

## The burden of acute pancreatitis and early experience of step-up approach for acute necrotizing pancreatitis at Military Hospital

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### Abstract

**Introduction:** Twenty-five percent of acute pancreatitis develops severe acute pancreatitis (SAP). SAP patients have prolonged hospitalization and require a substantial amount of manpower and hospital resources. The aim of this study was to give an insight into the burden of acute pancreatitis at a tertiary level military hospital and to share the experience of managing pancreatic necrosis with the application of the step-up approach.

**Methods:** A prospective descriptive study of consecutive patients was conducted at Shree Birendra Army Hospital from 2017 June to 2017 November. Patients with a diagnosis of acute pancreatitis admitted were stratified according to severity as per Revised Atlanta classification 2012. Patients with acute necrotizing pancreatitis were enrolled for the step-up approach. Patient's demography, baseline investigations, radiology, prognostic scoring scales and type of intervention were analyzed. The burden of severe acute pancreatitis at our center and the early experience of the step-up approach at our centre within the study period were studied.

**Results:** Out of 35 five patients with acute pancreatitis, 7 (20%) subsequently developed severe acute pancreatitis. Among them, five patients subsequently developed necrotizing pancreatitis who were managed according to the step-up approach. Out of them, three patients subsequently underwent operative intervention in the form of minimally invasive procedures like percutaneous drain placement, laparoscopic necrosectomy, video-assisted retroperitoneal debridement, and open necrosectomy.

**Conclusion:** Acute pancreatitis is a common presentation at our centre. The step-up approach in the management of acute necrotizing pancreatitis is a safe and feasible approach.

**Keywords:** Acute pancreatitis; Pancreatic necrosis; Step up approach.

### Introduction

Acute pancreatitis (AP) is one of the common gastrointestinal presentations in the emergency department. In the United States of America, it is associated with the highest aggregate of inpatient cost of around 2.6 billion dollars per year.<sup>1</sup> The overall burden of severe acute pancreatitis (SAP) of Nepal is yet unknown. SAP accounted for 25% of total ICU admission at Tribhuvan University Teaching Hospital

(TUTH) in 2013.<sup>2</sup> Intensive care unit (ICU) admission and necrosectomy are two most important determinants for medical cost. Institutionalization of step-up approach for management of acute necrotising pancreatitis (ANP) have been found to reduce the cost as well as improvement in treatment outcome.<sup>3-4</sup>

The incidence of SAP from two institutions from Nepal was found to be 27.9% and 12.9% respectively.<sup>5-6</sup> The

burden of SAP in our centre has not been reported yet. Mild pancreatitis is managed with supportive measures.<sup>7</sup> However management of severe form of the disease has to be individualized and proper timing of intervention is associated with a favorable outcome.<sup>7</sup> In recent years use of the minimally invasive technique in managing necrotic pancreatitis has been increasingly preferred over conventional open surgery and also it has shown better outcomes.<sup>3,8,9</sup> Multi-staged step-up approach in the management of ANP has improved the outcomes and reduced medical cost in comparison with early open surgery in recent years.<sup>10</sup>

Hence we conducted a prospective descriptive study to see the burden of disease at our centre and evaluated the outcome of the step-up approach in the management of ANP at our centre within the study duration.

## Methods

The prospective descriptive study was conducted in the Department of Surgery, at Shree Birendra Army Hospital for a period of six months (2017 June to 2017 November) after obtaining ethical approval and informed consent. All the patients admitted to Shree Birendra Army Hospital with age over 14 years and diagnosed as AP during the study period were included in the study. All the data was obtained from the patient's hospital record file which included patient demography, presentation of symptoms, physical examination findings, laboratory parameters during the hospital stay and perioperative details.

At emergency, patients were managed symptomatically after sending laboratory investigations. Laboratory investigations included baseline investigation i.e. complete blood counts, kidney and liver function tests (KFT and LFT), chest X-ray, routine urine examination, serum lipase, and amylase. All cases with an increase in more than three-fold rise in serum lipase and amylase were provisionally diagnosed as pancreatitis. After diagnosis patients were admitted under the department of the surgery and managed at ward/surgical intensive care unit (SICU) accordingly. The subsequent workup was to confirm the cause and severity of AP. The patients were managed according to the standard guidelines and protocol.

Mild cases were managed conservatively at the surgical ward with intravenous fluid, analgesics, and close observation. In case of mild biliary pancreatitis same sitting laparoscopic cholecystectomy was offered.

