

Original Research Article

“A STUDY ON MODIFIED CT SEVERITY INDEX FOR EVALUATION OF ACUTE PANCREATITIS AND CORRELATION WITH PATIENT OUTCOME”

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ABSTRACT

Background: Acute pancreatitis is a process of acute inflammation of pancreas usually caused by biliary stone, alcohol ingestion, metabolic factors and drugs. Abdominal pain is the major symptom of acute pancreatitis.

Objective: To study the prognostic value of MDCT in acute pancreatitis and to correlate modified CT severity index with clinical outcome.

MATERIAL & METHODS: **Study Design:** Prospective Observational study. **Study area:** The study was done in Department of Radio diagnosis, Integral Institute Of Medical Sciences And Research, Integral University, Lucknow, Uttarpradesh. **Study Period:** June 2021 – March 2022. **Study population:** patients admitted to Hospital with clinical impression of acute pancreatitis. **Sample size:** A total of 47 were included in the study. **Sampling method:** purposive sampling method. **Study tools and Data collection procedure:** Patients admitted to Hospital with clinical impression of acute pancreatitis who underwent contrast enhanced MDCT within three days of admission were included in the study. All scans were done using Siemens 128 slice Somatom definition AS. Bolus tracking method is used for post contrast scan with the tracker placed in the descending aorta at the level of dome of diaphragm.

Results: Modified CT Severity index was calculated by adding points assigned to each parameter. The severity of pancreatitis is classified into three categories: mild (0-2 points), moderate (4-6 points) and severe (8-10 points). According to the Modified CT Severity Index, the patients were graded into mild (n=19), moderate (n=20) and severe (n=8) i.e. 40% patients had mild, 43% patients had moderate and 17% had severe pancreatitis.

CONCLUSION: Extra pancreatic complications, when included in the CT scoring system (MCTSI) were significantly correlated with end organ failure and adverse clinical outcome. Hence MCTSI may be more useful scoring system than CTSI when used within three days of symptom onset.

Key words: Acute pancreatitis, modified CT severity index, prognostic value

INTRODUCTION:

Acute pancreatitis is a process of acute inflammation of pancreas usually caused by biliary stone, alcohol ingestion, metabolic factors and drugs. Abdominal pain is the major symptom of acute pancreatitis. It is generally classified into mild & severe forms. Mild pancreatitis, also called as interstitial or edematous pancreatitis is associated with minimal organ failure and an uneventful recovery.

Severe pancreatitis also called as necrotizing pancreatitis occurs approximately in 20% of the patients and is associated with organ failure or local complications, including necrosis, infection or pseudocyst formation. The diagnosis is usually established by leukocytosis, elevated serum amylase, serum lipase.

A computed tomography (CT) scan confirms the clinical impression of acute pancreatitis. The assessment of the severity of acute pancreatitis has a significant role in management. Mild pancreatitis responds well to the supportive therapy, whereas severe pancreatitis requires intensive monitoring and specific treatment.

The present study was undertaken to determine whether early CT is effective in assessing the severity of acute pancreatitis and in predicting the prognosis and clinical outcome in these patients.

Objective: To study the prognostic value of MDCT in acute pancreatitis and to correlate modified CT severity index with clinical outcome.

MATERIAL & METHODS:

Study Design: Prospective Observational study.

Study area: The study was done in Department of Radio diagnosis, Integral Institute Of Medical Sciences And Research, Integral University, Lucknow, Uttarpradesh.

Study Period: 1 year.

Study population: Patients admitted to Hospital with clinical impression of acute pancreatitis.

Sample size: A total of 47 were included in the study.

Sampling method: Purposive sampling method.

Inclusion Criteria: Patients admitted with clinical suspicion of acute pancreatitis who underwent contrast enhanced MDCT within three days of admission.

EXCLUSION CRITERIA:

1. Patients admitted with clinical suspicion of acute pancreatitis who did not undergo contrast enhanced MDCT.
2. Pancreatitis due to trauma.

