Scoring Systems For Acute Pancreatitis

Dr. Alankar Gupta

Resident DNB GI Surgery

Introduction

- Mortality of Severe acute pancreatitis is reported from 20 – 60%.
- Multifactorial scoring systems incorporating clinical and biochemical criteria for severity assessment have been in use for some decades.

Prognostic Factor

1. Ranson et al - 11 criteria
2. Glasgow score - 8 criteria
3. MOSS score - 12 criteria
4. BISAP score - 5 criteria
5. SIRS score – 5 criteria
6. APACHE II score - 14 criteria
7. CT severity index (CTSI)
8. C-reactive protein (CRP)
9. Interleukin 6 (IL – 6)
10. Procalcitonin (PCT)
11. Modified Marshal Score – Revised Atlanta 2012

Gut

ORIGINAL ARTICLE

Classification of acute pancreatitis—2012: revision of the Atlanta classification and definitions by international consensus

Peter A Banks,[1] Thomas L Bollen,[2] Christos Dervenis,[3] Hein G Gooszen,[4] Colin D Johnson,[5] Michael G Sarr,[6] Gregory G Tsiotos,[7] Santhi Swaroop Vege,[8] Acute Pancreatitis Classification Working Group

Gut. 2013 Jan;62(1):102-11.

Grades of Severity

- Mild acute pancreatitis
  - No organ failure
  - No local or systemic complications
- Moderately severe acute pancreatitis
  - Organ failure that resolves within 48 h (transient organ failure) and/or
  - Local or systemic complications without persistent organ failure
- Severe acute pancreatitis
  - Persistent organ failure (>48 h)
  - –Single organ failure
  - –Multiple organ failure

Modified Marshal Score

Organ system	0	1	2	3	4
Respiratory (PaO_2/FiO_2)	>400	301-400	201-300	101-200	≤101
Renal* (serum creatinine, mmol/L)	≤134	134-169	170-310	311-439	>439
Renal* (serum creatinine, mg/dL)	<1.4	1.4-1.8	1.9-3.6	3.6-4.9	>4.9
Cardiovascular (systolic blood pressure, mm Hg)†	>90	<90 and fluid responsive	<90 and not fluid responsive	<90, pH<7.3	<90, pH<7.2

For nonventilated patients, the FiO_2 can be estimated from below:

Supplemental oxygen, L/min	FiO_2 (%)
Room air	21
2	25
4	30
6-8	40
9-10	50

- A score of 2 or more in any system defines the presence of organ failure.

- A score for patients with pre-existing chronic renal failure depends on the extent of further deterioration of baseline renal function. No formal correction exists for a baseline serum

- Creatinine ≥134 µmol/l or ≥1.4 mg/dl.

- The Modified Marshall scoring system has the merit of simplicity, universal applicability across international centres, and the ability to stratify disease severity easily and objectively.

- The Modified Marshall scoring system is preferred to the SOFA scoring system, which is for patients managed in a critical care unit and which takes into account the use of inotropic and respiratory support.

Ranson's Criteria

"Prognostic signs and the role of operative management in acute pancreatitis,"

- Surgery Gynecology and obstetrics, vol.139,no.1,pp.69–81,1974.
- J.H.C.Ranson,K.M.Rikind,D.F.Roses,S.D.Fink,K.Eng, and F. C. Spencer,

- Ranson's criteria consist of 11 parameters.
- Five of the factors are assessed at admission and six are assessed during the next 48 hours

Ranson's Criteria on Admission :

- age greater than 55 years
- a white blood cell count of > 16,000/µL
- blood glucose > 11 mmol/L (>200 mg/dL)
- serum LDH > 350 IU/L
- serum AST >250 IU/L

Ranson's Criteria after 48 hours of admission :

- fall in hematocrit by more than 10 percent
- fluid sequestration of > 6 L
- hypocalcemia (serum calcium < 2.0 mmol/L (<8.0 mg/dL))
- hypoxemia (P_{O_2} < 60 mmHg)
- increase in BUN to >1.98 mmol/L (>5 mg/dL) after IV fluid hydration
- base deficit of >4 mmol/L