In contrast, severe cases were managed at the SICU/ Intensive care unit (ICU)/Intensive trauma care unit

(ITCU) as per the availability of a bed. Severe cases were managed by aggressive fluid resuscitation, adequate analgesia, central venous line access, monitoring of the vitals, intake and output charting, serials of investigations such as arterial blood gas analysis, hematocrit, blood sugar, serum magnesium and calcium, abdominal CT scan. Severity index scoring done for all cases at admission on need basis and protocol. Early enteral feeding was advocated except in severe vomiting or anorexia where total parenteral nutrition was instituted. Repeat CT scan was done for all cases the very next week of admission or where the clinical-pathological parameters demanded.

In all cases, Ranson's, APACHE-II, modified Glasgow and modified Computerized Tomography Severity Index (CTSI) severity scoring system were calculated. Organ failure was defined according to the Modified Marshall score. Organ failure less than 48 hours and more than 48 hours were termed transient and persistent respectively as per Revised Atlanta classification 2012. ANP, infected pancreatic necrosis (INP) and other local complications were defined according to Revised Atlanta classification 2012.<sup>11</sup>

Following algorithm was adopted for the management of pancreatic necrosis: Step-up approach.<sup>10</sup>

### I. Admission and First week

#### - Diagnosis

- Laboratory with liver enzymes, calcium, triglycerides
- Abdominal ultrasound for biliary etiology
- CECT imaging only in case of diagnostic uncertainty

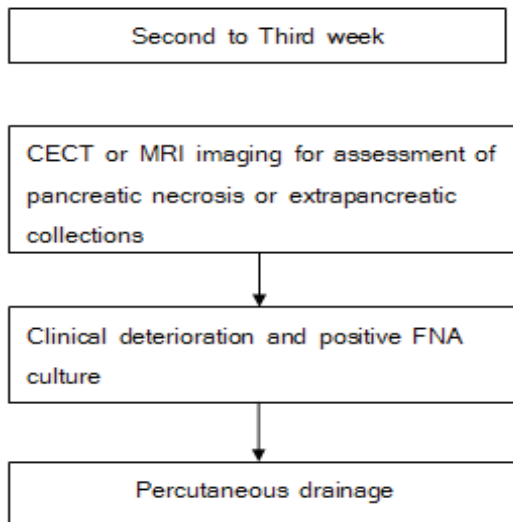
#### - Prognosis

- Blood Urea Nitrogen(First 24hr) for prediction of mortality
- Creatinine(First 24hr) for prediction of necrosis
- SIRS monitoring for progression of severity

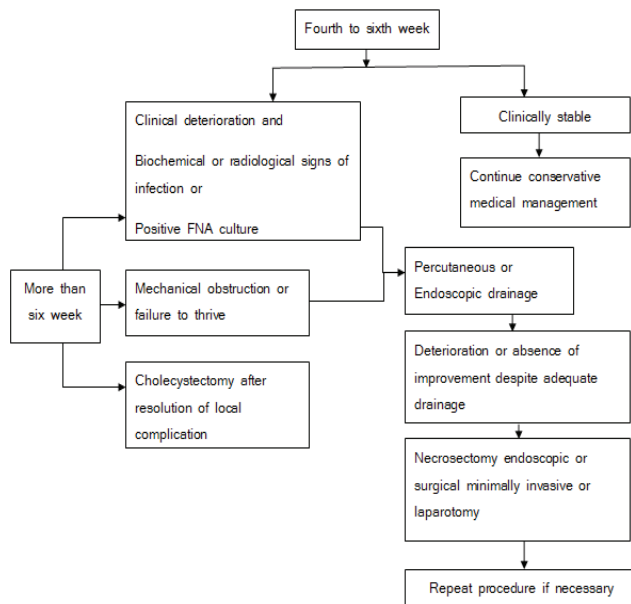
#### - Treatment

- Fluid management
- Nutritional support if needed (preferably enteral administration)
- Culture guided antibiotics
- Endoscopic Retrograde Cholangiopancreatography (ERCP) with sphincterotomy for cholangitis

Management algorithm for second to third week and fourth to six weeks are shown in figure 1 and 2 respectively.



**Figure 1: Algorithm showing a step-up approach for second to the third week**



**Figure 2: Algorithm showing a step-up approach from fourth week onwards**

Demography and frequency were analyzed using Statistical Package for the Social Sciences (SPSS) version 22. The outcome of the step-up approach was assessed using the patient's recovery and follow up status.

