

Comparison between Acute Physiology and Chronic Health Evaluation II and Ranson's scores in prognosis of acute pancreatitis

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Objective

Our aim was to compare the efficacy of Acute Physiology and Chronic Health Evaluation (APACHE) II and Ranson's scores in detecting the severity and prognosis of acute pancreatitis in a tertiary care hospital in Menoufia, Egypt.

Patients and methods

A total of 30 cases diagnosed as acute pancreatitis were admitted to our hospital during the period from March 2017 to July 2019. APACHE-II and Ranson's scores were calculated for all the cases. The best cutoffs for both scores and the area under the curve were estimated based on the receiver operating characteristics curve, and both scores were compared prospectively.

Results

The total number of patient selected for the tests was 30 patients. The mean age was 52.4 years, with range from 19 to 80 years. Females represented most cases (70%), with dominance of females in the Ranson's score. All patients showed pain in the epigastric region (100%) as a first symptom to start the scoring system. We found high accuracy, sensitivity, and specificity of APACHE-II score at cutoff point of 8.4 (92, 97, and 84%, respectively) compared with Ranson's score at cutoff point of 3.1, which shows less accuracy, sensitivity, and specificity (86, 90.4, and 82.4%, respectively), with significant *P* value of 0.001.

Conclusion

APACHE-II can be a suitable score in detecting patients who are suspected to have severe disease early from the start of their disease illness, and it may be better than Ranson's score in this concern.

Keywords:

acute pancreatitis, efficacy of Acute Physiology and Chronic Health Evaluation II, Ranson's score

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Introduction

Acute pancreatitis (AP) is a common inflammatory disorder of the pancreas that may develop local and systemic complications [1]. Pancreatitis has many different causes and predisposing factors, with mortality rate of ~5–10%. Most of the cases (80–90%) are mild, with no complications and having the best prognosis. The rest of the 10–20% of patients with severe patterns are more susceptible to local and systemic complications, which may need intensive care with or without surgical interference with high mortality expected [2].

Assessment and predicting severity of pancreatitis at early stages are important issues in the early management of AP, as patients with mild attack can be managed with fluid replacement and supportive treatment, unlike patients complaining of severe attack, who usually are critical and need ICU admission for close follow-up [3].

Clinically patients were classified as having mild, moderate, and severe AP according to the Atlanta scoring system. The Atlanta scoring system is easy to use, but it cannot predict suspected local nor systemic complications and cannot predict further prognosis of patients [4].

Many scoring systems have been used in the past years based on the addition of biochemical parameters to clinical data, and two of them are Acute Physiology and Chronic Health Evaluation (APACHE-II) and Ranson's scores. Each of them has some limitation, such as assessment at admission and after 48 h to evaluate the severity and prognosis [5].

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Our study is aiming to compare APACHE-II and Ranson's scores in detecting severity and prognosis of AP based on the Atlanta classification and multislice contrast-enhanced computed tomography (CT) scan in a tertiary care center in Menoufia, Egypt.

Patients and methods

Data collection

This prospective study was conducted on 30 patients with AP. Patients were subjected to both APACHE-II and Ranson's scores in the first 48 h of admission, to compare the accuracy of APACHE-II and Ranson's score in predicting the severity of AP in a tertiary care hospital in Menoufia, Egypt. It was conducted during the period of the study from March 2017 to July 2019 at the emergency department in Menoufia University and Shebin Elkom Teaching Hospitals, and the data were collected and have been presented in several tables and figures.

First of all, early diagnose of AP was done, which is based on having at least two of the following three criteria: (a) characteristic pain of pancreatitis which is usually at epigastric region referring to back and may be relieved by leaning forward, (b) triple elevation of serum amylase and lipase, and (c) characteristic radiological findings of AP by ultrasonography or CT scan or both.

Patients who were diagnosed as having AP based on the aforementioned criteria were told about this prospective study and consent was taken. Patients under the age of 16 years, those with pancreatic malignancies, and patients who were diagnosed as having chronic pancreatitis were excluded from the study.

After admission, patients underwent daily examination, as well as biochemical and radiological evaluation. Both scores were estimated at admission and within 48 h, in addition to 72 h for APACHE-II score. Complications, ICU admission, recovery, and mortality were noted and documented.

