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CLINICAL SPECTRUM AND OUTCOME OF ACUTE KIDNEY INJURY IN PATIENTS WITH ACUTE PANCREATITIS

Nephrology

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KEYWORDS

AKI, acute pancreatitis, Marshall Score

INTRODUCTION:

Severe acute pancreatitis (SAP), is a systemic disease in which the local inflammatory pathological changes of the pancreas involve multiple organs[1]. SAP has an acute onset, rapid progression, high incidence of complications and high mortality (7% to 47%).Acute kidney injury (AKI) occurs in SAP due to third space loss, intraabdominal hypertension, septic shock and abdominal compartment syndrome[2]. AKI leads to higher risk of morbidity and also increases cost of treatment.

AKI in the setting of SAP has been shown to have a 10-fold increase in mortality (74.7% versus 7%) [2]. AKI is characterized by rapid loss of kidney excretory function and is diagnosed by decreased urine output or the accumulation of end products of nitrogen metabolism (urea and creatinine) or both[3]. Acute pancreatitis causes peri-pancreatic fluid sequestration that reduces extra cellular fluid (ECF) volume and intravascular volume, leading to decreased renal perfusion and glomerular filtration rate causing acute kidney injury (prerenal). Systemic inflammation increases the vascular permeability leading to accumulation of fluid in the peritoneal cavity and extra peritoneal space, that increases the intra-abdominal pressure and thereby decreasing the renal perfusion[4]. Various inflammatory mediators (cytokines and increased nitric oxide synthesis) are released into the systemic circulation that cause systemic vasodilatation and stimulation of baroreceptors, resulting in increased sympathetic activity and angiotensin production which ends up in reduction in glomerular filtration rate (GFR) and multiple organ dysfunction. The exact mechanism of AKI in patients with acute pancreatitis is still unclear. The combination of renal disease and SAP can occur as a result of systemic conditions that affect many organs not only kidney and pancreas[5].

Incidence of AKI in acute pancreatitis is high. However there are no elaborate studies in our country to know the exact incidence[6]. Very few studies available from our country which include those done at Stanley Medical College, and at Aurobindo college, which were done using APACHE and RASNSON score[7] to determine the severity of pancreatitis. To my knowledge very few studies were based on Modified Marshall score in our country till now. Many of the already done studies did not include renal biopsy to identify the pathology of renal dysfunction [8]. After taking institutional ethical committee approval the study was started.

AIMS AND OBJECTIVES:

To prospectively assess hospitalized patients who have Acute Pancreatitis with AKI to know the clinical spectrum of the disease. To determine the impact of severity and outcome of AKI in patients with Acute Pancreatitis.

MATERIALS AND METHODS: carried out at Department of Visakhapatnam, Andhra Pradesh

This is a prospective, observational study Nephrology, KING GEORGE HOSPITAL, from April 2018 to December 2019.All thepatients with Pancreatitis and AKI were studied. Acute Pancreatitis was diagnosed based on clinical grounds and lab investigations (USG abdomen, amylase and lipase). AKI was diagnosed based on AKIN criteria.

INCLUSION CRITERIA

1. Age > 18 years
2. Patients with acute pancreatitis
3. Presence of AKI based on AKIN criteria
4. Documented normal serum creatinine prior to this episode

EXCLUSION CRIERIA

1. Age < 18 years
2. Chronic kidney disease
3. Underlying renal disease
4. Patients using nephrotoxic agents
5. Patients with pancreatitis due to surgery and chronic pancreatitis
6. Acute or chronic renal replacement therapy before admission
7. Pregnant and lactating mothers

PATIENT VARIABLES

Demographic information such as name, age, gender, history of prior illness and reason for admission and presenting symptoms were noted. Baseline serum creatinine values were determined through review of all serum creatinine values taken from patient during the preceding 12 months. If no preceding value is available then creatinine at admission is taken as baseline and peak serum creatinine value is noted. Progress of the patients and evidence of other organ failure noted.