The prognostic implications of Ranson's criteria are as follows :

- Score 0 to 2 : 2% mortality
- Score 3 to 4 : 15% mortality
- Score 5 to 6 : 40% mortality
- Score 7 to 8 : 100% mortality

Ranson's Criteria

- Meta-analysis of 110 studies found the Ranson score to be a poor predictor of severity.
- The sensitivity and specificity of these scoring systems for predicting severe acute pancreatitis range between 55%and 90%, depending on the cut-off number and the timing of scoring.
- Discriminant power and information content of Ranson's prognostic signs in acute pancreatitis: a meta-analytic study. Crit Care Med. 1999;27(10):2272.
- De Bernardinis M, Violi V, Roncoroni L, Boselli AS, Giunta A, Peracchia A

Imrie (Glasgow) Scoring System

Within 48 Hours of Hospital Admission†	Original[4]	Modified[6]
Age, y	>55	>55
White blood cell count, × 10^9/L	>15	>15
Serum glucose level, mmol/L (mg/dL)	>9.9 (>180)	>9.9 (>180)
Serum LDH level, U/L	>600	>600
Serum transaminase level, mU/mL	>100	. . .
BUN, mmol/L (mg/dL)	>16.1 (>45)	>16.1 (>45)
Serum calcium level, mmol/L (mg/dL)	<2 (<8)	<2 (<8)
Pao_2, mm Hg	<60	<64
Serum albumin level, g/L	<32	<32

**Zero to 2 criteria met indicates mild pancreatitis; 3 or more criteria, severe pancreatitis.*

†LDH indicates lactate dehydrogenase; BUN, blood urea nitrogen; and ellipsis, not applicable.

Apache II Scoring System

Physiological Variable	Reference Range
Rectal temperature, °C	36-38.4
Mean arterial pressure, mm Hg	70-109
Heart rate (ventricular response), beats/min	70-109
Respiratory rate, breaths/min	12-24
Oxygenation, mm Hg	$P_{AO_2} - P_{aO_2} < 200$ or $P_{O_2} > 70$
Arterial pH	7.33-7.49
Serum sodium level, mmol/L	130-149
Serum potassium level, mmol/L	3.5-5.4
Serum creatinine level, µmol/L (mg/dL) (double point score for acute renal failure)	0.6-1.4 (53-123)
Hematocrit	0.30-0.46
Leukocyte count, $\times 10^9$/L	0.003-0.015
Glasgow Coma Scale score (GCS)	15 – actual GCS score

** To calculate the Acute Physiology and Chronic Health Evaluation (APACHE) II score, the 12 physiological variables are assigned points between 0 and 4, with 0 being normal and 4 being the most abnormal.[9] The sum of these values is added to a point weighting for patient age (≤44 years = 0; 45-54 years = 2; 55-64 years = 3; 65-74 years = 5; ≥75 years = 6) and a point weighting for chronic health problems. $P_{AO_2} - P_{aO_2}$ indicates alveolar-arterial difference in partial pressure of oxygen.*

Laboratory Studies*	Acute Physiology Scores for Specific Parameters				
	0	1	2	3	4
Temperature (°C)	36.0–38.4	38.5–38.9, 34.0–35.9	39.0–39.9, 32.0–33.9	40.0–40.9, 30.0–31.9	>40.9, <30.0
Mean arterial BP (mm Hg)	70–109	· · ·	110–129, 50–69	130–159	>159, <50
Heart rate (beats per minute)	70–109	· · ·	110–139, 55–69	140–179, 40–54	>179, <40
Respiratory rate (breaths per minute)	12–24	25–34, 10–11	6–9	35–49	>49, ≤5
$P_{AO_2} - Pa_{O_2}$ (mm Hg)	<100	61–70	200–349	350–499, 55–60	>499, <55
Serum bicarbonate† (mmol/L)	23.0–31.9	32.0–40.9	18.0–22.9	41.0–51.9, 15.0–17.9	>51.9, <15.0
Arterial pH	7.33–7.49	7.50–7.59	· · ·	7.60–7.69	>7.69, <7.15
Serum sodium (mmol/L)	130–149	150–154	155–159, 120–129	160–179, 111–119	>179, <111
Serum potassium (mmol/L)	3.5–5.4	5.5–5.9, 3.0–3.4	2.5–2.9	6.0–6.9	>6.9, <2.5
Serum creatinine (mg/dL)	0.6–1.4	· · ·	1.5–1.9, <0.6	2.0–3.4	>3.4
Hematocrit (%)	30.0–45.9	46.0–49.9	50.0–59.9, 20.0–29.9	· · ·	>59.9, <20.0
WBC count ($\times 10^3/mm^3$)	3.0–14.9	15.0–19.9	20.0–39.9, 1.0–2.9	· · ·	>39.9, <1.0