Ethical approval was granted for the study by Menoufia University, Faculty of Medicine's ethics committee according to the Declaration of Helsinki. It was taken for research done on patients diagnosed with AP.

Definitions

We classified patients into three groups according to severity based on Atlanta 2012 classification system into mild, moderate, and severe.

Mild group had no local complications nor organ failure, moderate severity group had local complication as pancreatic necrosis and or nonpermanent organ failure, and severe group had permanent organ failure with or without local complications.

Management protocols

Patients diagnosed as having AP underwent resuscitation including the following:

- (1) Fluid support mainly was crystalloids.
- (2) Nutrition: early low-fat diet for patients who tolerate oral intake and parenteral to those who do not tolerate oral feeding.
- (3) Antibiotics were only used in patients suspected to have infected necrosis.
- (4) Patients with persistent signs of infected pancreatic necrosis underwent percutaneous drainage CT guided, and they were improved with no the need for open surgical drainage.
- (5) Additional systems support for critical patients at ICU for respiratory, renal, and cardiovascular systems.
- (6) Patients with CBD stones and or gall stones were prepared to undergo ERCP cholecystectomy after being fit for operation [6].

They were admitted to hospital departments according to Atlanta severity classification; mild and moderate group with no distant organ failure were admitted to ward, whereas severe AP group was admitted to ICU.

Severity stratification

We applied Atlanta, Ranson's, and APACHE-II scoring system on all patients included in the study, and results were compared with CT findings.

Items of scores are as follows:

Atlanta score, as shown in Fig. 1.

Ranson's score, as shown in Fig. 2.

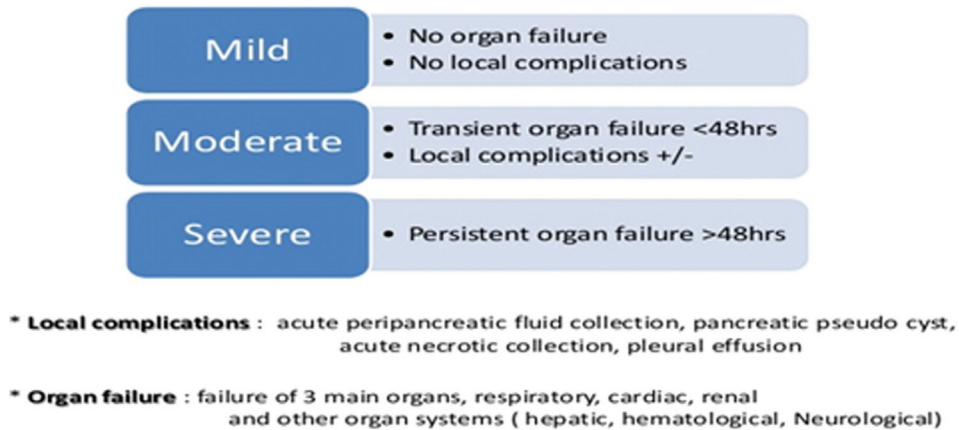
APACHE-II, as shown in Fig. 3.

Statistical analysis

Both scores were estimated, and also Atlanta 2012 classification was compared with respect to CT findings, organ failure, length of stay, and also mortality rate. Data were collected in a prospective manner in a Microsoft Excel Database. Continuous baseline descriptive variables were expressed as mean

Figure 1

Classification of acute pancreatitis – Revised ATLANTA criteria 2012



Items of revised Atlanta criteria 2012 [7].

Figure 2

Ranson Criteria and Prognosis	
At Admission	At 48 hours
<ul style="list-style-type: none"> Age > 55 years Leukocyte count > 16 x 10³/mcL Blood glucose > 200 mg/dL Serum LDH > 350 IU/L Serum AST > 250 IU/L 	<ul style="list-style-type: none"> Decrease in hematocrit > 10% Increase in BUN of > 8 mg/dL Serum calcium less than 8 mg/dL PaO₂ < 60 mm Hg Base deficit > 4 mEq/L Estimated fluid sequestration > 6,000 mL
<p>Score < 3 = Mortality 0–3% • Score ≥ 3 = Mortality 11–15% • Score ≥ 6 = Mortality 40%</p>	

