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Single Center Analysis of Epidemiology and Outcome of Pancreatitis

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1. Introduction

Acute pancreatitis (AP) is one of the most common indications for hospitalization and may potentially lead to fatal outcomes [1]. The clinical presentation often lies on a spectrum of severity from mild abdominal pain to severe shock and multiorgan failure. This variation in presentation often creates obstacles in diagnosis by clinicians and may lead to significant underdiagnosis [2]. These factors integrate to cause considerable variance in mortality and outcomes on a case-to-case basis [3]. Furthermore, there is a wide variety of possible etiologies for acute pancreatitis, which guide both acute management, short- and long-term outcomes, and prevention strategies [4].

With the increasing emphasis placed on high-value care, a clear epidemiological picture of the nature of pancreatitis within a chosen demographic would help guide the approach to management taken by physicians. Better, more efficient, and cost-effective approaches to diagnosis and treatment can be formulated when more observational data is available to us [5]. In the United Arab Emirates, a study was published in 1990 by Niazy A., Abou Farsakh identifying the incidence of AP to be 1 in 10,000. The most common etiology identified was biliary disease, accounting for more than half the cases [6].

However, with the increasing heterogeneity of factors such as diet, substance use, and immigration and ethnicity profiles within the region, considerable differences can be expected in our population now as compared to 30 years ago. More data is needed to better characterize the causes, management, and outcomes of AP in our region today.

With the aim of contributing to this ongoing issue, we retrospectively analyzed the causes, interventions for and outcomes of 324 cases of AP in a single center in Sharjah, United Arab Emirates.

2. Methodology

2.1. Study Population

This is a cross-sectional, single-center study in which we retrospectively studied the hospitalization and admission course for 324 patients treated for acute pancreatitis from 3rd January 2019 to 29th January 2022. The criteria for diagnosis of pancreatitis were 2 of the following: (1) new onset upper abdominal pain, (2) at least three-fold elevation in serum levels of pancreatic enzymes, and (3) radiological changes suggestive of acute pancreatitis.

Patients were admitted under internal medicine, general surgery, and other medical subspecialities. The main admitting department was general surgery, except for cases of diagnostic uncertainty or severity of the associated medical condition.

Hospitalizations of patients with pancreatic cancer and/or chronic pancreatitis were excluded as they could confound the data on AP. Patients admitted multiple times were taken as two separate hospitalizations.

For each hospitalization, we identified the underlying etiology and classified each into alcohol abuse, gallstones, hypertriglyceridemia, idiopathic, or other. Furthermore, we collected demographic data such as age and gender. We also outlined the associated medical history or underlying medical conditions. Data was also collected on the radiological and laboratory investigations obtained for each patient.

Biliary pancreatitis was diagnosed if there was radiological evidence of cholelithiasis. Alcohol-induced pancreatitis was diagnosed based on the history and when there were no other causes. Pancreatitis secondary to hypertriglyceridemia was diagnosed based on laboratory tests indicating high triglycerides and the absence of other causes

of pancreatitis. Traumatic or iatrogenic pancreatitis was diagnosed based on history. Idiopathic pancreatitis was labeled when there were no other etiologies.

We excluded hospitalizations of patients younger than 13 years of age, patients who died before full diagnostic evaluation could be completed, and patients with missing characteristics in the electronic medical record.

Patients were labeled to have readmission if they met the criteria for acute pancreatitis on a second event, with no underlying features of chronic pancreatitis.

2.2. Outcomes

The primary outcome was epidemiological characteristics of acute pancreatitis-related hospitalizations. Secondary outcomes included rates of in-hospital mortality, intensive care unit admission, procedural rates, length of hospital stays, and readmissions.

2.3. Statistical Analysis

Data was analyzed by the Statistical Package for Social Sciences (SPSS) version 23 software (IBM Corp.; Armonk, NY, USA) using descriptive analysis to determine the incidence of acute pancreatitis in association with the age and sex of the study population. Presenting symptoms, tools used for diagnosis, as well as etiology were also assessed in a similar way. Quantitative variables were expressed as mean (±SD). Student's t-test and chi-square tests were used to analyze and compare data whenever appropriate. Significant results were considered if p-value<0.05.

3. Results

3.1. Baseline Characteristics

For the study period, there were 324 admissions for acute pancreatitis. There were 60 cases of acute pancreatitis in 2019, 99 cases in 2020, 147 cases in 2021, and 18 cases in the first month of 2022.

