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Acute pancreatitis: Demographics, aetiological factors and outcomes in a regional hospital in South Africa

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Summary

Introduction. The spectrum of aetiologies and outcomes of acute pancreatitis in South African settings is under-reported. We report our experience at a regional hospital and compare it with international norms.

Patients and methods. Data were prospectively collected on all admissions of patients with acute pancreatitis to a regional hospital during the period June 2001 - April 2006. The causes of the pancreatitis were noted and complications and mortality rate were determined.

Results. From June 2001 to April 2006 there were 322 admissions of 282 patients with acute pancreatitis. The median age was 37 years (range 13 - 73 years). There were 94 females and 188 males. Episodes of pancreatitis were associated with alcohol consumption in 62% of cases and with gallstones in 14%; 4% of cases were associated with both gallstones and alcohol consumption, 8% with dyslipidaemia and 5% with retroviral disease. In 15% of admissions local complications developed, and 9% of admissions ended in death of the patient. Of the 28 deaths, 71% occurred in the first 2 weeks.

Conclusions. As in other South African reports, alcohol was the main cause of pancreatitis. Outcomes in this series are similar to those in Western studies except that the majority of deaths occurred early, implying that improved supportive care may improve overall survival.

Although acute pancreatitis is a common reason for emergency hospital admissions,[1] there is a paucity of information about the disease in a South African context[2,3] and to what extent disease severity and outcomes compare with published literature on the subject.

We prospectively investigated the hospital prevalence, aetiology, disease severity and outcomes of pancreatitis in a regional hospital setting in Durban, South Africa.

Patients and methods

During the period June 2001 - April 2006 data were prospectively collected on all admissions of patients to Addington Hospital with a diagnosis of pancreatitis.

The diagnosis was established by clinical presentation, together with an elevated serum amylase level (at least twice the upper limit of normal[4]) or an elevated urine amylase level >760 U/l.[4] Imaging by ultrasound or computed tomography scan was used as a confirmatory or primary diagnostic investigation where indicated. The pancreatitis was considered to be idiopathic when a cause was not apparent after initial screening.

All patients were assessed using the Glasgow criteria.[5] Organ dysfunction (Atlanta criteria)[6] was evidenced by the presence of shock (systolic blood pressure <90 mmHg), pulmonary dysfunction (PaO_2 <60 mmHg), renal failure (creatinine level >174 μmol/l) or gastrointestinal bleeding (>500 ml/h). A CT scan was an additional diagnostic modality in patients judged to have severe disease, to diagnose and quantify pancreatic necrosis.[7,8] Lipid assays were performed routinely.

Patients with pancreatic necrosis and requiring organ support were given ciprofloxacin.

The number of patients requiring intensive care unit admission, the duration of ICU and hospital stay, the development of complications and the number of deaths were noted.

Statistical analysis

Descriptive statistics were used to determine the characteristics of the cohort. These were stated as mean values and range.

Results

From June 2001 to May 2006, there were 322 admissions (1% of total admissions to the general surgical wards in the same period) of 282 patients with a diagnosis of acute pancreatitis, of whom 94 were female and 188 male. The median age of the patients was 37 years (range 13 - 73 years) and the median hospital stay was 6 days (range 1 - 123 days).

The median serum amylase level was 676 U/l (range 25 - 11 144 U/l), and the amylase level reached the diagnostic cut-off level in 252 admissions (78%). In 53 admissions (16%) an elevated urine amylase level supported the diagnosis

where the serum amylase was normal or marginally elevated. In 6 patients with markedly elevated triglycerides and normal or unmeasurable serum or urine amylase the clinical presentation and the lipaemia were considered supportive of the diagnosis.

In 4 patients the diagnosis was established at laparotomy. In 2 patients with an elevated amylase level ischaemic bowel was suspected, but in the other 2 the diagnosis was not suspected preoperatively. Ultrasound and CT scan were the sole confirmatory investigations in 7 cases. The aetiological associations are set out in Table I. Alcohol and gallstones were the main factors associated with pancreatitis. Sixteen patients were known to have HIV infection. One of these had a possible alcohol association, and in 8 patients on antiretroviral therapy with didanosine and stavudine these drugs were thought to be responsible for the pancreatitis. In the remainder the cause was uncertain. Primary hyperparathyroidism and hereditary spherocytosis accounted for a single case each.