Criteria of Ranson's scoring system [8].

with SD and were compared using the Mann–Whitney test and univariate analysis of variance test. Categorical variables were expressed as absolute numbers and proportions. Bivariate relationships for categorical variables were assessed using Fisher's exact test and Pearson's χ^2 test. Sensitivity, specificity, positive predictive value, and negative predictive value were calculated for each scoring system. Receiver operating characteristics (ROC) curves for severe AP, ICU admission, pancreatic necrosis, and organ failure were plotted for Ranson's score and APACHE-II, and predictive accuracy of each scoring system was measured by the area under ROC curve (AUC), with 95% confidence interval. AUC values were compared for statistical significance using De Long test. A *P* value of less than 0.05 was considered statistically significant.

Results

Patient characteristics

The total number of patients selected for the tests was 30 patients. The main age was 52.4 years, with range from 19 to 80 years. The age groups showed no any statistically significant difference regarding APACHE-II score and Ranson score, as shown in Table 1.

Females represented most cases (70%), with dominance of females in Ranson's score. This indicates female dominance in the distribution of the disease. The comparison between different sex groups shows statistically significant difference, as shown in Table 2.

Presentation of the patient

All patients showed pain in the epigastric region (100%) as a first symptom to start scoring system (APACHE-II

Figure 3

Physiologic variable ^a	Point score								
	+4	+3	+2	+1	0	+1	+2	+3	+4
1 Temperature	>41*	39-40.9*	-	38.5-38.9*	36-38.4*	34-35.9*	32-33.9*	30-31.9*	<29.9*
2 Mean arterial pressure (mm Hg)	>160	130-159	110-129	-	70-109	-	50-69	-	<49
3 Heart rate	>180	140-179	110-139	-	70-109	-	55-69	40-54	<39
4 Respiratory rate(non-ventilated or ventilated)	>50	35-49	-	25-34	12-24	10-11	6-9	-	<5
5 Oxygenation:									
a) FIO ₂ > 0.5: use A-aDO ₂	>500	350-499	200-349	-	<200	-	-	-	-
b) FIO ₂ < 0.5: use PaO ₂ (mm Hg)	-	-	-	-	>70	61-70	-	55-60	<55
6 Arterial pH	>7.7	7.6-7.69	-	7.5-7.59	7.33-7.49	-	7.25-7.32	7.15-7.24	<7.15
7 Serum Na (mMol/L)	>180	160-179	155-159	150-154	130-149	-	120-129	111-119	<110
8 Serum K (mMol/L)	>7	6-6.9	-	5.5-5.9	3.5-5.4	3-3.4	2.5-2.9	-	<2.5
9 Serum creatinine (mg/dL): double point score for acute renal failure	>+++3.5	2-3.4	1.5-1.9	-	0.6-1.4	-	<0.6	-	--
10 Hct (%)	>60	-	50-59.9	46-49.9	30-45.9	-	20-29.9	-	<20
11 WBC (in 1000s)	>40	-	20-39.9	15-19.9	3-14.9	-	1-2.9	-	<1
12 Glasgow coma score (GCS)	Score = 15 minus actual GCS								

Acute physiology score is the sum of the 12 individual variable points
 Add 0 points for the age <44.2 points. 45-54 years: three points. 55-64 years: five points. 65-74 years: six points >75 years
 APACHE II score = acute physiology score + age points + chronic health points. Minimum score = 0; maximum score = 71. Increasing score is associated with increasing risk of hospital death
 Add chronic health status points: two points if elective postoperative patient with immunocompromise or history of severe organ insufficiency; five points for nonoperative patient or emergency postoperative patient with immunocompromise or severe organ insufficiency^c
 13^d Serum HCO₃(venous-mMol/L) use only if no ABGs
 >52 41-51.9 - 32-40.9 22-31.9 - 18-21.9 15-17.9 <15
 Adapted from Knaus WA, Draper EA, Wagner DP, Zimmerman JB: APACHE II: A severity of disease classification system. *Critical care medicine* 13: 818-829. 1985.
 Interpretation of APACHE II scores (predicted mortality rate).
 0-4 ~4% death rate 10-14 ~15% death rate 20-24 ~40% death rate 30-34 ~75% death rate.
 5-9 ~8% death rate 15-19 ~25% death rate 25-29 ~55% death rate Over 34 ~85% death rate.
^a APACHE II Score = acute physiology score + age points + chronic health points. Minimum score = 0; maximum score = 71. Increasing score is associated with increasing risk of hospital death.
^b Choose worst value in the past 24 h.
^c Chronic health status: Organ sufficiency (e.g. hepatic, cardiovascular, renal, pulmonary) or immuno-compromised state must have preceded current admission.
^d Optional variable: use only if no ABGs.