Requirement for renal biopsy-Indications –
1. Proteinuria > 1 g/day
2. Hematuria,
3. Non recovering AKI

Renal biopsy was performed under ultrasound guidance with a biopsy gun (BARD gun 16/18 gauge, 22mm cutting edge). Examination of renal biopsy tissue was done by light microscopy (hematoxylin and eosin (H and E), periodic acid Schiff (PAS), and methenamine silver staining) and immuno fluorescence microscopy using fluorescein isothiocyanate (FITC) conjugated rabbit anti-human immunoglobulin IgG, IgM, IgA, and C3 antibodies. The intensity was semi quantitatively scored as 0 for negative, 1+ for present, 2+ for definite, 3+ for strongly positive. Electron microscopy was not used as this facility is not available to us.

Duration of hospital stay and the progress of patient (complications) during hospital stay noted. Requirement of RRT and number of sessions of HD and the outcome at discharge (complete recovery, partial recovery, mortality) will be noted.Patients are followed up for a period of 3 months

Patients who developed pancreatitis, and the supportive laboratory and clinical evidence were eligible. Serum amylase, serum lipase, ultrasound abdomen were taken into account for the diagnosis. The diagnosis of Acute Pancreatitis is established by the presence of two of the three following criteria:
(i) Abdominal pain consistent with the illness,
(ii) Serum amylase and / or lipase greater than three times the upper limit of normal, and / or
(iii) Characteristic findings from abdominal imaging.

Severity of pancreatitis is classified based on APACHE score and Atlanta classification based on Modified Marshall score.

ACUTE KIDNEY INJURY

AKIN criteria was used to diagnose AKI, that required an absolute increase in serum creatinine of 0.3mg/dl above baseline or increase to 150% of baseline within 48 hours. Urine output of <0.5 ml/kg/hr for 6

to 12hrs is also defined as AKI as per AKIN classification.

In the study period a total of 160 patients with pancreatitis were identified of which 62 had various renal disorders. After exclusion of CKD and other renal disorders a total of 40 patients were with pancreatitis and AKI were included in the study. Patients with pancreatitis due to surgery or patients with chronic pancreatitis were excluded from the study

STATISTICALANALYSIS:
For descriptive statistical analysis, mean, standard deviation, and frequencies were calculated. Different characteristics were represented as numbers or percentage wherever required. Statistical analysis was done by statistical software SPSS for Windows v17.0 (SPSS, Chicago, IL, USA). Comparisons between groups were performed using the Student *t*-test or the Mann–Whitney *U* test for Continuous variables and the chi-square test ($c2$) or the Fisher exact test for categorical data *p*-Value shows the significance level ($p < 0.05$).

Outcomes- The primary outcome was mortality during the hospitalization

RESULTS:
Total of 40 patients were studied. The number of males in the study population is more when compared to females which is statistically significant. Of the total population majority (85%) of them are males and the remaining were females (15%).Majority of the patients (n =33) were middle aged in the range of 30-59 yrs. Only 1 patient was above 60 yrs of age. 6 patients were younger than 30 yrs. Majority of the patients were in the middle age probably reflecting the high incidence of alcohol intake in this age group. Overall mean age is 42.33±8.61 years. There is no significant mean difference in age between males and females. Abdominal pain was the most common presenting symptom, seen in all the patients (100%) in the study. Oliguria is seen in 26(65%) patients, followed by vomitings in 14(35%) cases.Fever, pedal oedema, dyspnoea were seen in few patients.

5 patients in the total study group had hypertension. 5 patients had diabetes,4 patients had CAD. 7 patients had other comorbidities that included HIV and hypothyroidism. However 19 patients (51%) had no comorbidities.

27 (67.5%) patients had bulky pancreas in USG abdomen. 7 patients had normal sized pancreas. USG abdomen could not be done in 6 patients, as the patients were in ICU on ventilator. Alcohol is the commonest etiology for acute pancreatitis in our study population and majority of the alcoholics are males. Cholelithiasis was the commonest etiology in females. In this study alcohol is a significant risk factor compared to gall stones (p<0.05).

Renal biopsy was done for a total of 25 patients, indications being non recovering AKI, active urinary sediment, and nephrotic range proteinuria. Of the total, majority (n-=19) had acute tubular necrosis, 4 had patchy cortical necrosis, 2 patients were found to have Ig A nephropathy.