Study tools and Data collection procedure:

Patients admitted to Hospital with clinical impression of acute pancreatitis who underwent contrast enhanced MDCT within three days of admission were included in the study. All scans were done using Siemens 128 slice Somatom definition AS. Bolus tracking method is used for post contrast scan with the tracker placed in the descending aorta at the level of dome of diaphragm.

The severity of pancreatitis was scored using modified CT severity index and classified into three categories (mild, moderate and severe). The modified index is a 10 point scoring system derived by assessing the degree of pancreatic inflammation (0 to 4 points) pancreatic necrosis (0 to 4 points) and extrapancreatic complications (0 or 2 points). Clinical outcome parameters included the length of hospital stay, the need for surgical intervention and the occurrence of infection, organ failure and death.

Statistical Analysis: The data was collected, compiled and compared statistically by frequency distribution and percentage proportion. Quantitative data variables were expressed by using Descriptive statistics (Mean \pm SD). Qualitative data variables were expressed by using frequency and Percentage (%). Chi square test to assess the statistical significance.

OBSERVATIONS& RESULTS:

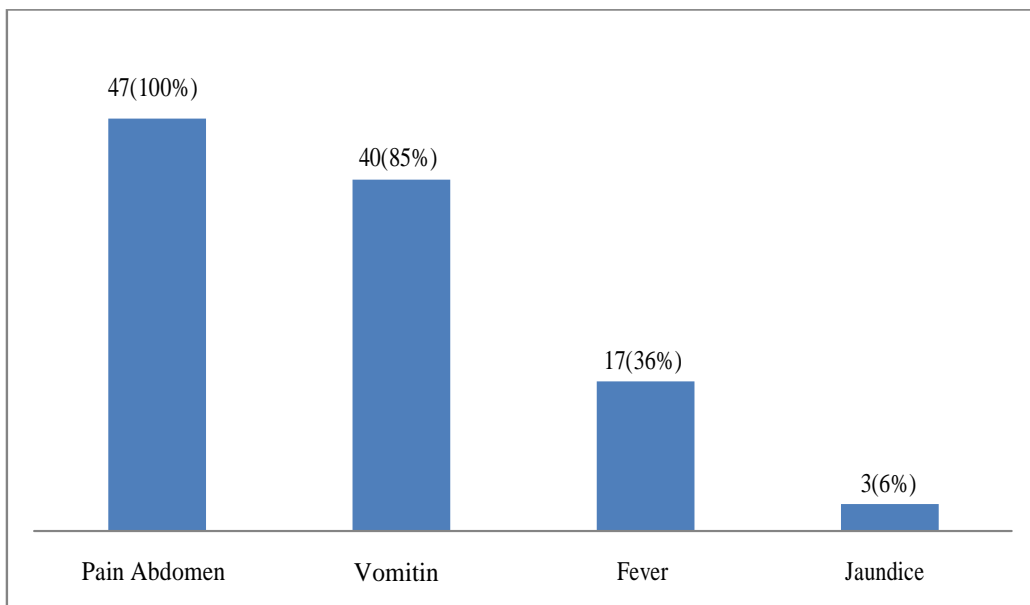
Table 1: Age distribution of the study group.

Age group (in years)	Number of patients	Percentage
15-25	5	11
26-35	18	38
36-45	9	19
46-55	7	15
Above 55	8	17
Total	47	100

Study included patients between the age group ranging from 15 years to 79 years with a mean age of 40 yrs. Maximum number of patients was seen in the age group of 26- 35 years of age group which consisted of 18 (38.3%) patients.