Of the 44 patients with gallstone-related pancreatitis and the 14 with gallstones and alcohol consumption as probable causes, 42 had cholecystectomy within 30 days of the the admission, 2 refused surgery and 1 had had a previous cholecystectomy. The others did not honour appointments for cholecystectomy at 6 weeks. Seventeen had endoscopic retrograde cholangiopancreatography, 14 for jaundice, 2 for persistent symptoms and 1, who had proven choledocholithiasis, during advanced pregnancy. Five patients with pancreatitis associated with gallstones and no jaundice died. ERCP was not performed in any of these patients.

Complete assessment using a modified Glasgow Score of 8 criteria was done in 301 of the 322 admissions (93%). The proportions of patients assessed as having severe disease according to the Glasgow criteria and the organ failure criteria of disease severity were similar (Table II).

Of the patients 34 (11%) were admitted to the intensive care unit; 21 of them died, in all of whom the Glasgow criteria had predicted severe disease. The range of stay in the ICU was 1 - 23 days. Seven patients died without ICU admission. The Glasgow criteria had predicted mild disease in 5 of these patients and severe disease in 2. Unfortunately a bed in the ICU was not available in the latter 2 cases.

Thirty-three (32%) of the 102 patients who had CT scan assessment had pancreatic necrosis. One was managed with percutaneous drainage and another with open surgery and lavage. In the other 31 management was expectant as infection of pancreatic necrosis was not established. Ten of these patients developed pseudocysts, 4 a pancreatic abscess and 7 died.

Forty-nine patients (15%) developed local complications. Pseudocysts occurred in 29 (9%). Ten had spontaneous resolution, 7 were managed expectantly and 7 were lost to follow-up. Four were drained by endoscopic means and 1 had spontaneous drainage into the duodenum.

Four patients (1%) developed an abscess. Two were successfully treated by percutaneous drainage and open drainage with lavage, but in the other 2 percutaneous drainage resulted in colonic fistula and subsequent death.

Transient obstructive jaundice (21 cases, 7%), gastric outlet obstruction (10, 3%) and haemorrhage (3, 1%) resolved with supportive therapy. Portal hypertension developed in 1 case (0.3%) as a consequence of portal vein thrombosis and a pseudocyst in the region of the head of the pancreas. This resolved after transduodenal endoscopic cyst drainage.

There were 28 deaths, of which 71% occurred within 2 weeks. Assessment of severity using the Glasgow Score and organ failure severity assessment score predicted mild disease in 11 of the deaths. The distribution of the deaths according to aetiology is set out in Table I. Dyslipidaemia and a dual aetiology of alcohol and gallstones were associated with the highest proportions of deaths.

Discussion

Internationally the incidence of pancreatitis is rising. In 1987 there were 108 000 admissions in the USA (excluding Veterans Affairs hospitals), with 2 251 deaths.[9] More recently in a 2006 report this had more than doubled to 220 000 admissions.[10] In the UK a rising incidence by a factor of 10 has been noted from the 1960s to the 1980s, but there is still a wide regional variation from 150 to 420 cases per million population.[1,11,12] In South Africa there have been no incidence studies and only 2 hospital prevalence studies.[2,3]

In this cohort alcohol was implicated in two-thirds of the admissions and gallstones in 17%, while 5% were deemed idiopathic (Table I). These proportions are similar to those in the Cape Town[2] and Johannesburg[3] series. Table II shows the variation in the aetiologies of acute pancreatitis in US, European and South African settings. In general, Western cohorts have a significantly higher prevalence of gallstone aetiology.

Patients were not routinely counselled for HIV testing, so only those with known disease were identified. Pancreatitis in

TABLE I. SPECTRUM OF AETIOLOGIES, ETHNIC DISTRIBUTION AND MORTALITY

		Gender		Ethnic group				
Aetiology	No. (%)	Female	Male	African	Indian	Mixed race	White	Deaths (%)
Alcohol	**198 (61.5)**	**15**	**183**	**81**	**80**	**23**	**14**	**15 (7.6)**
Gallstones	**44 (13.7)**	**35**	**9**	**24**	**16**	**2**	**2**	**4 (9.1)**
Alcohol/gallstones	**14 (4.3)**	**8**	**6**	**7**	**5**	**1**	**1**	**4 (28.5)**
Idiopathic	**21 (6.5)**	**9**	**12**	**10**	**7**	**3**	**1**	**1 (4.7)**
Dyslipidaemia	**26 (8.1)**	**22**	**4**	**3**	**21**	**2**	**0**	**3 (11.5)**
Retroviral disease	**16 (5.0)**	**13**	**3**	**16**	**0**	**0**	**0**	**1 (6.3)**
Other	**3**	**3**	**0**	**2**	**1**	**0**	**0**	**0**
Total	**322**	**105**	**217**	**143**	**130**	**31**	**18**	**28 (8.7)**