Table 1: Biopsy Of Patients

BIOPSY	Frequency	Percent
ATN	19	47.5
Ig A Nephropathy	2	5.0
Patchy Cortical Necrosis	4	10
not done	15	37.5
Total	40	100.0

All the patients whose biopsy revealed ATN survived. 1 patient who had cortical necrosis on renal biopsy expired, all the remaining patients survived. 2 patients who had Ig A nephropathy also recovered. Majority of the patients who underwent biopsy were males (n = 20) i.e. around 84%, 4 were females (16.6%).All the patients who had patchy cortical necrosis progressed to CKD, only 1 patient with ATN progressed to CKD. All the patients who had Ig A nephropathy have recovered.

Majority of the patients who underwent biopsy were males (n = 20) i.e. around 84%, 4 were females (16.6%).All the patients who had patchy cortical necrosis progressed to CKD, only 1 patient with ATN progressed to CKD. All the patients who had Ig A nephropathy have recovered. Of the total patients, 10(25%) of them had recurrent pancreatitis, of which 8(80%) are males and 2(20%) are females.

Of all the patients with recurrent pancreatitis, 2 patients had AKI in the past episode; both these patients were males with history of alcohol intake. 8 patients had past history of acute pancreatitis without AKI. In the study population majority of the patients 26 of the total (65%) were categorized under AKIN stage 3. 12(30%) patients as AKIN stage 2 and remaining (5%) as stage 1.Recovery status of the study population is dependent on the stage of AKI. All the 14 patients who had AKIN stage 1 and stage 2 have recovered. (2 patients - stage 1, 12 patients - stage 2). All 3 patients who expired had AKIN stage 3 kidney injury. The remaining 23 patients who had AKIN stage 3 have survived.

Patients with AKIN stage 3 had higher level of serum creatinine, Platelet count and Pao2/Fio2 when compared to those patients who had lower stages of AKIN which is statistically significant. There is no significant difference among the three groups with regard to proteinuria, total count, and lipase and amylase levels.AKI stage 3 has higher duration of stay in the hospital when compared to other staging which is statistically significant.Of the total study population, 5 patients (12.5%) progressd to CKD . 3 patients have expired and the remaining 32 patients have recovered.All the patients who progressed to CKD had AKIN stage 3 renal failure. All the patients who progressed to CKD had multiple organ dysfunctions. Out of all the patients who progressed to CKD 4 had cortical necrosis on biopsy and 1 had ATN.All the patients (n = 3) who expired were males, of all the patients who expired 2 had diabetes and 1 had hypertension.Of the survivors 31 were males (n=83%), 6 were females (16%), out of which 7 had diabetes, 3 had hypertension, the remaining had no comorbidities. 5 of the survivors had progressed to CKD. When the laboratory parameters of survivors and non survivors are compared,there is a significant difference in the mean values of serum creatinine, total count, AST, lipase, amylase and PaO2/FiO2. Non survivors had a higher creatinine, higher total count, and higher levels of AST and ALT and lower O2 saturation compared to non survivors.In the remaining variables there is no significant mean difference among survivors and non survivors

Table 2: Comparison of mean values of different lab parameters with recovery status

	RECOVERY	N	Mean	Std. Deviation	PValue
CREATININE	NonSurvivors	3	5.800	1.7088	<0.05
	Survivors	37	3.168	2.1559	SIG
BILURUBIN	NonSurvivors	3	6.933	4.0266	>0.05
	Survivors	36	2.689	1.3835	Not.SIG
AST	NonSurvivors	3	953.33	344.287	<0.05
	Survivors	37	450.00	208.846	SIG
ALT	NonSurvivors	3	426.67	250.067	>0.05
	Survivors	37	149.19	92.327	Not.SIG
PROTEINUREA	NonSurvivors	3	523.667	467.0228	>0.05
	Survivors	36	358.453	365.3045	Not.SIG
TC	NonSurvivors	3	14733.33	2230.097	<0.05
	Survivors	37	10091.89	2405.362	Not.SIG
PLATELET COUNT	NonSurvivors	3	1.3000	.78460	>0.05
	Survivors	37	1.6243	.45790	SIG
LIPASE	NonSurvivors	3	560.00	96.437	<0.05
	Survivors	37	389.19	119.429	SIG
AMYLASE	NonSurvivors	3	1063.33	109.697	<0.05
	Survivors	37	793.78	192.590	SIG
PAO2/FIO2	NonSurvivors	3	233.33	28.868	<0.05
	Survivors	37	420.27	69.101	SIG

