

Clinical characteristics of 5375 cases of acute pancreatitis from a single Chinese center, 1996-2015

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Acute pancreatitis (AP) remains a common and life-threatening gastrointestinal emergency, which is usually induced by gallstones, hyperlipidaemia, alcohol abuse, pancreatic carcinoma, and trauma.^[1] According to the 2012 Atlanta consensus, AP is divided into three general grades of severity: mild (MAP), moderate (MSAP), and severe (SAP).^[2] MAP is often self-limiting, while SAP is associated with high fatality, aggregate costs, and long hospital stay.^[3] The prognosis of AP was reported to have improved but the incidence of which increased in western countries and Japan.^[4-6] Regrettably, very few studies on AP in Chinese were published.^[7] To obtain a better understanding of the variations in demography, etiology, and treatment of AP, we conducted a large-scale retrospective study in 5375 patients at Ruijin Hospital in the period 1996 to 2015.

Patients discharged between January 1, 1996, and December 31, 2015 were identified. Patients were included if they were originally admitted to Ruijin Hospital or transferred within 72 h from onset. Each admission was assigned a subtype based on etiology (gallstone, hyperlipidemia, alcohol, other). The AP severity was classified as mild, moderately severe, and severe according to the 2012 Atlanta consensus.^[2] All continuous data were expressed as mean \pm standard deviation or median with interquartile range and compared using Student's *t* test or one-way analysis of variance. Categorical data were analyzed using χ^2 or Fisher exact test, as appropriate. A *P* value of <0.05 (2-tailed) was considered statistically significant. Data were analysed using SAS 9.1.0 (SAS Institute, Cary, NC, USA) or GraphPad Prism software 5.0.1 (GraphPad Software, San Diego, CA, USA).

Five thousand three hundred and seventy-five patients were included in this study (3137 men and 2238 women).

MAP, MSAP and SAP consisted of 49.0%, 21.3%, and 29.7% of the cases, respectively. Gallstones (63.0%), hyperlipidemia (8.5), and alcohol (7.4%) were the top 3 known causes and 21.1% of the cases were attributed to the “other” factors. Averagely, it took a patient 14 (9–25) days (median, interquartile range) and 5231 (2769–10,920) US dollars in hospital. A summary of overall characteristics is shown in [Table 1].

The 51–60 years group was the most vulnerable to AP according to the age distribution shown in Supplementary Figure 1, <http://links.lww.com/CM9/A27>. The average age of patients did not change statistically ($P = 0.05$) during the 20-year study period [Supplementary Figure 2, <http://links.lww.com/CM9/A27>]. What's more, biliary AP was more inclined to occur in elderly patients while AP due to “other” factors showed the opposite characteristic [Supplementary Figure 3, <http://links.lww.com/CM9/A27>].

Over the study period, the proportion of biliary, hyperlipidemic, and alcoholic AP increased despite of a reduction of the other etiological types [Figure 1]. Etiology related clinical features of AP were shown in [Table 2]. Alcoholic AP was much more likely to progress to severe cases (41.5%, $P < 0.001$) than the other etiological types, was associated with the highest frequency of pancreatic necrosis (22.6%, $P = 0.003$), and led to the lowest proportion of laparotomies (12.6%, $P < 0.001$) and the lowest hospital fatality rate (1.8%, $P < 0.001$). Biliary AP, however, was the direct opposite of alcoholic AP, with the lowest proportion of severe cases (21.2%) and pancreatic necrosis (14.2%), the highest proportion of laparotomies (22.7%), and the highest hospital fatality rate (5.1%, $P = 0.012$) [Table 2]. Interestingly, when etiology related fatality was adjusted according to severity mix, biliary AP was associated with the lowest fatality (3.5%), which was lower than the actual fatality. Hyperlipidemic, alcoholic,

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Table 1: General description of 5375 patients with acute pancreatitis.

Variables	No. of patients	Results
Sex		
Male	3137	58.4%
Female	2238	41.6%
Age (years)		53 (42–65)
Male	3137	51 (41–63)
Female	2238	55 (43–67)
Severity type		
Mild	2635	49.0%
Moderate	1146	21.3%
Severe	1594	29.7%
Etiology		
Gallstone	3386	63.0%
Hyperlipidemia	457	8.5%
Alcohol	398	7.4%
Other	1134	21.1%
Median interval from onset to visit (h)	5375	6 (4–7)
Median hospital stay (days)	5375	14 (9–25)
Median hospital expense (USD*)	5375	5231 (2769–10920)

All data were shown as median (IQR). *Expense was calculated at the exchange rate for US dollars in 2015.