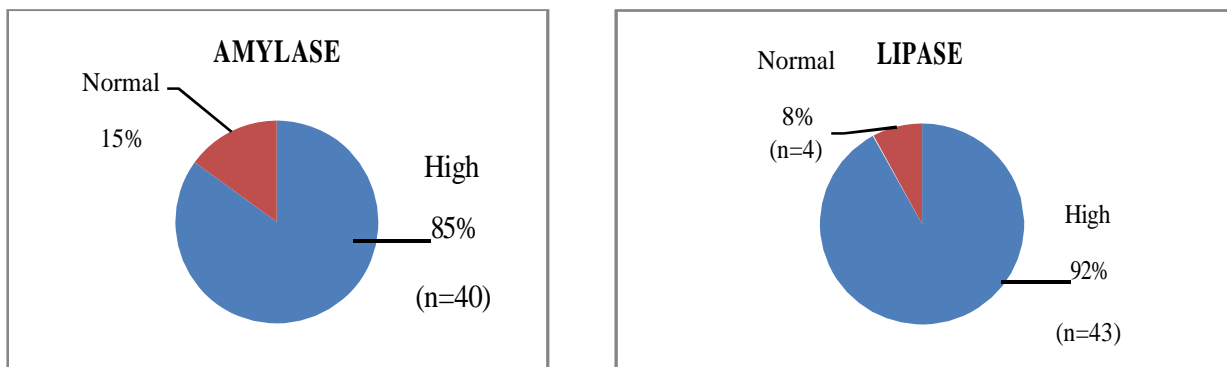
In the present study, out of 47 cases, 35 (74.5%) were male and 12 (25.5%) were females with a male to female ratio of 2.9: 1.

Figure 1: Mode of clinical presentation of acute pancreatitis.



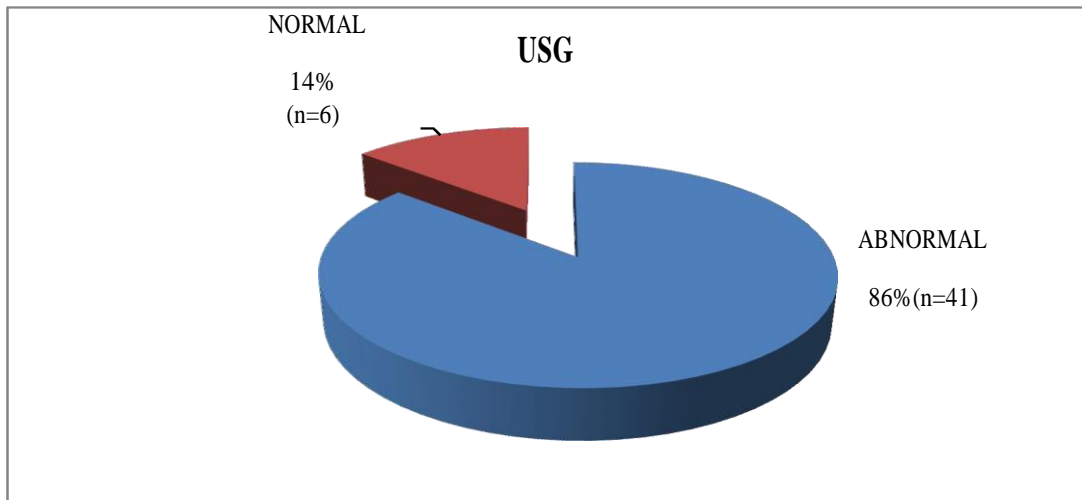
All 47 patients (100 %) presented with pain abdomen. 40 patients (85%) had vomiting, 17(36%) patients had fever and 3(6%) of patients had jaundice at the time of admission.

Figure 2: Patients with elevated amylase and lipase levels. (Laboratory diagnosis)



Amylase was elevated in 40 (85%) patients at presentation. Lipase was elevated in 43(92%) patients at presentation.

Figure 3: Patients with normal or abnormal findings on ultrasonography.



In 6 (14%) patients ultrasound was normal. 41 (86%) patients had abnormal ultrasound findings such as bulky pancreas with altered echogenicity, peripancreatic fat stranding, fluid collection, ascites or pleural effusion.