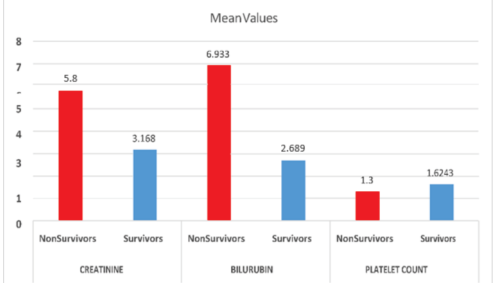

Figure 1: Comparison of mean values of parameters in Survivors and Non Survivors

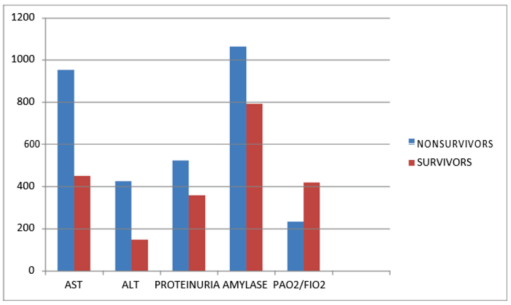

Figure 2: Comparison of mean values of parameters in Survivors and Non Survivors

Majority of the study population (n=24) required renal replacement therapy (60%). Of the total population 40% (n=16) did not require renal replacement therapy. RRT is given in the form of hemodialysis. Among survivors 64% of population (n= 27) underwent RRT. All the patients who expired required RRT in the form of hemodialysis. Of the patients who received RRT 5 of them progressed to CKD and the remaining recovered. 26 patients of the total population who received RRT had AKIN stage 3. The remaining 4 patents had AKIN stage 2. All the 3 patients who eventually expired also underwent RRT.

Severity of pancreatitis as determined by Modified Marshall score, the more severe the pancreatitis as determined by Marshall Score, the more severe the organ damage as evidenced by greater creatinine, greater bilurubin values and lower O2 saturation. Except for ALT and proteinuria all variables have significant mean differences among the three groups. Patients who had MARSHALL SCORE value > 5 has higher duration of ICU stay when compared to lower score which is statistically significant.

Table 3: Mean Values Of Various Lab Parameters Versus Marshall Score

	MARSHALLSCORE						P Value
	<2		2-5		>5		
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	
Creatinine	2.4	.7	4.3	1.2	7.0	2.5	<0.05*
Bilirubin	2.6	1.2	2.5	1.3	5.2	3.3	<0.05*
AST	456	223	429	173	683	380	<0.05*
ALT	146	83	152	98	251	215	>0.05
Proteinuria	432.2	362.5	357.5	360.1	312.0	435.3	>0.05
Tc	12217	1667	13010	2564	15225	1895	<0.05*
PlateletCount	1.77	.51	1.64	.41	1.25	.49	<0.05*
Lipase	351	85	384	103	525	158	<0.05*
Amylase	757	229	753	127	1054	122	<0.05*
Pao2/Fio2	463	21	425	59	275	48	<0.05*

DISCUSSION

AKI is a common complication associated with a poor prognosis in patients with acute pancreatitis. In critically ill patients[9] AKI, independent of other predictors of outcome such as preexisting chronic disease, uncontrolled infection, number of organ system failures, contributes to mortality[10].This is a prospective study conducted at our center. The incidence rate ranges from 14% to 42%[11,12] in previous studies. In the patient population at our center, the incidence rate of AKI was 25%. A similar Indian study conducted by Departments of Nephrology and Medicine, Sri Aurobindo Institute of Medical Sciences, Indore, India, had an incidence around 20%. A study conducted by Hao et al, Zhoaaxin et al in the Department of Emergency Medicine, Hunan province, China reported an incidence of around 18%. Another Indian study conducted by Manokaran, Edwin Fernando, at Stanley Medical College reported an incidence of 32%. However, comparison between studies is difficult because of differences among patient populations and criteria for inclusion of patients. The reported incidence of AKI (25%) in the patients of this study does not reflect the true incidence of renal disease, because only hospitalized patients were included. Routine screening for evidence of renal disease in all patients with acute pancreatitis may provide better incidence of renal disease in the local population. The mean age of patients with pancreatitis with AKI was 42.33±8.61 yrs. in our study. Maximum numbers of patients were in the age group of 30 to 59 years (82.5%), 15 % of the population aged less than 30 yrs. Only one patient is older than 60 yrs.