The APACHE II score

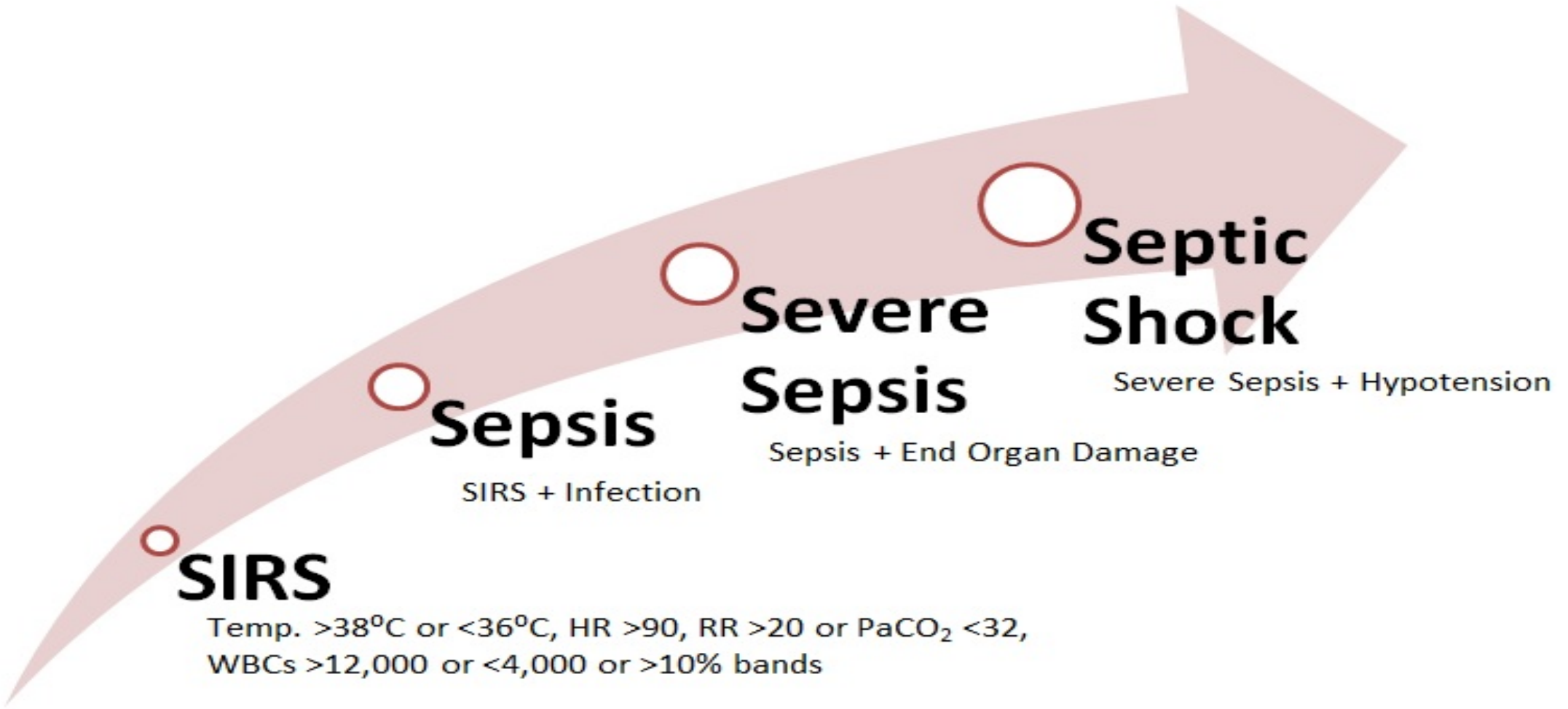
- It has 12 physiologic measures and extra points based upon age and presence of chronic disease
- Most widely studied severity scoring system in AP
- It has good negative predictive value and modest positive predictive value for predicting severe AP and can be performed daily

