone AP	12 (75% of gallstone cases)
CECT performed	39 (76.5%)
Pancreatic edema on imaging	28 (54.9%)
Peripancreatic fluid collections	11 (21.6%)
Pancreatic necrosis	6 (11.8%)
Pseudocyst formation	2 (3.9%)

Imaging and morphological findings

All patients underwent initial abdominal ultrasonography. Cholelithiasis or biliary sludge was confirmed in all cases of gallstone pancreatitis. A total of 39 patients (76.5%) underwent contrast-enhanced CT (CECT) abdomen. Among these, pancreatic edema was seen in 28 patients (54.9%), peripancreatic fluid collections in 11 patients (21.6%), and necrosis in 6 patients (11.8%). Pancreatic pseudocysts were noted in two patients, both with alcoholic pancreatitis, and required subsequent endoscopic drainage. No vascular complications such as pseudoaneurysms or thrombosis were noted.

Severity and outcomes

Most of the individuals in this study were classified as having mild to moderately severe acute pancreatitis based on the updated Atlanta classification. Six individuals (11.8%) experienced localized problems that required prolonged hospital admissions. Crucially, during the research period, no cases of in-hospital mortality were noted. Hospitalization lasted an average of 6.4±3.2 days. Hospital stays were noticeably longer for patients with pancreatitis brought on by alcohol and hypertriglyceridemia.

DISCUSSION

This study offers valuable insight into the etiological landscape of acute pancreatitis in Sikkim, a northeastern Indian state marked by distinctive demographic and cultural features. Among the 51 patients included, alcohol consumption was the most common cause, followed by gallstones. This pattern reflects findings from other Indian regions but also highlights regional gender-specific trends and risk profile.[12] Alcohol-induced acute pancreatitis (45.1%) was predominant in our cohort, in line with patterns seen across northern and northeastern India, where alcohol use remains prevalent, particularly among male.[13] Similar findings from multicentric studies have shown that over 40% of male patients with AP in India suffer from alcohol-related disease.[14] This underscores the urgent need for community-based alcohol cessation programs as a public health priority in such regions.

Gallstone-induced pancreatitis (31.4%) was the second most frequent etiology and showed a clear female predominance. This trend mirrors global data and Indian studies suggesting gallstones are a leading cause of AP in women.[15] Contributing factors may include local dietary habits rich in fats and carbohydrates, as well as possible genetic predispositions.[16] Hypertriglyceridemia accounted for 7.8% of cases, an emerging trend in urbanizing parts of India where metabolic syndrome, diabetes, and obesity are on the rise.[17] Drug-induced pancreatitis, although less common (3.9%), is a critical differential diagnosis, particularly in patients on long-term immunosuppressive therapies or chemotherapy.[11] The overall clinical course was relatively mild in our population. Only two patients developed pancreatic pseudocysts requiring intervention, and there were no reported deaths. These outcomes contrast with larger studies that report 10-20% complication or mortality rates, possibly indicating earlier presentation or a less severe disease phenotype in our cohort.[18]

Despite offering regionally relevant insights, this study has a few limitations. First, the relatively small sample size and single-center design may limit the generalizability of the findings to the broader northeastern Indian population. Third, long-term follow-up data were not included, which could have provided insight into recurrence or progression to chronic pancreatitis. Future multicentric studies with

larger cohorts and extended follow-up are recommended to validate and expand upon these findings.

In summary, alcohol and gallstones were the dominant causes of acute pancreatitis in this region, with gender-specific distributions. These findings stress the importance of locally tailored prevention strategies and healthcare planning. Additionally, the emergence of metabolic and drug-related causes points to the necessity for improved diagnostic capabilities and structured follow-up, particularly in resource-limited settings. This study helps bridge a significant gap in regional epidemiological data and may support clinicians in refining context-specific diagnostic and therapeutic protocols.

CONCLUSION

This study identifies alcohol and gallstones as the predominant causes of acute pancreatitis in Sikkim, with clear gender-based trends, alcoholism among males and gallstone disease among females. The emergence of metabolic and drug-induced cases highlights the need for broader diagnostic vigilance. These findings not only fill a crucial gap in regional epidemiology but also inform targeted preventive measures and public health strategies tailored to the local population. By contributing region-specific data, the study enhances understanding of AP in a distinct demographic setting and can serve as a foundation for future research and healthcare policy planning in northeastern India.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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