In our study age was an insignificant factor for the development of AKI. Company et al reported that age positively correlated with the prognosis of acute pancreatitis, however in a study, conducted by Ravindra Kumar, Naresh Pahwar, Departments of Nephrology and Medicine[13], Sri Aurobindo Institute of Medical Sciences, Indore, India found that age was an insignificant risk factor for AKI in patients with SAP. A study by Li et al. Had an average age of 54.29 ± 9.85 also revealed that age was an insignificant factor in the development of AKI in patient with acute pancreatitis. Mean age of patients who had acute pancreatitis was 42.92 ±12.60 years. In the study conducted by Manokaran, Edwin Fernando, at Stanley Medical College, with no significant difference seen between the patients with AKI and patients with no AKI in terms of age (p 0.47).In a study conducted by Jiao, Yi Li, YI Tang in China revealed mean age of 50.2 yr.

Males constituted about 85% of the study population, where as females were only about 15% of the total which is statistically significant. In a study conducted by Jiao Jiao Zhou,Yi Li, et al in Division of Nephrology, West China Hospital , males constituted about 56.8%[14]. In another study conducted by D. D. Tran et al, Division of Nephrology, Amsterdam, The Netherlands, male constitute 56 % which Is statistically insignificant .In an Indian study done at Department of Nephrology and Medicine[13], Sri Aurobindo Institute of Medical Sciences, Indore, of a total of 72 patients 58(80.5%) were males, which corresponds to this study .The higher incidence of males may be probably due to the higher consumption of alcohol by males in our population. Most common etiology of pancreatitis in males was chronic alcoholism (85%). In females gall stones is the common etiology in this study, which is statistically significant. The high incidence of males in the study may be probably due to the higher consumption of alcohol by males in our population. In an Indian study done at Departments of Nephrology and Medicine[13], Sri Aurobindo Institute of Medical Sciences, Indore, the major cause of pancreatitis was alcohol intake in 33.33%patients, cholelithiasis in 25% of patients and necrotizing pancreatitis in 20.8% patients. In a study conducted in China, by Haao et al had biliary causes as the most common etiology followed by alcohol which is statistcally insignificant, probably reflecting the lesser prevalence of alcohol abuse. Previous studies found that alcohol consumption increased the risk of kidney failure by initiating and/or promoting atherogenic risk factors, such as high blood pressure, hyperuricemia, insulin resistance and diabetes. The results of this study support the same .In this study the higher incidence in males is statistically significant.

Abdominal pain was the most common presenting symptom in our study, seen in all the patients followed by, Oliguria seen in 26(65%) of the cases, and vomitings in 14(35%) cases. Fever, pedal oedema, dyspnoea were seen in few patients.

Diabetes was present in 12.5% of the total study population, 12.5% had hypertension and 10% had past history of CAD. An Indian study done at Stanley Medical College found that there were higher proportion of diabetics in AKI group when compared to non-AKI group (40.63% vs 14.71%). This difference was statistically significant (p value is 0.004). Another Indian study done at, Sri Aurobindo Institute of Medical Sciences, Indore found that although the differences were not statistically significant, the patients with diabetes, hypertension had a higher risk of development of AKI in SAP. However in our study diabetes or hypertension had no effect on the prognosis of patients with acute pancreatitis who developed AKI.

Majority of patients in our study presented with AKIN stage 3(67.5%) followed by stage 2(27.5%), only 2 patients presented with stage 1,

similar to the study done by Jiaojiao Zhou et al in Division of Nephrology, Kidney Research Institute, China in which 29.0% had AKI I, 39.5% had AKI II, and 56.6% had AKI III, based on AKIN staging .In Another Indian study done by Manokaran, Edwin Fernando et al, 81.25 of the total patients had AKIN stage 1 followed by stage 2 (12.50%) and stage 3 6.28%)[22], additionally in this study the risk of death is high if AKI stage >1 at admission (odds ratio:3.59) .In our study,patients with AKIN stage 3 had a significant higher level of S.creatinine , platelet count and Pao2/Fio2 when compared to those patients who had lower stages of AKIN which is statistically significant. Patients with AKIN stage 3 had a higher duration of stay in hospital that is statistically significant. All the patients who expired had AKIN stage 3. In a study conducted in China by Jiao, Yi Li showed statistically significant difference in values of creatinine , AST, ALT, and presence of diabetes

, in the patients who had AKIN stage 3 as compared to stage 2 and stage 1. Thus patients with more severe renal dysfunction as denoted by higher stage of AKIN ,had associated other organ failure as evidenced by thrombocytopenia, hypoxemia (respiratory system), higher total counts(higher incidence of sepsis), and higher morbidity as denoted by longer duration of stay in the hospital . All the patients who expired in the study had AKIN stage 3, which denoted that more severe the renal injury, greater the mortality.