- Mortality is less than 4 % with a score <8 and is 11 to 18 % with a score >8
- Complex and cumbersome
- Does not differentiate between interstitial and necrotizing pancreatitis,
- Does not differentiate between sterile and infected necrosis.
- It has a poor predictive value at 24 hours

- Addition of a body mass index (BMI) score to APACHE II (known as APACHE O)
- 17 physiological variables - APACHE III

MOSS/MODS score

Multiple Organ Dysfunction Score (MODS)						
Organ System Values	MODS Score					
	0	1	2	3	4	
Haematologic: Platelet Count (x10^3/mm^3 or 10^9/L)	> 120	81-120	51-80	21-50	≤ 20	*> 120*
Hepatic: Serum Bilirubin (□mol/L)	≤ 20	21-60	61-120	121-240	> 240	*≤ 20*
Renal: Serum Creatinine (□mol/L)	≤ 100	101-200	201-350	351-500	> 500	*≤ 100*
Cardiovascular: PAR	≤ 10	10.1-15	15.1-20	21-30	> 30	*≤ 10*
Coma Score	15	13-14	10-12	7-9	≤ 6	*15*
Respiratory: PaO_2 / FiO_2	> 300	226-300	151-225	76-150	≤ 75	*> 300*



Systemic Inflammatory response Syndrome

SIRS—defined by presence of two or more criteria:

- Heart rate >90 beats/min
- Core temperature <36°C or >38°C
- White blood count <4000 or >12000/mm^3
- Respirations >20/min or PCO_2 <32 mm Hg[13]

SIRS

- Presence of the systemic inflammatory response syndrome (SIRS) is associated with increased mortality
- Applied easily at the bedside every day
- Mortality rates
  - 25 %those with persistent SIRS from admission,
  - 8 % - SIRS at admission but not persistent
  - 0 % - no SIRS
- Severity of AP was greater among patients with AP and SIRS on day one

Bedside Index Of Severity In Acute Pancreatitis (BISAP) Score

BUN >25 mg/dL (8.9 mmol/L)	1 point
Abnormal mental status with a Glasgow coma score <15	1 point
Evidence of SIRS	1 point
Patient age >60 years	1 point
Imaging study reveals pleural effusion	1 point

Mortality – 0-2 point - < 2%
3- 5 point - > 15 %

CT severity score (the Balthazar score)

Grading based upon findings on unenhanced CT		
Grade	**Findings**	**Score**
A	Normal pancreas - normal size, sharply defined, smooth contour, homogeneous enhancement, retroperitoneal peripancreatic fat without enhancement	0
B	Focal or diffuse enlargement of the pancreas, contour may show irregularity, enhancement may be inhomogeneous but there is on peripancreatic inflammation	1
C	Peripancreatic inflammation with intrinsic pancreatic abnormalities	2
D	Intrapancreatic or extrapancreatic fluid collections	3
E	Two or more large collections of gas in the pancreas or retroperitoneum	4

Necrosis score based upon contrast enhanced CT	
Necrosis, percent	**Score**
0	0
<33	2
33-50	4
≥50	6

- It was developed by Balthazar et al. to evaluate the degree of pancreatic edema, necrosis and the presence of peripancreatic fluid collections.