## Results

Thirty-five patients were admitted with the diagnosis of AP. Among them 23 (65%) were male and 12 (34%) were female. The overall disease burden was more among the 30 to 45 years age group which accounted for 14 (40%)

cases. (Table 1) Four (11%) patients had moderately severe pancreatitis and seven (20%) patients had SAP. Among the seven severe pancreatitis cases, five subsequently developed necrotising pancreatitis within a period of one to three weeks which were diagnosed on the basis of clinical features and confirmed with CT scan findings. ( Table 1)

Management strategies among all the patients are illustrated in Table 2. One patient was referred to other centre of endoscopic retrograde cholangiopancreatography whereas five patients who subsequently developed ANP were managed according to the step-up approach. Out of them, three patients ( Figure 3, Figure 4 and Figure 5) subsequently underwent operative intervention in the form of minimally invasive procedures like percutaneous drain placement, laparoscopic necrosectomy, Video-assisted retroperitoneal debridement (VARD) and open necrosectomy. (Table 3)

**Table 1: Distribution of patients according to demography, etiology, and severity.**

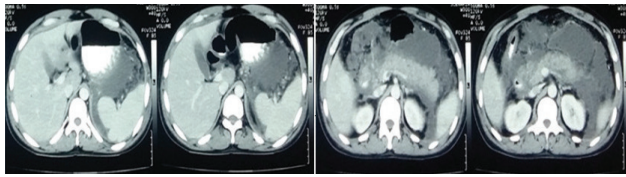
Demography	Frequency (N=35)	Percentage (%)
Male	23	65%
Female	12	34%
Distribution of AP according to etiology		
Biliary pancreatitis	16	45%
Alcohol-induced	12	34%
Traumatic pancreatitis	01	2%
Other	06	17%
Distribution of cases according to the severity		
Mild acute pancreatitis (MAP)	24	68%
Moderate acute pancreatitis (MSAP)	4	11%
Severe acute pancreatitis (SAP)	7	20%
Necrotizing pancreatitis	5	14%
Sterile pancreatic necrosis	2	5%
Infected pancreatic necrosis	3	8%

**Table 2: Management of patients with AP**

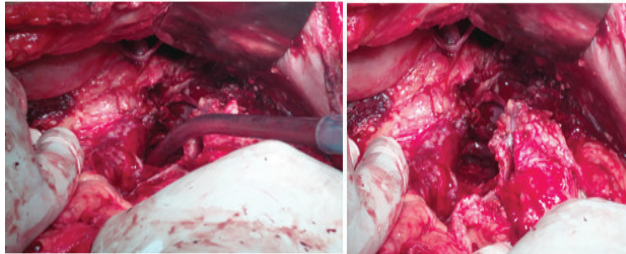
Management modalities	Frequency (N=35)	Percentage (%)
Conservative	15	42%
Laparoscopic cholecystectomy	16	45%
ERCP	1	2%
Operative intervention for infected necrosis	3	8%

**Table 3: Management strategies according to step-up approach for infected pancreatic necrosis**

Case summary	Intervention
Case 1 ( Figure 3 and Figure 4)	The first week- conservative treatment
Twentyeight-year-old male	The third week- CT guided percutaneous drain placement with serial flushing maintaining sterile environment up to 6 <sup>th</sup> week. However, the size of necrosom was increasing.
CECT diagnosis- ANP	
Ranson's score- four	Seventh week- Laparoscopic necrosectomy for persistent unwellness and increasing size of necrosom
APACHE II score-ten	
Modified Glasgow score- four	The tenth week- Re-laparoscopic necrosectomy converted to open necrosectomy due to uncontrolled bleeding
Modified CTSI- eight	Outcome- patient doing fine up to 90 days follow up
Case 2 (Figure 5)	The fifth day of injury- Right posterolateral thoracotomy for acute hemothorax
Thirtysix-year-old male with Blunt abdominal trauma with Grade two pancreatic injury with multiple right sided rib fractures ( 7 <sup>th</sup> to 9 <sup>th</sup> ) with pneumothorax	The seventh day of injury- Exploratory laparotomy for peritonitis which revealed delayed jejunal perforation with hemorrhagic pancreatitis. Jejunal perforation was repaired and hemorrhagic pancreatitis left untouched
	The fourteenth day of injury- CECT revealed ANP
	The fifteenth day of injury- CT guided drain placement
	The twentieth day of injury- Videoscope assisted retroperitoneal debridement (VARD) (Figure six) for unresolving sepsis and deteriorating general condition
	Outcome- Surgical site infection (SOUTHAPTON GRADE five) and patient doing fine up to 90 days follow up
Case 3	The first week- conservative management, followed by serial percutaneous drain placement two in number
Fourty-one year old male with CECT suggestive of ANP	The fourth week- CT guided large drain placement and continuous lavage for a week for increasing fever and leucocytosis
	Sixth week-Patient improved with a decrease in purulent discharge and minimal collection in CECT. Serial drain removal was done
	Outcome- patient doing fine up to 90 days follow up



**Figure 3: CECT showing the peripancreatic fluid collection in a severe pancreatitis patient**



**Figure 4: Intraoperative photo of laparotomy necrosectomy and lavage after the failure of laparoscopic necrosectomy**



**Figure 5: Photo showing Video-Assisted Retroperitoneal Drainage, following CT guided pigtail drainage and lavage**

## Discussion

Our finding suggests that AP is more common in the younger age groups (30 to 45 years), 20% of patients subsequently developing SAP. An early experience of the step-up approach among three patients with ANP is rewarding at our centre though the sample size is very small.