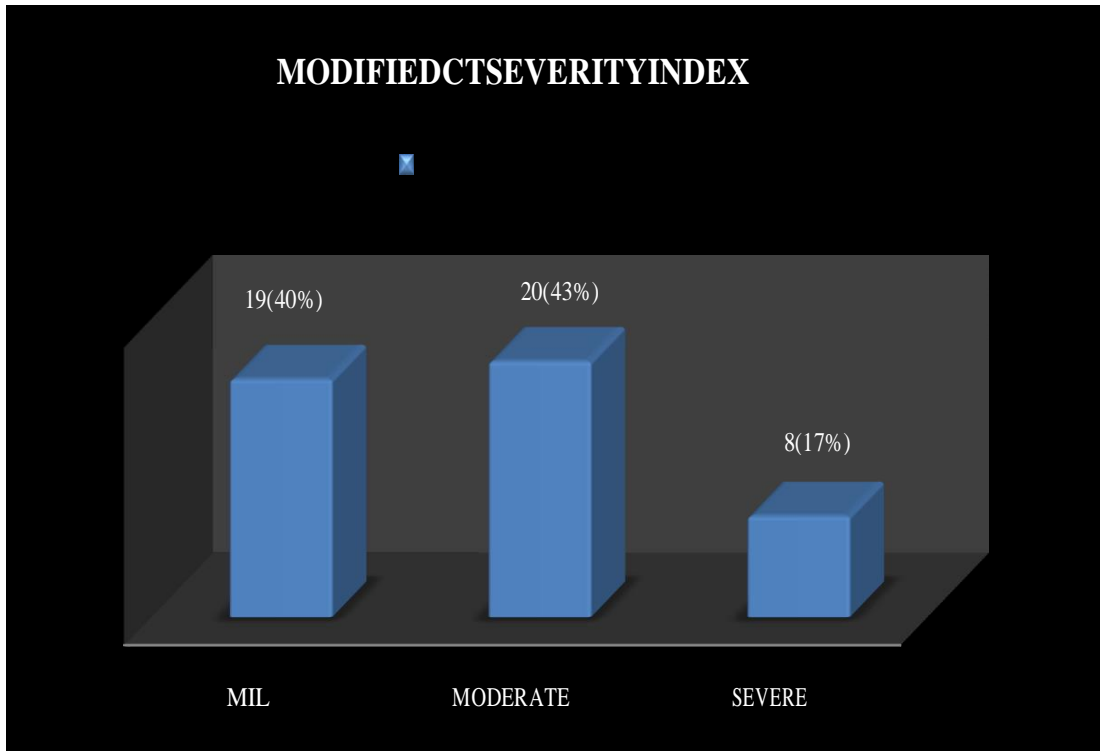
COMPUTED TOMOGRAPHIC EVALUATION

After diagnosing Acute Pancreatitis based on the clinical presentation, biochemical parameters and ultrasonography, patients were subjected to CT scan of the abdomen according to the standard protocol. The severity of the pancreatitis was assessed by assigning point system by using Modified CT Severity Index and CT Severity Index.

MODIFIED CT SEVERITY INDEX.