- In the CTSI pilot study, a score of 7–10 was able to predict 92% morbidity and 17% mortality rate in patients with AP, compared to the low morbidity (2%) and mortality (0%) associated with a CTSI score of 0-1 .

- CT severity index equals unenhanced CT score plus necrosis score: maximum = 10, ≥6 = severe disease.
- Patients with a CT severity index >5 were eight times more likely to die, 17 times more likely to have a prolonged hospital course, and 10 times more likely to undergo necrosectomy than the patients with scores <5
- there is no uniform correlation with the extent of necrosis and organ failure and/or mortality

- *Adapted from Balthazar, EJ, Robinson, DL, Megibow, AJ, Ranson, JH, Radiology 1990; 174:331.*

- Imaging modality of choice for staging acute pancreatitis and for detecting complications.
- DCT has been shown to detect pancreatic parenchymal necrosis with a diagnostic sensitivity of 87% and an overall detection rate of 90%.

E. J. Balthazar, P. C. Freeny, and E. van Sonnenberg, “Imaging and intervention in acute pancreatitis,” *Radiology, vol. 193, no.* 2, pp. 297–306, 1994

C-reactive protein

- Among single biochemical markers, C-reactive protein (CRP) remains the most useful.
- Despite its delayed increase, peaking not earlier than 72 h after the onset of symptoms, it is accurate and widely available.
- As a single prognostic marker, an elevated C-reactive protein (CRP) concentration of greater than 150 mg/L indicates that acute pancreatitis has a complicated course with a sensitivity of 85% in the first 72 h after the onset of symptoms.
- NOT SPECIFIC for pancreatitis , and other causes of inflammation such as cholangitis and pneumonia need to be ruled out before severity assessment by measurement of CRP

IL-6

- Significantly increased in severe acute pancreatitis in comparison with mild disease already on the day of admission
- Peak concentration on day 3 after the clinical onset of the disease
- Early severity stratification.
- Sensitivities of 69–100% with specificities in the range 70–86% for the detection of severe acute pancreatitis are reported .

Journal ofGastroenterology and Hepatology, vol. 22, no. 4, pp. 550–554, 2007.

Procalcitonin (PCT)

- Procalcitonin, the biologically inactive propeptide of calcitonin, is a more rapid acute-phase reactant with the ability to indicate a status of bacterial or fungal infection and sepsis.
- Several studies have indicated its diagnostic value for the differentiation between mild and severe acute pancreatitis within the first 24 h of disease presentation
- Sensitivity of 89% and a specificity of 82%, in a recent meta-analysis

World Journal of Surgery, vol. 30, no. 9, pp. 1713–1721, 2006.

Complications requiring ICU monitoring and treatment

System	Complication
Pulmonary	Mechanical ventilation; pneumonia with hypoxemia ($Pao_2 \leq 60$ mm Hg); and hypoxemia ($Pao_2 \leq 60$ mm Hg) or dyspnea requiring frequent assessment of need for intubation
Cardiovascular	Hypotension requiring pressor support; ischemia or acute myocardial infarction noted on electrocardiogram or cardiac enzymes; and new onset arrhythmia other than sinus tachycardia
Infectious	Sepsis of any origin
Renal	New onset oliguric or nonoliguric renal failure or new onset dialysis
Hematologic	Disseminated intravascular coagulation and platelet counts $<50 \times 10^9$/L
Neurologic	Glasgow Coma Scale score ≤ 9 and diminished responsiveness or agitation (requiring significant sedation) with need for frequent airway monitoring
Gastrointestinal tract	Stress ulcer with hematemesis or melena (requiring >2 U of blood per 24 hours)

Research Article

Comparison of Ranson, Glasgow, MOSS, SIRS, BISAP, APACHE-II, CTSI Scores, IL-6, CRP, and Procalcitonin in Predicting Severity, Organ Failure, Pancreatic Necrosis, and Mortality in Acute Pancreatitis

Ajay K. Khanna,[1] Susanta Meher,[1] Shashi Prakash,[1] Satyendra Kumar Tiwary,[1] Usha Singh,[2] Arvind Srivastava,[3] and V. K. Dixit[4]

