

## Original Research Article

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# Intravenous fluids in acute pancreatitis: a prospective study

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## ABSTRACT

**Background:** Fluid therapy is the mainstay of treatment in the management of acute pancreatitis. Most guidelines recommend aggressive fluid therapy in the initial 48-72 hours. We aimed to compare the occurrence, persistence or worsening of systemic inflammatory response syndrome (SIRS) and occurrence organ failure in patients with acute pancreatitis receiving normal and high volume fluid therapy in the first 24 hours.

**Methods:** This was a prospective observational study. Consecutive adult patients admitted with acute pancreatitis were included in the study. SIRS was defined according to the criteria. Organ failure and local complications were defined according to Atlanta classification. Patients were divided into two groups according to the rate of fluid administered in the initial 24 hours: Normal volume group which received fluids at a rate <150 ml/hour and high volume group >150 ml/hour.

**Results:** A total 60 patients were included in the study with 30 each in the two groups. Persistence or worsening of SIRS at 48 hours was more in normal volume fluid group compared to the high volume fluid group ( $p=0.076$ ). Organ failure at 48 hours was more in normal volume fluid group compared to the high volume fluid group ( $p=0.074$ ). Incidence of local complications equal in both group.

**Conclusions:** Our study did not show any statistically significant difference in outcomes in patients with acute pancreatitis receiving normal or high volume fluids in the initial 24 hours. Further multi-centric randomised control trials are required to analyze the outcomes of high and normal volume fluid resuscitation in acute pancreatitis.

**Keywords:** Acute pancreatitis, Fluid resuscitation, Systemic inflammatory response syndrome

## INTRODUCTION

Acute pancreatitis (AP) is a disease with a substantial burden on the health system. Acute pancreatitis can be due to various etiological factors. In Indian population it is commonly due to alcohol and gall stones. The incidence of AP is increasing steadily. There is an increase of 2.7% per year in the incidence of AP between 1988 and 2010.<sup>1</sup>

AP can be categorized into mild, moderately severe, and severe. It is not only important in diagnosing AP, but also categorizing the grade of severity. Usually mild acute pancreatitis (MAP) resolves by itself, but severe acute pancreatitis (SAP) has a good chance of mortality due to

fatal complications. SAP is seen in 20% of patients.<sup>2</sup> There is a wide variation in morbidity and mortality between MAP and SAP (mild <5% versus severe 20-25%).<sup>3,4</sup> Determinants of outcomes are presence of organ failure or local complications. To improve the clinical outcome in AP, an accurate assessment of severity and appropriate management plan is essential.

The pathophysiological changes in acute pancreatitis are most marked in the first 24-72 hours of the illness. Supportive therapy is considered as the most important therapeutic strategy in the management of acute pancreatitis. Early fluid resuscitation is believed to play an important role in the prevention of complications like

pancreatic necrosis and organ failure by preserving pancreatic micro circulation.<sup>5</sup> But the evidence of benefit of early aggressive fluid therapy on the prognosis of acute pancreatitis is derived from indirect data. Recent studies show that patients who received small amount of fluids during the initial 24 hours did not have a worse outcome and the administration of a great amount of fluid during the initial 24 hour was independently associated with organ failure and local complications.<sup>6</sup> The failure to clearly demonstrate the superiority of one fluid strategy over another may come from the great variability of individual response to volume expansion and the specific hemodynamic status of each patient at a given time.

This study aims at analyzing the persistence or occurrence of SIRS and organ failure in patients with acute pancreatitis receiving normal volume fluid therapy and high volume fluid therapy in the initial 24 hours.