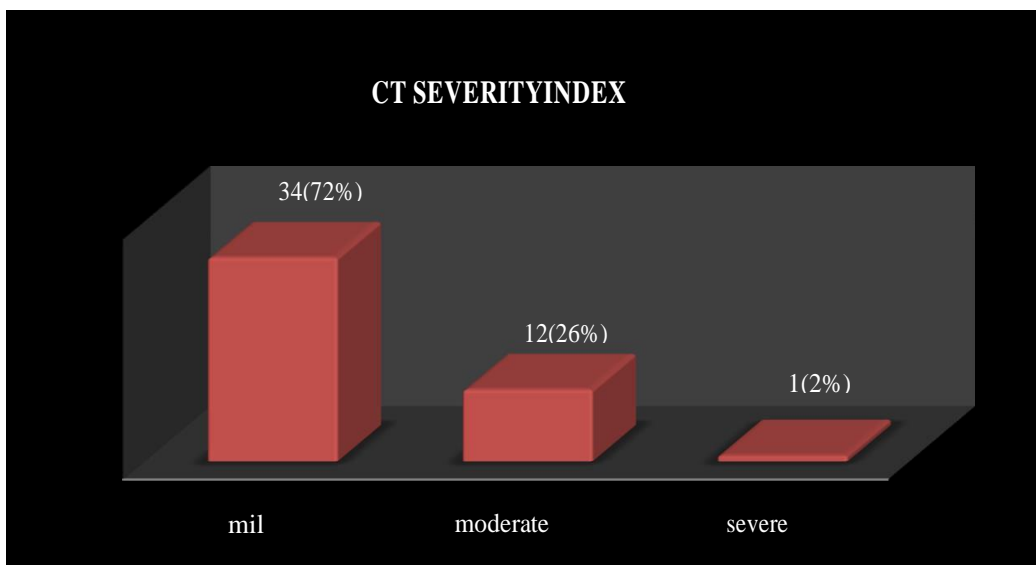
The modified index is a 10 point scoring system derived by assigning points to the degree of pancreatic inflammation (0 to 4 points) pancreatic necrosis (0 to 4 points) and extrapancreatic complications (0 or 2 points). All patients were graded into mild (score 0-2), moderate (score 4-6) or severe (score 8-10).

Figure 4: MODIFIED CT SEVERITY INDEX.



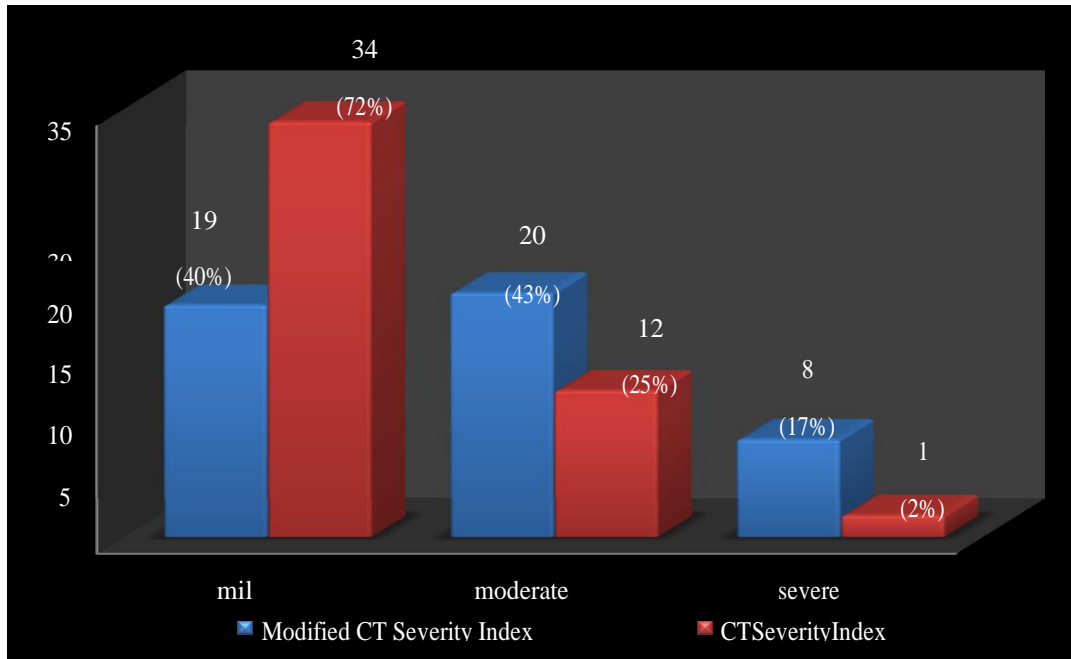
Modified CT Severity index was calculated by adding points assigned to each parameter. The severity of pancreatitis is classified into three categories: mild (0-2 points), moderate (4-6 points) and severe (8-10 points). According to the Modified CT Severity Index, the patients were graded into mild (n=19), moderate (n=20) and severe (n=8) i.e. 40% patients had mild, 43% patients had moderate and 17% had severe pancreatitis.