Criteria of APACHE-II scoring system [9]. APACHE, Acute Physiology and Chronic Health Evaluation.

Table 1 Age distribution in study population

	All cases	F (%)	APACHE-II score		F (%)		Ranson's score		F (%)		P value	χ ²
			≤8	>8	≤8	>8	≤3	>3	≤3	>3		
Total	30	100	16	14	53	47	21	9	70	30		
Age												
≥60	11	37	6	5	20	17	8	3	27	10		
50-59	7	23	4	3	13	10	6	1	20	3		
40-49	8	27	4	4	13	13	5	3	17	10	0.9737	0.78
30-39	2	7	1	1	3	3	1	1	3	3		
20-29	1	3	0	1	0	3	0	1	0	3		
≤20	1	3	1	0	3	0	1	0	3	0		

APACHE, Acute Physiology and Chronic Health Evaluation. Statistical test used: c² test. P value less than or equal to 0.05 considered statistically significant (95% confidence interval).

Table 2 Sex distribution in study population and correlation with Ranson's score and Acute Physiology and Chronic Health Evaluation II score

	All cases	n (%)	APACHE-II score		F (%)		Ranson's score		F (%)		P value	Statistically significant
			≤8	>8	≤8	>8	≤3	>3	≤3	>3		
Total	30	100	16	14	53	47	21	9	70	30		
Sex												
Male	9	30	2	7	6	24	4	5	13	17	0.0293	Sig.
Female	21	70	14	7	47	23	17	4	57	13		

APACHE, Acute Physiology and Chronic Health Evaluation. Statistical test used: c² test. P value less than or equal to 0.05 considered statistically significant (95% confidence interval).

and Ranson's), and the other symptoms showed positive effect for more than 50% of patients, but this did not

affect any type of scoring system, with no statistically significant difference in data, as shown in Table 3.

Table 3 Presentation of patients

	All cases	F (%)	APACHE-II score		n (%)		Ranson's score		n (%)		P value	χ^2
			≤ 8	> 8	≤ 8	> 8	≤ 3	> 3	≤ 3	> 3		
Total	30	100	16	14	53	47	21	9	70	30		
Presentation												
Pain in epigastric	30	100	16	14	53	47	21	9	70	30		
Vomiting	24	80	12	12	40	40	16	8	53	27	1	0.312
Abdominal Distension	18	60	10	8	33	27	13	5	43	17		
Non passage of stool	16	53	9	7	30	23	12	4	40	13		

APACHE, Acute Physiology and Chronic Health Evaluation. Statistical test used: c^2 test. *P* value less than or equal to 0.05 considered statistically significant (95% confidence interval).

Table 4 Disease distribution based on etiology

	All cases	n (%)	APACHE-II score		n (%)		Ranson's score		n (%)		P value	χ^2
			≤ 8	> 8	≤ 8	> 8	≤ 3	> 3	≤ 3	> 3		
Total	30	100	16	14	53	47	21	9	70	30		
Etiology												
Gall stone (biliary)	25	83	14	11	47	37	18	7	60	23	0.8698	0.98
Nonbiliary	5	17	2	3	7	10	3	2	10	7		

APACHE, Acute Physiology and Chronic Health Evaluation. Statistical test used: c^2 test. *P* value less than or equal to 0.05 considered statistically significant (95% confidence interval).