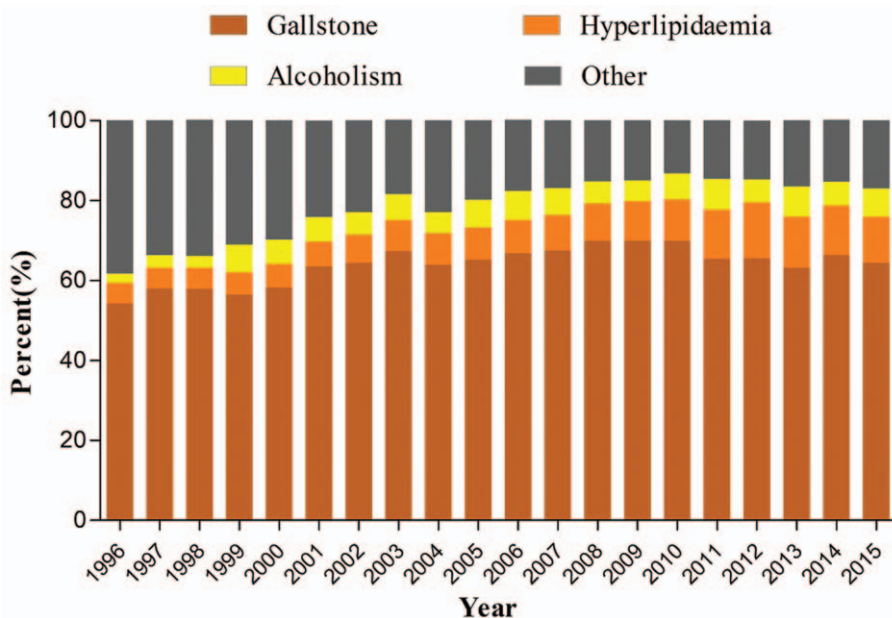


Figure 1: Yearly trends of the variation in the aetiology mix during 1996–2015. Biliary acute pancreatitis (AP) and hyperlipidaemic AP increased, whereas AP due to other factors decreased over the years. The proportion of alcoholic AP showed no tendency of change from 1999.

Table 2: Etiology-related characteristics of patients with acute pancreatitis.

Variables	Etiology				P
	Gallstone	Hyperlipidemia	Alcohol	Others	
Age (years)	55 (46–63)	45 (39–52)	46 (40–52)	49 (40–58)	<0.001
M/F	1.4	2.6	8.4	1.3	<0.001
Ratio of SAP	719 (21.2%)	181 (39.6%)	165 (41.5%)	529 (46.7%)	<0.001
Pancreatic necrosis	481 (14.2%)	74 (16.2%)	90 (22.6%)	167 (14.7%)	0.003
Surgery	769 (22.7%)	64 (13.9%)	50 (12.6%)	181 (16.0%)	<0.001
Fatality	172 (5.1%)	15 (3.3%)	7 (1.8%)	46 (4.1%)	0.012
Fatality adjusted to severity mix	3.5%	5.6%	5.8%	6.5%	0.039
Median hospital stay (days)	14 (9–25)	15 (10–25)	15 (9–23)	14 (9–26)	0.999

All data were shown as n, median (IQR). SAP: Severe acute pancreatitis.

and the other type of AP, however, showed higher adjusted fatalities than actual fatalities [Table 2]. However, no etiological discrepancy was found in hospital stay duration [$P = 0.999$, Table 2].

Table 3: Fatality of patients with acute pancreatitis according to severity and period.

Variables	No. of patients	Fatality (%)
In hospital fatality	240	4.5
Mild	3	0.1
Moderate	40	3.5
Severe	197	12.4
Period*		
1996–2000	32	5.9
2001–2005	81	4.7
2006–2010	76	4.9
2011–2015	51	4.0

* Fatality was adjusted according to the severity mix.

A total of 240 (4.5%) patients died during hospitalization. The fatality rate of mild, moderate, and severe cases was 0.1%, 3.5%, and 12.4%, respectively. The severity-adjusted fatality rate was 5.9% during 1996 to 2000, 4.7% during 2001 to 2005, 4.9% during 2006 to 2010, and 4.0% during 2011 to 2015, which showed no statistical reduction [$P = 0.207$, Table 3]. A more detailed analysis revealed a reduction in the fatality rate of SAP and moderately severe AP between 1996 and 2000, but not in the subsequent years [Figure 2]. A similar reduction in hospital stay was found over time before 2005 [Figure 2].

Within 72 h from onset, SAP patients received less net fluid inflow and a reduced ratio of early enteral nutrition implementation [Table 4]. The proportion of emergent endoscopic retrograde cholangiopancreatography for biliary SAP did not change significantly [$P = 0.517$, Table 4]. Invasive procedures, including percutaneous drainage and laparotomy, both showed a decreased trend although the reduction of percutaneous drainage was not