Figure 5: CT SEVERITY INDEX



According to the CT Severity Index, the patients were graded into mild (n=34), moderate (n=12) and severe (n=1). 72% patients had mild, 25% patients had moderate and only 2% patients had severe pancreatitis as per CTSI score.

Figure 6: Comparison of total number of patients belonged to each severity indexes based on MCTSI and CTSI.



In CTSI scoring system, 34 patients (72%) belonged to mild category, 12 (25%) patients had moderate and only patient belonged to severe pancreatitis. But in MCTSI scoring system 19 (40%) patients found to have mild pancreatitis and 20 (43%) patients found to have moderate and 8 (17%) patients severe pancreatitis.

The discrepancy is attributed to the inclusion of extrapancreatic complications in MCTSI scoring system. Hence, two extra points were added to the severity index in addition to the pancreatic inflammation and necrosis findings.

Table 2. Patient outcomes and duration of hospitalisation in severity based on Modified CT Severity Index.

MCTSI	MILD	MODERATE	SEVERE
Total number of patients	19	20	8
Mean duration of hospitalization (in days)	6	9	14
Surg. intervention	0 (0%)	2 (10%)	2 (25%)
Infection	2 (10%)	8 (40%)	7 (88%)

End organ failure	6 (32%)	7 (35%)	8 (100%)
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The above statistics shows that, highly significant correlation exists between the prediction of end organ failure with the classification according to the MCTSI (p=0.002) than CTSI (p=0.012).

With statistical values, it can be concluded that, there is a highly significant correlation between the prediction of systemic infection with the classification according to the MCTSI (P=0.001), compared to the classification according to CTSI which is not statistically significant (p=0.172).statistical analysis shows significant correlation between CTSI scoring system (p=0.017) and surgical intervention as compared to the MCTSI scoring system (0.117).

Duration of hospital stay in our study was ranging from 2 to 23 days with mean duration of 9 days. The mean duration of hospitalization in mild, moderate and severe classes of Acute Pancreatitis according to Modified CT Severity Index was 6, 9 and 14 days respectively. Whereas it was 7, 14 and 3 days respectively as per the CT Severity Index. The above values shows that mean duration of hospitalization correlates well with the severity classification based on the MCTSI than CTSI.

DISCUSSION:

Pancreatitis is classified as acute unless there is CT, MRI, or endoscopic retrograde cholangiopancreatography (ERCP) findings of chronic pancreatitis when pancreatitis is classified as chronic pancreatitis, and any episode of acute pancreatitis is considered an exacerbation of inflammation superimposed on chronic pancreatitis.

Initial clinical assessment of the progression of acute pancreatitis alone has been inadequate in identifying patients who develop a severe disease. Identifying severe cases are important and can play a significant role in management decision and in reducing the morbidity and mortality associated with severe acute pancreatitis. Ranson score, Glasgow score, APACHE II, Marshall and SOFA (Sepsis-related organ failure assessment) scoring system are different severity scoring system studied in the past and proven to be indicators of the clinical severity. But, none of the above scoring system was proven to be the precise indicators of the adverse clinical outcome.

Mean age of presentation is 40 years in our study population. It is concurrent with study done by Thomas et al¹, Jauregui et al², and others. The prevalence of chronic alcohol abuse and biliary stones are common in fourth and fifth decades explain the high incidence of the acute pancreatitis in this age group.

M: F ratio in our study is about 3:1. Similar results are seen by Freeny et al³. As alcohol was the most common etiological factor in our study which is common in males, a high M: F ratio was observed.