Table 5 Atlanta's criteria in study population and correlation with Acute Physiology and Chronic Health Evaluation and Ranson's score

	All cases	n (%)	APACHE-II score		n (%)		Ranson's score		n (%)		P value	χ^2
			≤ 8	> 8	≤ 8	> 8	≤ 3	> 3	≤ 3	> 3		
Total	30	100	16	14	53	47	21	9	70	30		
Atlanta's criteria												
Mild	10	33	8	2	50	14	14	1	67	12		
Moderate	12	40	5	4	31	28	4	2	19	23	0.04	512
Sever	8	27	3	8	19	58	3	6	14	65		

APACHE, Acute Physiology and Chronic Health Evaluation. Statistical test used: c^2 test. *P* value less than or equal to 0.05 considered statistically significant (95% confidence interval).

A large number of patients had biliary causes (83%), whereas other nonbiliary causes included alcoholic, hypercalcemia, and hyperparathyroidism (17%). The cause of pancreatitis does not affect any of the scoring system, with no significant statistically difference, as shown in Table 4.

Classification of pancreatitis

We performed classification of pancreatitis into mild, moderate, and severe by the Atlanta grading. Our study showed 16 patients with APACHE-II score less than or equal to 8, where eight patients were evaluated as mild in Atlanta's grade, five patients as moderate, and three patients as severe. However, 14 patients had APACHE-II score more than 8, where two patients were evaluated as mild, four patients as moderate, and eight patients as severe.

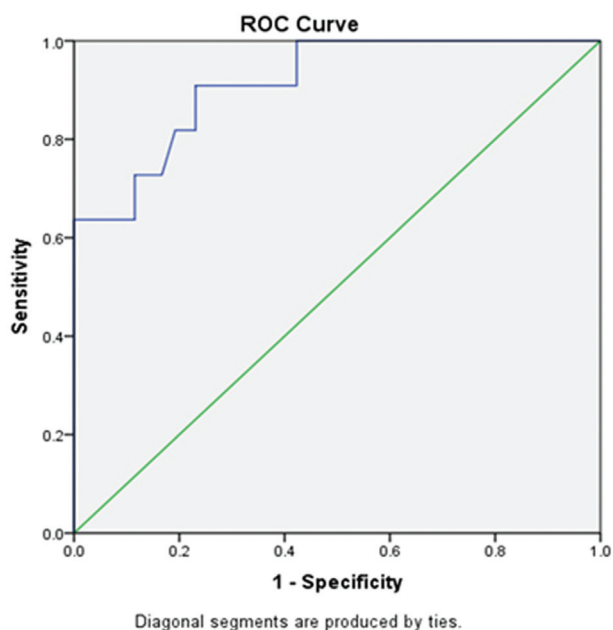
Regarding correlation of Ranson's score system with Atlanta grade, the data show 21 patients with mild Ranson's score less than or equal to 3, of whom 14 patients were evaluated as mild, four patients as a moderate, and three patients as severe in the Atlanta's grade. However, nine patients had severe Ranson's score more than 3, where one patient was evaluated as mild, two patients as moderate, and six patients as severe in the Atlanta's grade. Interestingly, we found a significant correlation between Atlanta grading and Ranson's and APACHE-II score, with *P* value of 0.04, as shown in Table 5 and Figs 4 and 5.

Computed tomography finding of the patients

The APACHE-II scoring system shows more response against patients with CT finding more

than the Ranson's scoring system. The relation shows statistically significance of data, as shown in Table 6 and Fig. 6.

Figure 4

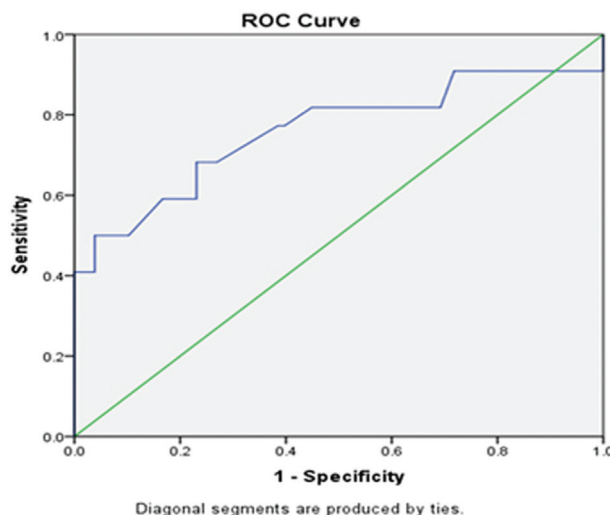


AUC of the APACHE score in evaluation of severity of pancreatitis by Atlanta score. APACHE, Acute Physiology and Chronic Health Evaluation; AUC, area under the curve.