## METHODS

This was a single centered prospective observational study conducted in the Department of General Surgery and Department of Gastroenterology, St. John's Medical College Hospital, Bangalore, a tertiary level teaching hospital. Study period was from June 2016 to July 2017. The sample size was calculated using nMaster software with a confidence interval of 80% and an alpha error of 5%. Sixty patients admitted with AP as per the definition of modified Atlanta criteria were included in the study. Exclusion criteria included: patients with congestive cardiac failure and chronic renal diseases; patients already received treatment from other hospitals; patients presenting after 48 hours of onset of symptoms and pregnant women. This study was approved by the St. John's Medical College and Hospital institutional ethics committee.

At admission, haematocrit, haemoglobin, blood counts, arterial blood gas analysis, liver function test, serum amylase and serum lipase values are obtained. Patients who receives intravenous fluids at a rate of 100-150 cc/hour in the first 24 hours was included in the normal volume group and those receives intravenous fluid at a rate of 150-250 cc/hour was included in the high volume group. Systemic inflammatory response syndrome (SIRS) score and modified Marshalls score were accessed at admission. Patients are assessed at 24 and 48 hours for the persistence or worsening of SIRS, organ failure and local complications.

All analysis was performed using Statistical Package for the Social Sciences (SPSS) version 2.15.0.

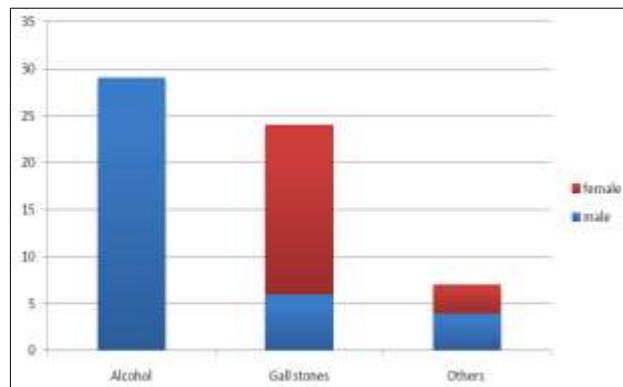
## RESULTS

The study population consisted of 39 males (65%) and 21 females (45%) (Table 1). The etiology of acute pancreatitis was most commonly alcohol (n=29; 48.33%) and gallstone (n=24; 40%) related. Other 7 cases were due to drugs and

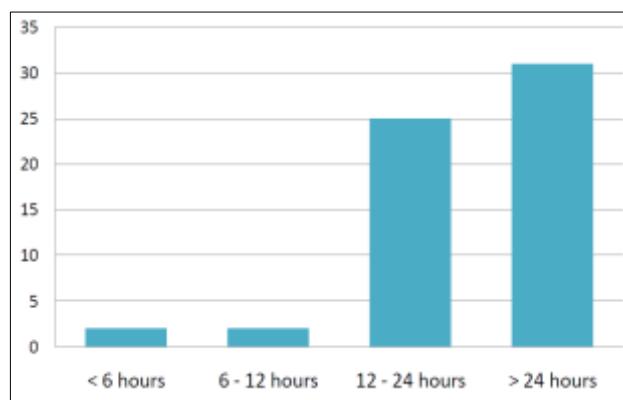
post endoscopic retrograde cholangiopancreatography (ERCP) (Figure 1). 41 patients (68.33%) presented with classical symptoms of AP. Most of the patients (51.66%) presented after 24 hours from the onset of symptoms (Figure 2).

**Table 1: Gender distribution of study population.**

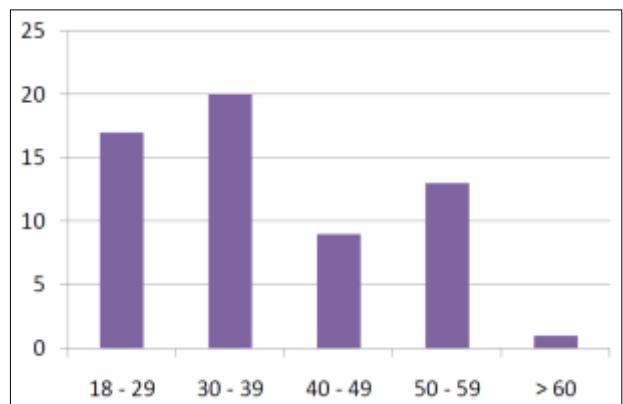
Sex	Number	Percentage
Male	39	65
Female	21	45