AP is one of the common presentations in an emergency. The overall incidence of AP is not yet known. The burden of SAP in our study was found to be 20% (7/35). Bohara et al found 7/53 (13.2%) and 4/31 (12.90%) in their centre.<sup>6,12</sup> This small difference may be due to the small sample size in our study. Similarly, 23/45 (51.2%) of severe pancreatitis

was reported by S. Manandhar et al in 2012 which was very high as compared to this study.<sup>13</sup> This contrast finding is probably due to different risk stratification classification used, i.e we used Revised Atlanta Classification 2012, whereas S. Manandhar et al used Atlanta classification 1992.

Age is considered one of the prognostic markers in severity scoring system namely Ranson's, APACHE-II, Modified Glasgow.<sup>14-16</sup> Our patients were predominantly of the age group 30 to 45 years, which could be because our centre is a military hospital with a higher ratio of young military personnel. Our study showed male predominance, nearly double male population than the female with a ratio of 1.91:1. However other studies showed not much difference in male to female ratio.<sup>5,6,13</sup> Again, this contradictory finding could be probably due to the predominantly male population in the military. Biliary pancreatitis is the most common cause of pancreatitis worldwide.<sup>1,17</sup> Our study also showed gall stone disease as the predominant cause. However, alcohol was also associated with a significant number of cases, which is probably due to the predominance of the young male population.

AP is a self-limiting disease, however, despite the early presentation and diagnosis 25% subsequently develop SAP with mortality up to 50%.<sup>17</sup> SAP requires to prolong hospitalization and needs ICU care, consuming a substantial amount of manpower and hospital resources. The study conducted in Skane University Hospital in Sweden found overall hospital cost and cost for loss of production was per person in mean €5,100 ± 2,400 for MAP and €28,200 ± 38,100 for SAP (p < 0.001). Among the severe group those patients who needed ICU stay had significantly higher hospital costs (€39,200 ± 30,600 versus €7,700 ± 6,400; p < 0.001).<sup>18</sup> They also found the cost of treatment of biliary pancreatitis was significantly higher than of alcohol-induced pancreatitis due to the need for operative intervention. They also highlighted the need for minimally invasive intervention and optimal timing of cholecystectomy in acute biliary pancreatitis to reduce the hospitalization and loss of production cost. Murata et al from Japan in their study confirmed that ICU stay and necrosectomy were two most important determinants of medical cost for hospitalized patients with AP.<sup>19</sup> PANTER trial showed that the patient who underwent step-up approach had lower utilization of health care resources for operation. They also found that the mean absolute difference of \$15,963 per patient between step-up and open necrosectomy and total reduction in cost by 12% with the step-up approach.<sup>3,4</sup> The same trial also demonstrated the clinical benefit of the step-up approach over open necrosectomy, with major complications or

death more common in open necrosectomy group, 69% vs 40%, however, the death rate among two groups did not differ significantly.

In developing countries and resource deficit regions, the management of pancreatitis can have catastrophic health expenditure. It increases the cost of treatment and also the cost incurred to treat complications further adds to the personal and institutional costs. Our institution being tertiary level army hospital, services are rendered only to serving/ retired soldiers and their immediate family members, catering beneficiary population of approximately six lakh people. The services provided are free of cost encouraging the clinicians to individualize advance treatment to beneficiaries free of cost. However, the cost of treatment to the Army office and nation remains the same. We institutionalized the step-up approach at our centre after evidence from the PANTER trial. A total of five patients of ANP were managed as per protocol in the study period, out of which three patients were intervened in the form of a minimally invasive approach to open necrosectomy successfully. Though our study duration and the sample size are very small, it can provide evidence that the step-up approach can be practiced in a high volume tertiary centre with a competent multidisciplinary team. Also, a larger sample size was not thought to be feasible because ANP with complication is uncommon.

The major limitation of our study is that it is a single centre study with small sample size. It cannot provide robust evidence about practicing the step-up approach; however, it thus provides evidence at a national and regional level to encourage surgeons for this approach for a better outcome.

## Conclusion

Acute pancreatitis is a common presentation at our centre. The step-up approach in the management of acute necrotizing pancreatitis is a safe and feasible approach.

## Acknowledgments

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**Conflict of interest:** None

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