[1] *Department of General Surgery, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Ultra Pradesh 221005, India*
[2] *Department of Pathology, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Ultra Pradesh 221005, India*
[3] *Department of Radiodiagnosis, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Ultra Pradesh 221005, India*
[4] *Department of Gastroenterology, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Ultra Pradesh 221005, India*

Correspondence should be addressed to Ajay K. Khanna; akhannabhu@gmail.com

Received 18 May 2013; Accepted 28 August 2013

Academic Editor: Attila Olah

Hindawi Publishing Corporation
HPB Surgery
Volume 2013, Article ID 367581, 10 pages
http://dx.doi.org/10.1155/2013/367581

Prognostic Factor

1. Ranson et al - 11 criteria
2. Glasgow score - 8 criteria
3. MOSS score - 12 criteria
4. BISAP score - 5 criteria
5. SIRS score – 5 criteria
6. APACHE II score - 14 criteria
7. CT severity index (CTSI)
8. C-reactive protein (CRP)
9. Interleukin 6 (IL – 6)
10. Procalcitonin (PCT)

Objective Measurement

1. Severity of the disease (SAP)
2. Pancreatic necrosis (pnec)
3. Requirement of ICU admission
4. Length of hospital stay (LOHS)
5. Mortality

METHODS

- BISAP score, APACHE II score, and multiple organ system score (MOSS), SIRS were calculated using data from the first 24 hours of admission .
- Ranson and Glasgow scores were calculated using data in first 24 hours and later 48 hours of admission.

- IL-1, Procalcitonin Day 1
- C- Reactive protein Day 2
- CECT Abdomen Day 4

Diagnostic Criteria Of Acute Pancreatitis

The diagnosis of acute pancreatitis (AP) was based on the presence of two of the following three features:

1. abdominal pain characteristic of AP
2. serum amylase and/or lipase ≥3 times the upper limit of normal
3. characteristic finding of AP on abdominal CT Scan.

- Patients were classified as mild AP and severe AP, based on the presence of organ failure for more than 48 hrs and local complications.

- Organ failure included
  - Shock (systolic blood pressure < 90mmHg)
  - Pulmonary insuiciency (arterial PO2 < 60mm Hg at room air or the need for mechanical ventilation),
  - Renal failure (serum creatinine level > 2mg/dL after rehydration or hemodialysis).

- Pancreatic Necrosis was assessed by CECT
- Evidence of Pancreatic Necrosis on CT was defined as lack of enhancement of pancreatic parenchyma with contrast.

Ranson et al - 11 criteria	≥ 3
Glasgow score	≥ 3
MOSS score	≥ 5
BISAP score	≥ 2
SIRS score	≥ 2
APACHE II score	≥ 8
CT severity index (CTSI)	≥ 5
C-reactive protein (CRP)	≥ 150mg/L
Interleukin 6 (IL – 6)	≥ 50 pg/mL
Procalcitonin (PCT)	≥ 0.5 ng/mL

Patient Characteristic

Patients characteristics	No. of cases	Percentage
Sex		
Male	37	51.4
Female	35	48.6
Religion		
Hindu	66	91.7
Muslim	6	8.3
Age group		
11–20	9	12.5
21–30	17	23.6
31–40	12	16.7
41–50	16	22.2
51–60	5	6.9
61–70	13	18.1

Comorbidities		
Diabetes mellitus	3	4.2
Hypertension	1	1.4
Other	2	2.8
No comorbid condition	62	86.1
Both DM and hypertension	4	5.6
BMI		
<18.5	1	1.4
18.5–24.9	55	76.4
25–29.9	14	19.4
30–34.9	2	2.8

Presentation

Pain abdomen	72	100
Radiating	62	86.1
Nonradiating	10	13.9
Peritonitis	62	86.1
Localized	36	58.1
Diffuse	26	41.9
Nausea	6	8.3
Vomiting	51	70.8
Distension abdomen	29	40.2
Nonpassage of flatus and stool	21	29.2
Breathlessness	22	30.6