Chronic alcohol abuse is the most common etiological factor in our study constituting 53% of cases. Similar results were observed by Dugernier T L⁴ and Freeny et al³.and Bulbai et al⁵ In contrary, studies done by Bollen T L et al⁶ and Jauregui et al² showed biliary stones as the predominant.

Present study showed a significant correlation of grades of severity of pancreatitis based on both MCTSI and CTSI with patient outcome parameters. However MCTSI was more closely associated with patient outcome than CTSI in our study.This difference in statistical significance between CTSI and MCTSI in our study may be attributed to the inclusion of extrapancreatic complications in the MCTSI system. We assume that the presence of ascites and pleural fluid may be responsible for the improved correlation with MCTSI, because they may be early indicators of organ dysfunction. Another important difference between the MCTSI and CTSI is that, MCTSI differentiates only between presence and absence of acute fluid collections and, therefore does not require a count of the collections as in case of CTSI.

Similar study was done by Mortelet K J et al⁷ In his study, when applying the modified index, the severity of pancreatitis and the following parameters correlated more closely than when the previously established CTSI was applied. In contrary to present study results, Bollen T L et al⁶ showed no statistically significant differences between the two CT scoring systems with regard to all the studied severity parameters.

In present study, for the MCTSI and CTSI to detect severe pancreatitis, sensitivity was 40% vs. 34%, negative predictive value was 67% vs. 56% respectively, specificity and positive predictive value of 100% for both indexes. Hence MCTSI is more useful for the screening in patients with severe acute pancreatitis than CTSI. Jauregui et al² found similar results, stating that for the MCTSI and CTSI, to detect severe pancreatitis, sensitivity was 61% vs. 38%, specificity 66% vs. 100% and positive predictive value of 81% vs. 100%, respectively.

In a study done by Mole D J et al⁸ showed that extrapancreatic complications are associated more closely with the multi organ failure than presence of infection. In our study extrapancreatic complications were significantly associated with adverse outcome. Study done by De Waele et al⁹ showed similar results and concluded that, extrapancreatic inflammation assessed by abdominal CT scan allows accurate estimation of disease severity and mortality within 24 h of admission.

In present study, 36% of patients were found to have evidence of systemic infection. However, the presence of infection was not confirmed in our study. Beger H G et al¹⁰ did clinical study on 114 patients with acute necrotizing pancreatitis, found 23.8% to have infection by bacterial contamination of the pancreatic necrosis confirmed by laparotomy. In present study 8 patients had severe pancreatitis and all patients had evidence of necrosis on CECT. All these patients had adverse clinical outcome when compared to the patients who had mild or moderate pancreatitis. Similar results seen in study done by Dugernier T L et al⁴ where all patients with acute severe pancreatitis had necrosis on CT scan.

There is no significant correlation between presence of necrosis and need of surgical intervention in our study. Similar results were seen in study done by Freeny et al³. This can be explained as patients presented with relapse and having pseudocyst and mild severity of pancreatitis but required surgical intervention.

In present study 2% of mortality rate was observed, Lescence et al¹¹ observed 6% mortality in their study. The mean annual mortality rate for acute pancreatitis in the population was 1.3 per 100,000. Study done by Chamisa, T et al¹² showed difference in mortality rate in gallstone pancreatitis and alcohol induced pancreatitis which was 6.5% and 3.1% respectively.

CONCLUSION:

Present study showed highly significant correlation between the MCTSI score and the prediction of end organ failure, systemic infection and duration of hospital stay and RAC grading of pancreatitis. Extra pancreatic complications, when included in the CT scoring system (MCTSI) were significantly correlated with end organ failure and adverse clinical outcome. Hence MCTSI may be more useful scoring system than CTSI when used within three days of symptom onset.