patients infected with HIV is most frequently associated with antiretroviral medication and with opportunistic pancreatic infections.[13-16] In this series over half the patients were receiving treatment but none were identified with pancreatic infection. Outcomes have been found to be similar to non-HIV-related pancreatitis,[16] and our limited data support this observation. However, pancreatitis has been shown to be associated with an increasing proportion of deaths in patients on highly active antiretroviral therapy (HAART).[17] HAART has been associated with the development of pancreatitis. The antiretroviral drug most frequently associated with pancreatitis is didanosine, an adenosine analogue.[13,15] Ritonavir, a protease inhibitor, has been associated with severe hypertriglyceridaemia and pancreatitis.[18] Pentamidine, an aromatic diamidine used in the treatment and prophylaxis of *Pneumocystis carinii* pneumonia, also causes pancreatitis by a direct toxic effect.[13]

In view of the over 30% prevalence of HIV in surgical patients in our region[19] it is important that details of HAART therapy are obtained. HAART can then be modified to reduce the risk of subsequent pancreatitis.

Hypercalcaemia is rare, as our single case illustrates, but worth investigating because although primary hyperparathyroidism is identified in less than 1 in 400 cases, treatment will be curative for both conditions.[20]

In the diagnostic work-up of acute pancreatitis an elevated amylase level is nonspecific as it may be raised in a number of acute abdominal conditions. Thomson *et al.*[12] performed laparotomies in 7 patients (2%) because of diagnostic doubt. In the present series laparotomy confirmed the diagnosis in 4 cases (1%), ultrasound in 4 (1%) and CT scan in 3 (1%).

Of Thomson *et al.*'s series of 378 patients[12] 26 (7%) developed pseudocysts and 11 (3%) pancreatic abscesses, figures similar to the present series, in which we found 29 (9%) pseudocysts and 4 (1%) pancreatic abscesses.

Mortality

The ability of the Glasgow Score and organ failure severity assessment score to predict severe disease in a number of series is set out in Table II. Figures for the Glasgow Score in the different studies are similar. The specificity is generally in the upper 80s, but sensitivity, i.e. the ability to detect all those with severe disease, is much lower. It was disappointing that the organ failure severity assessment score did not improve on the sensitivity. These indices are ineffective as clinical management tools because they do not accurately select patients for monitoring in a high-care unit. They are more useful for epidemiological comparison.

The mortality rate of 9% in this series is comparable to the mortality reported in some of the cited references.[21-23] Thomson *et al.*[12] reported a mortality of 15%, although only half of the deaths were thought to be directly related to complications of pancreatitis. The mortality due to gallstones at 9% is comparable to another series, which showed a mortality rate of 6%.[23]

The proportions of early and late deaths (with 2 weeks as the cut-off point) in different series are set out in Table III. A larger proportion of patients in this series died early, from systemic inflammatory response syndrome and multiple organ dysfunction syndrome, than in almost any other series. It is interesting to note that 7 of the patients who died early were not admitted to the ICU for monitoring. This again illustrates lack of an effective tool with which to predict the need for ICU admission.

Conclusion

This series reaffirms that alcohol is the major factor associated with acute pancreatitis in the South African context. It needs to be kept in mind that both HIV and HAART are possible aetiological factors, as the latter can be altered to reduce the risk. Severity indices are poor practical management tools owing to their low sensitivity. The mortality rate is similar to norms elsewhere, but the majority of deaths occur in the first 2 weeks. Improved selection for and availability of early supportive management have the potential to reduce mortality.