**Figure 1: Etiological causes of acute pancreatitis.**



**Figure 2: Time of presentation.**



**Figure 3: Age distribution of the study population.**

**Table 2: Complications of AP in normal and high volume group at admission and 48 hours.**

Complications	Normal volume		High volume	
	Admission	48 hours	Admission	48 hours
<b>SIRS</b>	7	4	13	4
<b>Organ failure</b>	1	2	4	1
<b>Local complications</b>	0	1	0	1

In the normal volume group the mean amount of fluid given in initial 24 hours was  $2495 \pm 273.34$  ml and the mean rate of fluid administration was  $105.833 \pm 10.75$  ml/hour. In the high volume group the mean amount of fluid given in initial 24 hours was  $5793 \pm 884.71$  ml and the mean rate of fluid administration was  $259.33 \pm 39.29$  ml/hour. The fluids used were normal saline and ringer lactate.

Persistence/worsening of SIRS at 48 hours were more in normal volume fluid group compared to the high volume fluid group ( $p=0.076$ ). Organ failure at 48 hours is more in normal volume fluid group compared to the high volume fluid group ( $p=0.074$ ). Incidence of local complications was equal in both groups (Table 2). In normal volume group with organ failure the system involved was renal system in one and respiratory system in the other. In high volume group the organ system involved was renal system.

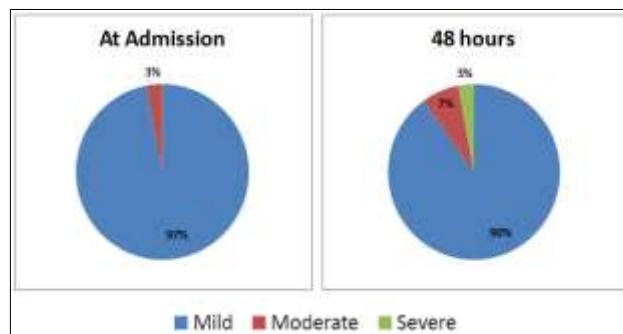
## DISCUSSION

In our study 65% of the patients with AP were males. Few other studies too have found a male predominance in AP, also suggesting a significant association between the gender and etiology of AP. Alcohol is the primary cause for both acute and chronic pancreatitis in most of the countries; both being common in men.<sup>7</sup> 48% of AP in our study was secondary to alcohol abuse and seen only in male patients. 40% of AP was secondary to gallstone disease with a female predominance; this gender-etiologic pattern seen in other studies too. In our study 61.66% of patients were between the ages of 18-40 years (Figure 3). Gallstone pancreatitis is more common in female subjects, and alcoholic pancreatitis was more common in middle-aged male subjects.<sup>8,9</sup> Other etiological factors for AP observed in the study included post ERCP, drugs and idiopathic. Two patients developed post ERCP acute pancreatitis. The drugs which caused AP were steroid and valproate. This observation gains importance in the view that most of the patients who develop AP are in the younger productive age group. Morbidity, mortality, diagnostic and treatment costs associated with AP will have an adverse health and socioeconomic outcome on these patients at an individual level and at the societal level.