67% of the patients were male. The ages of patients included ranged from 14 to 103, with the mean age being 45 (mean age: 45 +- SD: 15 years). Patients admitted in the extremes of age had rarer causes of acute pancreatitis, such as post-ERCP for an ampullary tumor in a patient aged 103 years old. Of the 3 patients admitted under the age of 20, 1 had pancreatitis during a COVID-related admission, 1 had pancreatitis secondary to diabetic ketoacidosis (DKA), and 1 female developed pancreatitis secondary to a medication she was taking for acne.

Patients presenting with abdominal pain and jaundice had a higher average age (45) than patients presenting with diabetic ketoacidosis (DKA) (38), indicating that DKA is a more common cause of pancreatitis in the young.

The diagnosis of pancreatitis was made by history, physical examination, and laboratory findings in 224 patients, while radiology was also used for the diagnosis of 81 patients (25%).

The most common underlying cause of pancreatitis in our study population was biliary disease, (Table 1). Of the 324 patients, 102 patients (31.5%) had evidence of biliary disease as a cause. The second most prevalent etiologies were idiopathic pancreatitis (20.4%) and alcohol-induced pancreatitis (19.8%). Other noteworthy etiologies were hypertriglyceridemia (6%), diabetic ketoacidosis (5%), and chronic kidney diseases (3%). Less common causes included trauma. Rare etiologies included COVID-related pancreatitis, ischemic heart disease, and post-ERCP due to ampullary tumor. Each of these etiologies contributed to one admission. There were 46 smokers out of the 324 patients in our study (14.2%). Of the 324 patients admitted for acute pancreatitis, 2 were diagnosed with newly discovered chronic pancreatitis, and 31 were admitted as cases of acute pancreatitis but had a different discharge diagnosis.

Table 1: causes, frequency of pancreatitis

Diagnosis	Frequency	Percentage
Gallstones	102	31.50%
Idiopathic	66	20.40%
Alcohol	64	19.80%
Hypertriglyceridemia	19	5.90%
Diabetic ketoacidosis	15	4.60%
Chronic kidney disease	10	3.10%
Others medical related	8	2.50%
Secondary to other causes during hospital course of admission for another reasons	3	0.90%
Trauma	3	0.90%
Newly discovered chronic pancreatitis during admission for acute pain	2	0.60%
admitted as pancreatitis but discharge diagnosis differs	31	9.50%

3.2. Admission

The length of stay after admission ranged from 0 to 103 days. The mean length of stay was 7.6 days (7.65 days +- SD: 12.91 days).

Of the 324 patients, 77% (250) were admitted to the general surgery department. 18% (58) were admitted under internal medicine, and the remaining were distributed under nephrology, cardiology, and endocrine.

3.3. Laboratory Investigations

The average amylase was noted to be higher (1757 U/L) when gall stones were the underlying cause of pancreatitis, as compared to alcohol (472 U/L), hypertrigliceridemia (600 U/L), or trauma (424 U/L). A similar trend was observed in urinary amylase, which was also higher in gall stones (309597 IU/h) than in alcohol (91082 IU/h), hypertriglyceridemia (16132 IU/h) or trauma (1950 IU/h).

Meanwhile, the average lipase was also noted to be higher in gallstone pancreatitis (5734 U/L) as compared to pancreatitis secondary to alcohol (3232 U/L) or hypertriglyceridemia (3571 U/L).

3.4. Surgical Interventions

20% of our patients received surgical interventions. Of the surgical interventions utilized in pancreatitis, the most common was cholecystectomy (33 done). The second most common was endoscopic retrograde cholangiopancreatography (ERCP) (12). 4 patients had both cholecystectomy and ERCP done. 9 patients had an exploratory laparotomy done. 4 underwent an esophagogastroduodenoscopy (EGD). Meanwhile, 2 underwent a necrosectomy and 1 underwent only decompression for abdominal compartment syndrome. It is important to note that 3.1% of patients left against medical advice in the emergency department.

3.5. Intensive Care Unit (ICU) Admission

30 cases were admitted to the ICU (9.3% of our total study sample), of whom 11 died (3.4% of our study sample). Of the 30 cases admitted, only 16 had an admission diagnosis of pancreatitis. The remaining 14 were admitted with only suspicion of pancreatitis and diagnosed as pancreatitis during the admission. The admitting department was medicine in most of the cases that required ICU admission (15), general surgery in 12 cases, nephrology in 2 cases, and cardiology in 1 case (Table 2).

The average age of ICU admission was 43.07 years old (43.1 SD +- 17 years). Males were admitted to the ICU more often than females (20 males and 10 females). The length of stay on average in the ICU was 18.7 days.