REFERENCES

1. McKay CJ, Evans S, Sinclair M, Carter CR, Imrie CW. High early mortality rate from acute pancreatitis in Scotland, 1984-1995. *Br J Surg* 1999; 86: 1302-1306.
2. Funnell IC, Bornman PC, Weakley SP, Terblanche J, Marks IN. Obesity: an important prognostic factor in acute pancreatitis. *Br J Surg* 1993; 80(4): 484-486.
3. John KD, Segal I, Hassan H, Levy RD, Amin M. Acute pancreatitis in Sowetan Africans. A disease with high mortality and morbidity. *Int J Pancreatol* 1997; 21(2): 149-155.
4. Steinberg WM, Goldstein SS, Davis ND, Shamma'a J, Anderson K. Diagnostic assays in acute pancreatitis. A study of sensitivity and specificity. *Ann Intern Med* 1985; 102(5): 576-580.
5. Blamey SL, Imrie CW, O'Neill J, Gilmour WH, Carter DC. Prognostic factors in acute pancreatitis. *Gut* 1984; 25(12): 1340-1346.
6. Bradley EL, III. A clinically based classification system for acute pancreatitis. Summary of the International Symposium on Acute Pancreatitis, Atlanta, Ga, September 11 through 13, 1992. *Arch Surg* 1993; 128(5): 586-590.

TABLE II. COMPARISON OF SEVERITY SCORES AS PREDICTORS OF OUTCOME IN REPRESENTATIVE SERIES

Author	Year	No.	Sensitivity	Specificity	PPV	NPV
Glasgow Score						
Larvin[24]	**1989**	**290**	**61**	**89**	**59**	**90**
Wilson *et al.*[25]	**1990**	**160**	**71**	**88**	**66**	**91**
Tran and Cuesta[26]	**1992**	**259**	**58**	**89**	**68**	**84**
Taylor *et al.*[27]	**2005**	**49**	**64**	**73**	**67**	**70**
This series	**2007**	**322**	**57**	**92**	**31**	**94**
Organ failure						
This series	**2007**	**322**	**57**	**88**	**31**	**96**

PPV = positive predictive value; NPV = negative predictive value.

TABLE III. COMPARISON OF THE FREQUENCY OF AETIOLOGIES, COMPLICATIONS AND DEATHS IN REPRESENTATIVE SERIES

							Mortality		
Author	Origin	Number	Alcohol	Gallstones	Idiopathic	Local complications	Total	Early <2 wks	Late >2 wks
Ashley *et al.*[28]	**USA**	**1 110**	**NS**	**NS**	**NS**	**NS**	**2%**	**29%**	**71%**
Mann *et al.*[22]	**England**	**631**	**30%**	**29%**	**NS**	**NS**	**9%**	**44%**	**56%**
Toh *et al.*[23]	**England**	**186**	**20%**	**33%**	**32%**	**15%**	**9%**	**NS**	**NS**
Mofidi *et al.*[29]	**Scotland**	**759**	**33%**	**47%**	**13%**	**14%**	**6%**	**31%**	**69%**
Thomson *et al.*[12]	**Scotland**	**378**	**15%**	**41%**	**20%**	**9%**	**8%**	**NS**	**NS**
Carnovale *et al.*[30]	**Italy**	**1 135**	**6.5%**	**68.7%**	**12.3%**	**NS**	**5%**	**51%**	**49%**
Ricci *et al.*[31]	**Italy**	**125**	**12%**	**76%**	**0%**	**NS**	**4%**	**NS**	**NS**
John *et al.*[3]	**S Africa**	**136**	**83%**	**7%**	**7%**	**10%**	**8%**	**NS**	**NS**
Funnell *et al.*[2]	**S Africa**	**99**	**74%**	**14%**	**7%**	**NS**	**13%**	**NS**	**NS**
This series	**S Africa**	**322**	**62%**	**14%**	**7%**	**16%**	**9%**	**79%**	**21%**