REFERENCES:

- 1 . Thomas L Bollen, Vikesh K Singh, Rie Maurer, Kathryn Repas, Hendrik W van Es, Peter A Banks and Koenraad J Morteale. A Comparative Evaluation of Radiologic and Clinical Scoring Systems in the Early Prediction of Severity in Acute Pancreatitis. *The American Journal of Gastroenterology* 107, 612-619.
2. Jauregui-Arrieta L, Alvarez-Lopez F, Cobian-Machuca H, Solis-Ugalde J, Torres-Mendoza B, Troyo-Sanroman R. Effectiveness of the modify tomographic severity index in patients with severe acute pancreatitis. *Rev Gastroenterol Mex.* 2008 Jul- Sep; 73(3):144-8.
3. Freeny PC, Hauptmann E, Althaus SJ, Traverso LW, Sinanan M. Percutaneous CT- guided catheter drainage of infected acute necrotizing pancreatitis: techniques and results. *AJR Am J Roentgenol.* 1998 Apr; 170(4):969-75.
4. Thierry L. Dugernier et al, Compartmentalization of the Inflammatory Response during Acute Pancreatitis Correlation with Local and Systemic Complications. *Am J Respir Crit Care*, 2003, Med Vol 168. pp 148–157.
5. Bulabai Karpagam, Hemhnath. Study Analysis of Acute Pancreatitis by CT. *Journal of Evolution of Medical and Dental Sciences* 2015; Vol. 4, Issue 92, November 16; Page: 15731-15735.
6. Thomas L. Bollen, Vikesh K. Singh, Rie Maurer, Kathryn Repas, Hendrik W. van Es, Peter A. Banks, Koenraad J. Morteale Comparative Evaluation of the Modified CT Severity Index and CT Severity Index in Assessing Severity of Acute Pancreatitis *AJR* 2011;197:386–392.

7. Koenraad J. Morteale, Walter Wiesner, Lisa Intriere et al, 'A Modified CT Severity Index for Evaluating Acute Pancreatitis: Improved Correlation with Patient Outcome', *AJR* 2004; 183:1261-1265.
8. Damian J. Mole, Katie L. McClymont, Sarah Lau, Rosamund Mills, Christopher Stamp-Vincent, O. James Garden, Rowan W. Parks. Discrepancy between the Extent of Pancreatic Necrosis and Multiple Organ Failure Score in Severe Acute Pancreatitis. *World J Surg* (2009) 33:2427-2432.
9. De Waele JJ, Delrue L, Hoste EA, De Vos M, Duyck P, Colardyn FA. Extrapancreatic inflammation on abdominal computed tomography as an early predictor of disease severity in acute pancreatitis: evaluation of a new scoring system. *Pancreas*. 2007 Mar; 34(2):185-90.
10. Beger HG, Bittner R, Block S, Büchler M. Bacterial contamination of pancreatic necrosis. A prospective clinical study. *Gastroenterology*. 1986 Aug; 91(2):433-8.
11. Lecesne R, Tourel P, Bret PM, et al. Acute pancreatitis: interobserver agreement and correlation of CT and MR Cholangiopancreatography with outcome. *Radiology* 1999; 211:727-735.
12. Chamisa, T. Mokoena, T.E. Luvhengo. Changing Pattern of Incidence, Aetiology and Mortality from Acute Pancreatitis at Kalafong Hospital, Pretoria, South Africa, 1988-2007: A Retrospective Evaluation. *East and Central African Journal of Surgery*, Vol. 15, No. 1, Mar-Apr, 2010, pp. 35-39.
13. Balthazar EJ, Freeny PC, vanSonnenberg E. Imaging and intervention in acute pancreatitis. *Radiology* 1994; 193:297-306.
14. Triantopoulou C, Lytras D, Maniatis P, et al. Computed tomography versus Acute Physiology and Chronic Health Evaluation II score in predicting severity of acute pancreatitis. *Pancreas* 2007; 35:238-242.
15. Dipti K. Lenhart, Emil J. Balthazar, 'MDCT of Acute Mild (Nonnecrotizing) Pancreatitis: Abdominal Complications and Fate of Fluid Collections', *AJR* 2008; 190:643-649.