The most common reason for pancreatitis leading to ICU admission was alcohol use in 9 patients, followed by gallstones in 7 patients (Table 3).

Table 2: frequency of ICU admission

Admission Diagnosis	Frequency in ICU Admissions	Percentage of ICU Admissions
Pancreatitis	16	53.30%
Chest pain	3	10%
Diabetic ketoacidosis	2	6.70%
Renal impairment	2	6.70%
Jaundice	2	6.70%
Abdominal pain	2	6.70%
Acute abdomen	1	3.30%
Gastrointestinal Bleeding	1	3.30%
Cholecystitis	1	3.30%

Table 3: reason for pancreatitis leading to ICU admission

Etiology of Pancreatitis	Frequency in ICU Admissions	Percentage of ICU Admissions
Alcohol	9	30.00%
Gallstones	7	23.30%
Diabetic ketoacidosis	5	16.70%
Primary diagnosis not pancreatitis but occurred secondarily in the ICU	4	13.30%
Idiopathic	3	10.00%
Chronic kidney disease	1	3.30%
Other	1	3.30%

3.6. In-Hospital Mortality

11 patients of 324 (3.4%) died inside the hospital, all of whom were in the ICU. The average age of these patients was 48.4. Of the 11 patients, 8 were male (72.7%), while only 3 were female (27.3%). The admitting team for the patients was internal medicine in 6 cases, general surgery in 4 patients, and cardiology in 1 case.

The most common etiology resulting in mortality was alcohol use, followed by gallstones (Table 4).

Table 4: reasons for pancreatitis within ICU mortality

Etiology of Pancreatitis	Frequency in Mortality	Percentage of Mortality
Alcohol	5	45.50%
Gallstones	3	27.20%
Diabetic ketoacidosis	1	9.10%
Other	2	18.10%

3.7. Readmission

Of all the 324 patients, 22 patients were readmitted (6.8%). The leading underlying cause of pancreatitis in re-admitted patients was alcohol use in 8 patients (36.4%). 7 patients with idiopathic pancreatitis were readmitted (31.8%). Only 4 of the patients with gallstones were readmitted (18.2%).

4. Discussion

Acute pancreatitis is an acute inflammation of the pancreas and adjacent tissues. There is a significant paucity in the literature on acute pancreatitis in the UAE. Due to a changing demographic, as well as advances in endoscopic and laparoscopic procedures, disease outcomes are likely to have changed over the past 30 years.

In comparison to the last study on acute pancreatitis in the UAE, published in 1990, 76 episodes of acute pancreatitis occurred between January 1984 to December 1987 [6]. Meanwhile, our study showed 324 episodes from January 2019 to January 2022. However, this increase could be attributed to changes in the criteria used to diagnose pancreatitis. A serum amylase level of more than 1000/l with a consistent clinical presentation was the only criterion used in the original study. Furthermore, advances in diagnostic testing, as well as the increase in the utilization of laboratory tests in the emergency department, could have led to the apparent increase. Finally, changing patient demographics, risk factors, as well as population behavior in relation to food and alcohol consumption could contribute to the rise in cases. While there is an apparent rise in cases in our study from 2019 to 2021, this is most likely a result of other hospitals in the region becoming overwhelmed with COVID-19 cases, and thus, diverting non-COVID cases, including acute pancreatitis, to our emergency department.

Similar to the findings of Niazy A.'s and Abou Farsakh's study, biliary disease remained the most common cause of acute pancreatitis, accounting for 54.1% of cases. However, while alcohol-related pancreatitis caused only 6.6% of episodes in their study, we found alcohol-related pancreatitis to account for 19.8% of cases. This increase can most likely be attributed to changes in social convention in relation to alcohol consumption, as well as changing population demographics and immigration.

Interestingly, while we found 20.4% of cases of acute pancreatitis to be idiopathic, Niazy A. and Abou Farsakh reported only 9.8% to be idiopathic. Despite the advances that have taken place since then, more patients were left undiagnosed in our recent study. This could be attributed to the admission of acute pancreatitis patients under surgery rather than medicine, which is less well-equipped to investigate the breadth of possible non-surgical acute pancreatitis etiologies.

The mortality rate, on the other hand, has been static, despite the advances in management, with 3.3% reported in Niazy A., Abou Farsakh, and 3.4% in our study.

With regard to international studies, recent literature shows the global incidence of acute pancreatitis has been increasing over time, particularly in North America and Europe [7]. This rise has been driven mostly by biliary disease, while our studies show a significant rise both in biliary disease as well as alcohol consumption. This might be due to more significant increases in alcohol availability and consumption trends in our region as compared to Europe and North America.