Sensitivity and specificity of Acute Physiology and Chronic Health Evaluation II score

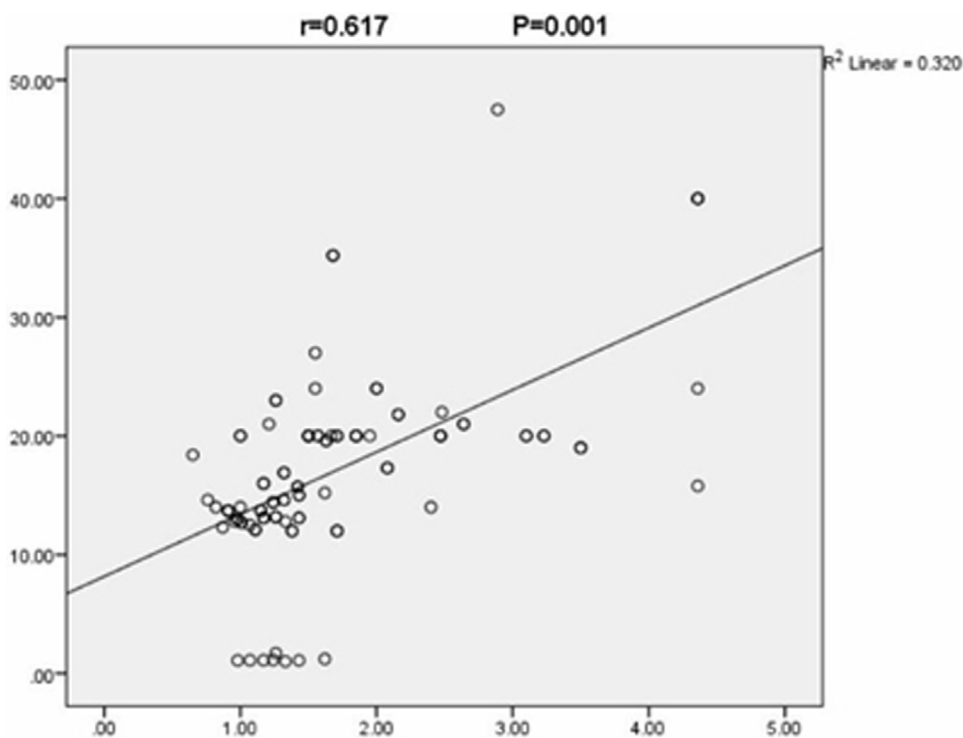
We measured AUC, sensitivity, and specificity of APACHE-II and Ranson's scores in assessment of pancreatitis severity by Atlanta score. Interestingly, we found high accuracy, sensitivity, and specificity of APACHE-II score at a cutoff point of 8.4 (92, 97,

Figure 5



AUC of the Ranson's score in evaluation of severity of pancreatitis by Atlanta score. AUC, area under the curve.

Figure 6



Correlation of Ranson's score and APACHE-II score with CTSI score. APACHE, Acute Physiology and Chronic Health Evaluation; CTSI, computed tomography scoring index.

Table 6 Computed tomographic finding of patients

	All cases	F (%)	APACHE-II score		F (%)		Ranson's score		F (%)		P value	χ^2
			≤8	>8	≤8	>8	≤3	>3	≤3	>3		
Total	30	100	16	14	53	47	21	9	70	30		
CT finding												
Pancreatic necrosis	19	63	5	14	0	100	10	9	47.5	100	0.0288	819
Pancreatic fluid collection	25	83	11	14	0	100	16	9	76	100		
Pleural effusion	28	93	15	13	7	93	20	8	95	89		
Ascites	14	47	0	14	0	100	5	9	24	100		

APACHE, Acute Physiology and Chronic Health Evaluation. Statistical test used: χ^2 test. *P* value less than or equal to 0.05 considered statistically significant (95% confidence interval).