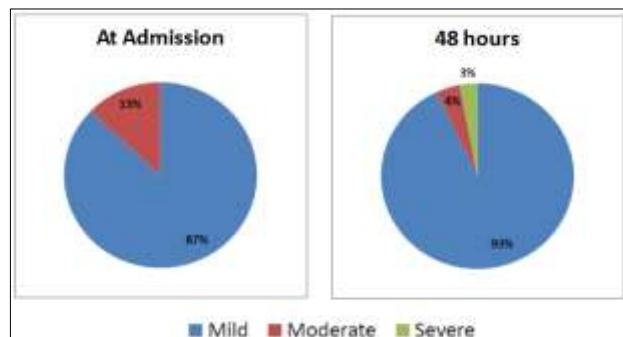
In the study 41.66% had a normal body mass index (BMI), but 53.32% had a BMI more than 23. Various studies have shown that obesity is associated with an amplified systemic inflammatory response in acute pancreatitis and is a prognostic factor for mortality, local, systemic complications and severity in AP.<sup>10</sup> Most of the patients in

our study group (51.66%) presented after 24 hours from the onset of symptoms. This observation is important as the pathological changes in AP develop much earlier before the serum tests are positive. This delay in presentation of the patients to hospital and initiation of fluid therapy may have an influence on the outcomes of the disease.

In the normal volume group patients received intravenous fluids at an average rate of  $105.833 \pm 10.75$ . The type of fluid used was normal saline and ringer lactate solution. In normal volume group at admission 97% of patients had mild pancreatitis and 3% had moderate/severe pancreatitis according to revised Atlanta criteria. After 24 hours of normal volume intravenous fluid therapy 90% had mild pancreatitis, 7% had moderate/severe pancreatitis and 3% had severe pancreatitis.



**Figure 4: Severity of acute pancreatitis at admission and after 48 hours in the normal volume group.**



**Figure 5: Severity of acute pancreatitis at admission and after 48 hours in the high volume group.**

In the high volume group patients received intravenous fluids at an average rate of  $259.33 \pm 39.29$ . At admission 87% of patients in the high volume group had mild

pancreatitis and 13% had moderate severe pancreatitis according to revised Atlanta criteria. After 24 hours of high volume intravenous fluid therapy 93% had mild pancreatitis, 4% had moderate severe pancreatitis and 3% had severe pancreatitis.

At the time of presentation, in the normal volume group 7 patients had SIRS and 1 patient had organ failure. At the end of 48 hours 4 patients had SIRS, 2 patients had organ failure and 1 patient developed local complication in the form of acute fluid collection. In organ failure the system involved was renal system in one and respiratory system in the other (Figure 4). In the high volume group 13 patients had SIRS and 4 patients had organ failure at the time of admission. After 48 hours 4 patients had SIRS, 1 had organ failure and 1 developed pancreatic ascitis (Figure 5). The organ system involved was renal system.

Persistence/worsening of SIRS at 48 hours are more in normal volume fluid group compared to the high volume fluid group ( $p=0.076$ ). Organ failure at 48 hours is more in normal volume fluid group compared to the high volume fluid group ( $p=0.074$ ). Incidence of local complications equal in both group. However the above observations did not have any significance. Many recent prospective studies suggest that early aggressive fluid therapy is not associated with improved outcomes in patients with AP.<sup>11,12</sup> These studies also have shown an association between aggressive fluid resuscitation and increased organ failure, acute pancreatic fluid collection, renal and respiratory insufficiency, intensive care unit admissions, sepsis and mortality. There are few observational studies which support aggressive fluid management in AP.<sup>13,14</sup> However most of the randomized trials provide evidence in favour of non-aggressive fluid therapy.

At present aggressive fluid therapy is the recommended for initial management of AP. However our study did not show any significant difference in outcomes in patients with AP receiving normal or high volume fluids in the initial 24 hours. One main limitation of our study was that most of the patients in our study group presented after 24 hours from the onset of symptoms. This delay in presentation of the patients to hospital and initiation of fluid therapy may have an influence on the outcomes.

## CONCLUSION

To conclude we have not found any statistically significant difference in the clinical outcomes of AP patients receiving normal or high volume fluid resuscitation in the initial 24 hours. We have found that our study does show the need for multi-centric randomized control trial with a larger study population to determine the rate and type of fluid resuscitation in the initial management of patients with AP.

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