Etiology

Etiology	No. of cases	Percentage
Biliary	44	61.1
Alcoholic	13	18.0
Idiopathic	9	12.5
Hypertriglyceridemia	2	2.8
Post-ERCP	2	2.8
Traumatic	2	2.8

AUC(Area Under Curve) of different prognostic markers in predicting SAP,PNEC, and mortality

AUC (95% CI)	SAP	PNEC	Mortality
Ranson	0.85 (0.76–0.92)	0.70 (0.55–0.89)	0.84 (0.75–0.94)
Glasgow	0.75 (0.63–0.86)	0.64 (0.49–0.79)	0.83 (0.73–0.93)
MOSS	0.73 (0.61–0.85)	0.61 (0.46–0.77)	0.77 (0.62–0.92)
SIRS	0.73 (0.61–0.85)	0.61 (0.46–0.76)	0.76 (0.64–0.88)
APACHE II	0.88 (0.79–0.97)	0.68 (0.58–0.83)	0.86 (0.77–0.95)
BISAP	0.80 (0.71–0.91)	0.61 (0.47–0.72)	0.83 (0.69–0.97)
IL-6	0.90 (0.81–0.99)	0.86 (0.77–0.94)	0.80 (0.69–0.91)
CRP	0.91 (0.83–0.99)	0.90 (0.82–0.97)	0.75 (0.63–0.88)
CTSI	0.66 (0.53–0.79)	0.75 (0.59–0.91)	0.57 (0.35–0.78)

MOSS: multiple organ system score, APACHE II: acute physiology and chronic health evaluation II, SIRS: systemic inflammatory response syndrome, BISAP: bedside index for severe acute pancreatitis, IL-6: interleukin 6, CRP: C-reactive protein, and CTSI: CT severity index.

Result

- The overall mortality in our cohort was 12.5% and 43.1% of patients had SAP.

Ranson , APACHE II , Glasgow

- Sensitivity, specificity, and accuracy of 83.9%, 78%, and 85% of Ranson criteria for prediction of SAP and 80.6%, 82.9%, and 88% for APACHE II score.
- Similar result has been found for prediction of pancreatic necrosis and mortality.
- For Glasgow score we found 71%, 78%, and 75% sensitivity specif icity and accuracy for prediction of SAP

BISAP, SIRS & MOSS scores

- Advantage – calculated over 24 hr
- Disadvantage - it cannot easily distinguish transient from persistent organ failure
- SIRS is one of the leading events responsible for the mortality of AP.

CT Severity Index

- CTSI had the highest sensitivity of 87.5% and 91.3% NPV in prediction of pancreatic necrosis

- lowest sensitivity in prediction of organ failure (65.2%).

Biochemical Markers

- Single biochemical markers can be used as a reliable indicator for early stratification of severity of acute pancreatitis within 24 hours of admission

CRP

- C-Reactiveprotein(CRP) is an acute phase reactant produced by the liver in response to IL-1, IL-6, and TNF- and it is the most widely available, low-cost, and well-studied marker of severity in AP.

- A cut-of level of 150mg/L within the first 48 hrs of symptom onset has sensitivity and specificity of 80–86% and 61–84%, respectively, for SAP and accuracy > 80% for necrotizing pancreatitis

CRP

- CRP was done in 60 patients in this study
- 58.3% of patients were having CRP value < 150mg/L whereas 41.7% of cases had value of ≥150mg/L.
- In patients having CRP level > 150mg/L incidence of SAP, OF, PNEC, ICUA, MORT, and LOHS was found to be 100% (25), 76.0% (19), 68.0%(17), 24.0%(6), and 24.0%(6) with an average length of hospital stay of 13.8 days, respectively.
- In this study CRP had the highest sensitivity (100%), NPV (100%), and specificity (81.4%) for pancreatic necrosis, followed by sensitivity of 86.2% and specificity and PPV of 100% for prediction of SAP.
- As a whole CRP is a good marker for prediction of complications and mortality in acute pancreatitis.