Renal biopsy was done in 25 (60%) of the total patients. Indications for biopsy include significant proteinuria or non recovering AKI (> 21 days). Of the total patients who underwent biopsy 21 are males (83%), females constituted around 17% (n = 4). Of all the patients who underwent biopsy 19 (75%) had acute tubular necrosis, 4 (16.6%) had patchy cortical necrosis and 2 patients had Ig A nephropthy. Majority of patients with ATN recovered, however one (5.5%) patient progressed to CKD. All the patients with patchy cortical necrosis progressed to CKD (100%). Both the patients with Ig A nephropathy recovered during the follow up period of 3 months. Patients with patchy cortical necrosis had involvement of other organ systems namely cardiovascular (evidenced by low blood pressure), respiratory (low pio2/fio2), and hepatic (elevated bilurubin).

A study conducted by Beisel et al diagnosed bilateral renal cortical necrosis at autopsy of patients with acute pancreatitis who succumbed to the illness. Another study conducted by Gupta et al in Australia had a higher incidence of acute tubular necrosis in their biopsy samples. In this study the major histological findings are ATN and patchy cortical necrosis. Patients with ATN had less severe disease and better prognosis, as only 1 of the total involved patients progressed to CKD. All the patients with cortical necrosis progressed to CKD. Patients who had cortical necrosis had severe disease as evidenced by multiple organ dysfunctions. Renal biopsy could not be done in 3 patients who eventually expired since the general condition of the patients was unstable.

Modified Marshall Score that is used to assess severity of organ dysfunction in acute pancreatitis is higher in patients with patchy cortical necrosis averaging around 7.25, however the average score in patients with ATN is 3.9.

In our study 100% of patients with renal failure had involvement of other organ systems. In our study majority of them had hepatic dysfunction, that is 35 (87.5%) of the total study population, cardiovascular system is involved in 25% of the cases , respiratory system is involved in 25% of the cases. In a study conducted by D.D.Tran, C.W.de Fijter et al only 2% had AKI alone without involvement of other organ systems (as shown in the table below). This study noted the contrast of the excellent prognosis of patients with isolated ARF and the unfavorable outcome in ARF patients with concomitant organ system failure, as observed in critically ill patients. The involvement of any additional organ system failure in the course of ARF increased mortality from 0 to 86-100% in the patients. Furthermore, survival was inversely related with the number of other organ system failures, and almost all patients with two or more organ system failures died in the study. Our study signifies that acute pancreatitis has systemic effects that eventually led to dysfunction of multiple organ systems, and the involvement of renal system predisposes (risk factor) to dysfunction of other organ systems .

All the patients who progressed to CKD had AKIN stage 3, so in patients with acute pancreatitis more severe the renal failure poorer the overall prognosis and also renal prognosis. Majority of the patients (4 out of the total 5 patients) who progressed to CKD had cortical necrosis on renal biopsy 1 patient had ATN. All the patients who progressed to CKD had cardiovascular system involvement as evidenced by low blood pressure, 4 patients had respiratory failure (hypoxemia), 4 had liver dysfunction (elevated bilurubin and liver enzymes).

Of the total 34(85%) patients who required renal replacement therapy in the form of haemodialysis , 25(73.5%) were males, 6(17.6%) were females ,out of which 3 males expired .Majority of the patients who required RRT had AKIN stage 3. In a similar Indian study 71%.52 of the patients required RRT. A study in China done byJiaojiao Zhou, Yi Li, 59% of the total required RRT, of the patients who received RRT, 5 of them progressed to CKD and the remaining recovered. 26 patients of the total population who received RRT had AKIN stage 3. The remaining 5 patients had AKIN stage 2(indications for dialysis being hyperkalemia and uremic encephalopathy). All the 3 patients who eventually expired also underwent RRT .so majority of patients with more severe disease required RRT. The patients who needed RRT had poorer renal prognosis and overall prognosis. In a study done by D.D.Tran[16],P.L.Oe et al 95% of patients in the non survivors group required RRT, where as no patient in the survivor group required RRT.