This is signified in the roughly equal rates of biliary disease and alcohol-related acute pancreatitis episodes found in the USA [5].

As mentioned above, it is important to consider the changes in clinical criteria of acute pancreatitis as a possible cause for the apparent increase in cases, as well as the increased availability and liberal usage of diagnostic testing. This being said, there has also been a change in risk factors leading to acute pancreatitis, such as waist circumference, diabetes, the incidence of gallbladder disease, and physical inactivity [8].

Abdominal fat has also been found to have a significant role in the etiology of acute pancreatitis [9].

Meanwhile, a 2014 study indicated that tobacco use was the single most important modifiable risk factor for pancreatic disease [10].

The average ages of acute pancreatitis admissions were similar in our study to those seen in the USA [11]. However, it is interesting to note that, only alcohol-related pancreatitis was more common in males in USA studies and biliary disease-related pancreatitis was more common in females. Our study shows more biliary disease-related pancreatitis in males. However, this is likely due to a male-dominant patient population of expatriates and labor workers.

Compared to a 2019 USA study, which showed a mean length of stay of 3.4 days [12], the mean length of stay in our study was significantly longer, at 7.6 days. This could be explained by the inclusion of ICU admission stays in our study, which were significantly longer.

Furthermore, our study showed a higher mortality rate (3.4%) in comparison to the USA (0.7%). Most reviews report a mortality rate of 1-2% [13, 14].

This may be explained by differences in management, however, the late and severe clinical presentations in uninsured patients and patients of lower socioeconomic background likely contribute to the apparent higher mortality. It is also likely that patients with milder symptoms in our population did not present to the hospital. Also, due to the fact that most of the study took place alongside the COVID-19 pandemic, it is possible patient hesitation in coming to the hospital, as well as a shortage in bed availability and staff played a part in the higher mortality rate. Finally, our hospital does not have a

specific gastroenterology unit for the treatment of pancreatitis.

With regards to procedural rates and surgical interventions, we had 3.1% of patients leaving against medical advice in the emergency department, as well as several patients refusing surgical intervention after admission and choosing to opt for surgery in their home countries. This is a significant limitation to our procedural rates and surgical intervention statistics.

Meanwhile, patient characteristics of ICU admissions were similar in our study to a 2020 study citing similar average age in patients admitted to the ICU and those who were not. Furthermore, alcohol-induced pancreatitis was reported as the most common cause of ICU admission, as was ours. The length of stay was 13.5 days, while ours was longer, at 18.7 days [15].

Finally, the use of imaging to diagnose acute pancreatitis was significantly more common in our study, where it was utilized in the diagnosis of 25% of patients, as compared to 12% cited in a UK study investigating the use of imaging in acute pancreatitis [16]. This is likely due to emergency physicians ordering CT scans in case of unclear or inconsistent histories, to ascertain whether the admitting department should be medical or surgical. Furthermore, several patients with chronic kidney disease could have elevations in pancreatic enzymes secondary to renal impairment. In these cases, emergency physicians would often order CT scans to differentiate whether the pancreatic enzyme elevation is due to acute pancreatitis or chronic renal impairment [17]

Our study is limited by the fact that any single-center study, particularly in a tertiary center, runs the risk of selection bias by including sicker patients, and not being representative of the population. Furthermore, due to the study taking place during the COVID-19 pandemic, there may be several confounding factors affecting patient presentation, demographics, and mortality. The population-based studies we used to compare our statistics use national data, rather than single-center data. Furthermore, another limitation is the high number of patients refusing surgical intervention or leaving against medical advice due to financial reasons. Data from more extensive cohort studies involving multiple centers would paint a more accurate picture of the demographics of acute pancreatitis in our region.

5. Conclusion

Acute pancreatitis is a common cause of acute abdominal pain with a wide variety of etiologies. Biliary disease remains one of the most common in our region and worldwide. Idiopathic pancreatitis is a prominent cause within our center, which could be due to the allocation of acute pancreatitis cases to the surgical rather than medical and gastroenterology teams, who may be better equipped at identifying non-biliary causes of pancreatitis.

The coronavirus pandemic possibly played an important role in acute pancreatitis mortality and presentation since 2020. The diversion of resources such as ICU beds, physician time, and hospital facilities to COVID patients likely played a role in increasing mortality from pancreatitis.

The diagnosis of pancreatitis largely is dependent on the history, physical exam, and laboratory findings, with the use of ultrasound for biliary causes. However, CT scan utilization is important in identifying acute pancreatitis in ambiguous or non-classical presentations.

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