IL-6

- Activated leukocytes release proinlammatory cytokines that stimulate the liver to produce acute phase proteins.
- Since the concentration of cytokines increases before acute phase proteins, numerous clinical studies have been done to assess the usefulness of cytokines, such as interleukin-(IL-) 1, IL-6, IL-8, IL-10, and IL-18, in predicting severity early in the course of AP.
- Most trials have focused on the pro inflammatory cytokines IL-6. Value of IL-6 is significantly elevated in SAP on the day of admission and tends to peak at 72 hrs later the clinical onset of disease, which makes IL- 6 an excellent marker of early severity stratification.

- A 2009 meta-analysis, defining severity by the Atlanta Classifcation, revealed that the sensitivity and specificity ranges for IL-6 in the first three days of admission were 81–83.6% and 75.6– 85.3%, respectively, with an IL-6 AUC of 0.75 on day one and 0.88 on the second day of admission .
- In this study IL-6 was done in 60 patients. 53.3% of patients were having IL-6 value <50 pg/mL and 46.7% were having value of ≥50 pg/mL.

- IL-6 has the highest sensitivity for prediction of SAP (93.1%), organ failure (95.7%), pancreatic necrosis (94.1%), and mortality (100%).

- Regarding specificity it has the highest specificity (96.8%) for SAP. It has very high NPV (93.8%) and accuracy (95.0%) for prediction of SAP.

- It has very high NPV (100%) for mortality and NPV (96.9%) for prediction of pancreatic necrosis.

PCT

- Procalcitonin (PCT) is a propeptide of the hormone calcitonin, which is released by hepatocytes, peripheral monocytes, and G-cells of the thyroid gland.
- PCT level can be measured by a semiquantitative strip test for fast results or by a fully automated assay to obtain a more accurate measurement.
- An increased PCT level has been found to be an early predictor of severity , pancreatic necrosis, and organ failure in patients with AP.

PCT

- In a recent meta- analysis a subgroup of 8 studies using PCT cut-of values of 0.5 ng/mL as a discriminator found that the sensitivity and specificity of PCT for development of SAP were 73%and 87%, respectively.

- In our study procalcitonin has 100% sensitivity for prediction of organ failure and mortality with a sensitivity of 86.4% for prediction of SAP.

Conclusion

Severe acute pancreatitis

- Prediction of SAP IL-6 had the highest sensitivity of 93.1%, followed by CRP (86.2%), procalcitonin (86.4%), and Ranson score (83.9%).
- CRP had the highest specificity of 100% with an accuracy of 95%, followed by IL-6 (96.4%) with an accuracy of 95%.
- Ranson and APACHE II scores come as the next best predictors of SAP.
- For prediction of organ failure procalcitonin had the highest sensitivity and NPV of 100%, followed by IL-6, Ranson, and APACHE II scores.
- Accuracy for prediction of organ failure is the highest for procalcitonin (83.3%) and APACHE II scores (83.3%).

Pancreatic necrosis

- For prediction of pancreatic necrosis it is the CRP which has the maximum sensitivity and NPV of 100%, followed by IL-6 which has a sensitivity of 94.1% and NPV of 96.9%.
- Ranson and MOSS scores are the next best predictors of pancreatic necrosis.
- CTSI has a sensitivity of 87.5% for prediction of pancreatic necrosis.
- The AUC for pancreatic necrosis is the highest for CRP (0.90), followed by IL-6 (0.86), and Ranson score (0.70).

ICU Stay

- Requirement of ICU admission was best predicted by MOSS score and SIRS with 100% sensitivity and NPV, followed by Ranson and Glasgow.

- Glasgow score has the highest accuracy for need of ICU requirement (66.7%).

Mortality

- For the mortality predictors it is IL-6, procalcitonin, Ranson, Glasgow, APACHE II, MOSS, and SIRS which have 100% sensitivity and NPV
- AUC for mortality prediction is the highest for Ranson (0.84) and APACHE II scores (0.86).

Thank you