The severity of acute pancreatitis as determined by Atlanta classification based on Modified Marshall score of organ dysfunction in this study revealed that out of the total 29 patients had score in the range of 2-5 . Only 3 patients had score below 2 (mild pancreatitis), all the patients with mild pancreatitis recovered spontaneously. 8 patients had score more than 5, out of which 3 expired and the 4 of them progressed to CKD. So patients with severe pancreatitis had a poor overall outcome and poor renal outcome. Similar to this, in a study done by Yi Le et al[15] , severe pancreatitis as defined by higher APACHE[17] and higher CT severity index had a higher prevalence of AKI. A similar study conducted by Ljutic D et al has showed multiorgan failure as an important prognostic factor for AKI in acute panceatitis.[18]. Another study conducted by D.D Tran et al showed that the mean number of organ system failures was greater in patients with AKI. In a study done by HUNG-YUAN LIN, JIUN-I LAI et al validates this concept that acute renal failure is associated with extremely high mortality in SAP patients, and also shows that severe acute pancreatitis itself is associated with higher incidence of acute renal failure[19].

Of the total patients, 10 (25%) had past history of pancreatitis without any evidence of chronicity, out of which only 2(20%) had past history of AKI, 8 cases had past history of pancreatitis without any evidence of AKI. In a study conducted by Hao et al in china[20] ,around 81% had recurrent pancreatitis, of which 18% had past history of AKI during the episode of SAP. In both the studies presence of AKI in the past was not proven to be a significant risk factor for development of AKI In the present episode.

When the characteristics of survivors and non survivors are compared in our population, all the 3(7.5%) patients who expired were males. All those who expired had alcoholic intake history, all the expired patients had AKIN stage 3 based on AKIN criteria. Elevated serum creatinine, higher total count, AST, lipase, amylase and lower PaO2/FiO2 were significantly associated with mortality. All the patients who expired had involvement of more than 3 organ systems. A study conducted by Hung Yuan et al in China revealed that patients with both diagnosis of AP and ARF had a increased mortality rate of 23.76% in the same hospitalization when compared to patients with AP alone without AKI, who had a mortality rate of 8.08%[21]. In an Indian study done at Stanley Medical College, Chennai, four patients expired (12.5%) in AKI group, while only one patient expired in non-AKI group (p- 0.018).

{In this study diabetes, alcohol intake, creatinine >2.4 mg/dl at admission were the important risk factors for mortality[22]. }

Our results are comparable to another Indian study one at Indore where of 72 patients, 8 patients expired during the course of the treatment, of which 6 (75%) patients developed multiple organ failure; no SAP patient without AKI died during the study period. Another study conducted in China by Jiao Yi et al[20] revealed that pancreatitis patients with AKI experience a significantly higher ICU mortality compared with those who never develop AKI during intensive care (20.5% vs 44.9%, p <0.001),similarly other studies done at China by Lin et al also found out that pancreatitis patients with AKI had a higher mortality

rate compared to those patients who did not develop AKI. This study has showed that the mortality is associated with multiorgan failure as evidenced by elevated creatinine, elevated bilurubin and low blood pressure along with hypoxemia in these patients , patients who have severe renal failure had higher chance of mortality.

CONCLUSION

- Incidence of AKI in the patients at our center is 25%, which signifies a higher incidence of kidney injury in patients with acute pancreatitis
- Higher incidence of males in the study population and the most commonetiology being alcohol, denotes the higher incidence of alcohol addiction in our state.
- A significant number of patients progressed to either CKD or succumbed to the illness signifying the grave prognosis of AKI in acute pancreatitis.
- Majority of the renal biopsies showed ATN, signifying toxin induced or is chemia induced renal cell injury.
- All the patients who expired had severe AKI (stage 3), and more severe organ failure. Renal failure is a significant prognostic indicator in acute pancreatitis.

More severe the renal injury poorer the renal prognosis and worser the patient survival.

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