7. Leung TK, Lee CM, Lin SY, *et al*. Balthazar computed tomography severity index is superior to Ranson criteria and APACHE II scoring system in predicting acute pancreatitis outcome. *World J Gastroenterol* 2005; 11(38): 6049-6052.
8. Mortele KJ, Wiesner W, Intriere L, *et al*. A modified CT severity index for evaluating acute pancreatitis: Improved correlation with patient outcome. *AJR Am J Roentgenol* 2004; 183: 1261-1265.
9. Steinberg W, Tenner S. Acute pancreatitis. *N Engl J Med* 1994; 330(17): 1198-1210.
10. Whitcomb DC. Acute pancreatitis. *N Engl J Med* 2006; 354: 2142-2150.
11. UKWorking Party on Acute Pancreatitis. UK guidelines for the management of acute pancreatitis. *Gut* 2005; 54: suppl III, iii1-iii9.
12. Thomson SR, Hendry WS, McFarlane GA, Davidson AI. Epidemiology and outcome of acute pancreatitis. *Br J Surg* 1987; 74(5): 398-401.
13. Dassopoulos T, Eli D. Ehrenpreis. Acute pancreatitis in human immunodeficiency virus-infected patients: A review. *Am J Med* 1999; 107: 78-84.
14. Manocha AP, Sossenheimer M, Martin SP, *et al*. Prevalence and predictors of severe acute pancreatitis in patients with acquired immune deficiency syndrome (AIDS). *Am J Gastroenterol* 1999; 94: 784-789.
15. Cappell MS, Marks M. Acute pancreatitis in HIV-seropositive patients: A case control study of 44 patients. *Am J Med* 1995; 98: 243-248.
16. Gan I, May G, Raboud J, Tilley J, Enns R. Pancreatitis in HIV infection: Predictors of severity. *Am J Gastroenterol* 2003; 98: 1278-1283.
17. Louie J K, Hsu LC, Osmond DH, Katz MH, Schwarez SK. Trends in causes of death among persons with acquired immunodeficiency syndrome in the era of highly active antiretroviral therapy, San Francisco, 1994-1998. *J Infect Dis* 2002; 186: 1023-1027.
18. Chapman SJ, Woolley IJ, Visvanathan K, Korman TM. Acute pancreatitis caused by tipranavir/ritonavir-induced hypertriglyceridaemia. *AIDS* 2007; 21(4): 532-533.
19. Caccala SR, Mafana E, Thomson SR, Smith A. Prevalence of HIV status and CD4 counts in a surgical cohort: their relationship to clinical outcome. *Ann R Coll Surg Engl* 2006; 88(1): 46-51.
20. Shearer MG, Imrie CW. Parathyroid hormone levels, hyperparathyroidism and acute pancreatitis. *Br J Surg* 1986; 73(4): 282-284.
21. Blamey SL, Osborne DH, Gilmour WH, O'Neill J, Carter DC, Imrie CW. The early identification of patients with gallstone associated pancreatitis using clinical and biochemical factors only. *Ann Surg* 1983; 198(5): 574-578.
22. Mann DV, Hershman MJ, Hittinger R, Glazer G. Multicentre audit of death from acute pancreatitis. *Br J Surg* 1994; 81(6): 890-893.
23. Toh SKC, Phillips S, Johnson CD. A prospective audit against national standards of the presentation and management of acute pancreatitis in the South of England. *Gut* 2000; 46: 239-243.
24. Larvin M. Assessment of severity and prognosis in acute pancreatitis. *Eur J Gastroenterol Hepatol* 1997; 9(2): 122-130.
25. Wilson C, Heath DI, Imrie CW. Prediction of outcome in acute pancreatitis: a comparative study of APACHE II, clinical assessment and multiple factor scoring systems. *Br J Surg* 1990; 77: 1260-1264.
26. Tran D, Cuesta M. Evaluation of severity in patients with acute pancreatitis. *Am J Gastroenterol* 1992; 87(5): 604-608.
27. Taylor SL, Morgan DL, Denson KD, Lane MM, Pennington LR. A comparison of the Ranson, Glasgow, and APACHE II scoring systems to a multiple organ system score in predicting patient outcome in pancreatitis. *Am J Surg* 2005; 189[2]: 219-222.
28. Ashley SW, Perez A, Pierce EA, *et al*. Necrotizing pancreatitis: contemporary analysis of 99 consecutive cases. *Ann Surg* 2001; 234(4): 572-579.
29. Mofidi R, Madhavan KK, Garden OJ, Parks RW. An audit of the management of patients with acute pancreatitis against national standards of practice. *Br J Surg* 2007; 94: 844-848.
30. Carnovale A, Rabiti PG, Manes G, Esposito P, Pacelli L, Uomo G. Mortality in acute pancreatitis: is it an early or a late event? *J Pancreatol* 2005; 6(5): 438-444.
31. Ricci F, Castaldini G, de Manzoni G, *et al*. Treatment of gallstone pancreatitis: six-year experience in a single center. *World J Surg* 2002; 26(1): 85-90.