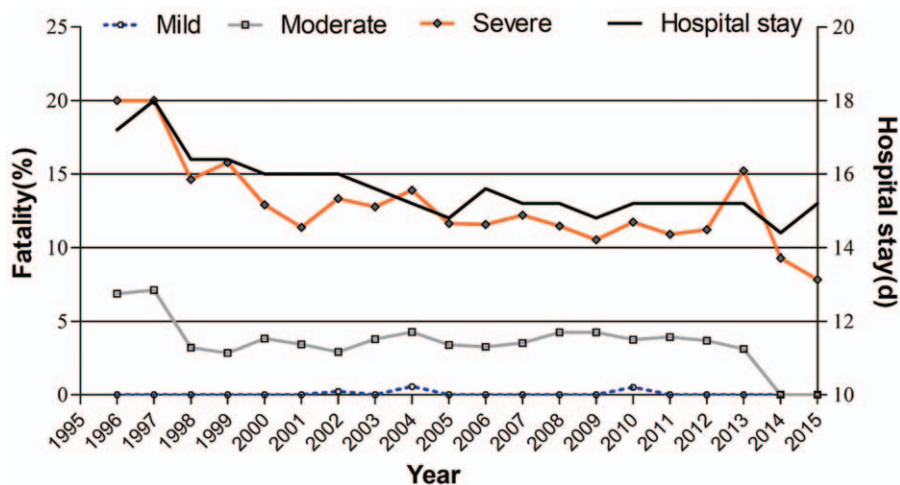


Figure 2: Yearly trends of severity-related fatality and hospital stay of patients with acute pancreatitis (AP). Severe AP and moderately severe AP showed a decrease in fatality during 1996 to 2001. Similar trends were found for the hospital stay duration.

Table 4: Characteristics of severe acute pancreatitis cases according to period ERCP, endoscopic retrograde cholangiopancreatography.

Variables	1996–2000	2001–2005	2006–2010	2011–2015	P
Treatment within 72 h					
Fluid (mL)	3050 (1057–4520)	2288 (618–3633)	2283 (140–4288)	1785 (789–3419)	0.029
Biliary ERCP	10/88 (11.3%)	19/203 (9.4%)	13/210 (6.2%)	9/118 (7.6%)	0.517
EN	25/182 (13.7%)	15/511 (2.9%)	32/544 (5.9%)	18/357 (5.0%)	<0.001
Percutaneous fluid drainage	32/182 (17.6%)	74/511 (14.8%)	64/544 (11.8%)	42/357 (11.8%)	0.258
Laparotomy	85/182 (46.7%)	160/511 (31.3%)	118/544 (21.7%)	93/357 (26.1%)	<0.001
Complications					
Digestive leakage	4/182 (2.2%)	4/511 (0.8%)	5/544 (0.9%)	5/357 (1.4%)	0.427
Pancreatic necrosis	87/182 (47.8%)	177/511 (34.7%)	127/544 (23.3%)	75/357 (21.0%)	<0.001
Fatality	29/182 (15.9%)	65/511 (12.7%)	63/544 (11.6%)	51/357 (14.3%)	0.530
MODS	23 (79.3%)	41 (63.1%)	47 (74.6%)	34 (66.7%)	–
Hemorrhage	3 (10.3%)	4 (6.2%)	5 (7.9%)	8 (15.7%)	–
Shock	0	11 (16.9%)	5 (7.9%)	2 (3.9%)	–
Sepsis	3 (10.3%)	9 (13.8%)	6 (9.5%)	7 (13.7%)	–
Median hospital stay (days)	40 (21–84)	29 (16–61)	28 (18–55)	29 (20–37)	0.001

All data were shown as median (IQR) or $n(\%)$. ERCP: Endoscopic Retrograde Cholangiopancreatography; EN: Enteral nutrition; MODS: Multiple organ dysfunction syndrome.

statistically significant [Table 4]. The percentage of digestive leakage and of pancreatic necrosis reduced [Table 4]. However, the fatality of SAP showed no significant reduction [Table 4]. The causes of death did not change significantly over time [Table 4]. In addition, we analyzed the frequency of SAP and fatality according to age group. We found that the ratio of SAP declined with age from age >20 years. However, fatality significantly increased with age despite the reduced percentage of SAP [Supplementary Figure 4, <http://links.lww.com/CM9/A27>].

In conclusion, the demographic characteristics of AP patients showed no significant changes during the study period. The proportion of gallstones, hyperlipidaemia, and alcoholism increased, and that of the “other” factors decreased. Biliary AP was associated with more surgeries and a higher actual fatality than the fatality adjusted according to severity mix, which inferred that biliary AP was more likely to be accompanied with infection. Patients with SAP received less fluid, fewer early enteral nutrition, and fewer laparotomies over the years.^[8] In a word, doctors are now more inclined to treat SAP patients non-surgically than ever in our center. Consequently, patients experienced fewer complications and spent less time in the hospital. However, the fatality revealed no significant reduction in the entire population of patients with AP between 1996 and 2015, which indicated that the present treatment to AP remain to be modified.

Limited to the fact that this study was conducting in a single center, the study was defective in the sphere of application. However, the large number of cases and wide range of the study interval could compensate for that limitation to some degree. We hope that this study may help in recognizing the variations of AP in terms of demography and etiology, as well as in evaluating the present treatment strategies, in the Chinese population.

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Conflicts of interest

None.

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