Table 7 Area under the curve of the Acute Physiology and Chronic Health Evaluation score in evaluation of severity of pancreatitis by Atlanta score

Best cutoff of APACHE-II	AUC	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
8.4	0.914	97	84	85.0	97	92

APACHE, Acute Physiology and Chronic Health Evaluation; AUC, area under the curve; NPV, negative predictive value; PPV, positive predictive value.

Table 8 Area under the curve of the Ranson's score in evaluation of severity of pancreatitis by Atlanta score

Best cutoff of Ranson's score	AUC	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
3.1	0.88	90.9	84.4	75.0	91	86

AUC, area under the curve; NPV, negative predictive value; PPV, positive predictive value.

Table 9 Outcome of patients with correlation to Acute Physiology and Chronic Health Evaluation II and Ranson's score

	All cases	F (%)	APACHE-II score		F (%)		Ranson's score		F (%)		P value	χ^2
			≤8	>8	≤8	>8	≤3	>3	≤3	>3		
Total	30	100	16	14	53	47	21	9	70	30		
Outcome												
Discharged	19	63	15	4	93	28.5	16	3	76	33	0.04	452
Died	1	3.5	0	1	0	7	0	1	0	11		
Left against medical advice	1	3.5	0	1	0	7	1	0	4.5	0		
ICU admission	9	30	1	8	7	57	4	5	19	56		

APACHE, Acute Physiology and Chronic Health Evaluation. Statistical test used: χ^2 test. *P* value less than or equal to 0.05 considered statistically significant (95% confidence interval).

and 84%, respectively) in comparison with Ranson's score at cutoff point of 3.1, which shows less accuracy, sensitivity, and specificity (86, 90.4, and 82.4%, respectively), with significant *P* value (0.001), as shown in Tables 7 and 8.

Outcomes of the patient

Among the 30 patients admitted to the surgical wards, ~19 (63%) patients were discharged, one (3.5%) patient died, one (3.5%) left against medical advice, and nine (30%) patients were transferred to ICU. Interestingly, 15 patients with APACHE-II score less than 8 were discharged and eight patients with APACHE-II more than eight underwent ICU admission, and one case died.

On the contrary, 16 cases with Ranson's score less than 3 were discharged, five patients underwent ICU admission with Ranson's score more than 3, with significant difference ($P=0.04$), as shown in Table 9.

Discussion

AP is described as an inflammatory process of the pancreatic gland that can lead to local injury and/or systemic complications up to multiple organ failure [10].

As severe AP may cause organ failure or even death and because assessment of severity clinically is not enough, other parameters are added to clinical assessment to

early identify and manage patients in need for intensive care and follow-up.

Severity was estimated better by adding biochemical parameters to clinical evaluation, such as score of Ranson's and APACHE-II score [4].

The Ranson criteria and the APACHE-II score are the most widely used severity assessment scores for AP, whereas the SOFA score is most widely used in the evaluation of patients with sepsis. These scoring systems are initially designed for mortality prediction of critically ill patients in the first 48 h [11].

In this study, we compared the classical and simple Ranson's scoring system with the more advanced APACHE-II scoring system. Severity of AP in this study was evaluated in comparison with the Atlanta criteria. We also used CT severity index as a correlation factor for assessment of our scores used.

Most of the studies depended on their comparison on Atlanta score or CT severity index, but few studies as our study used both. Atlanta score was used as a qualitative measure and CT was used as quantitative index for Ranson criteria and the APACHE-II comparison.

Our study was applied on 30 patients diagnosed as having AP and admitted to Menoufia hospital. We applied the both scoring systems (Ranson's and APACHE-II) on the all same patient of the study.

In this study, AP was found about two times more commonly in females than males (male to female ratio 30 : 70), and the mean age was 52.4 years. These results did not align with the results of the study of Malathy and Sundarapandian [12,13]. However, Yadav *et al.* [13], reported similar results as ours.

Regarding presentation of patients, we found epigastric pain is the most complaining symptom (100%), followed by vomiting, abdominal distension, and nonpassage of stool. This was similar to the clinical presentation described by Paul Ekka *et al.* [14].

In our study, biliary causes owing to gall stones represent the majority of cases (83%). Other nonbiliary causes included alcoholic, hypercalcemia, and hyperparathyroidism (17%) in our study, with no significant statistically difference in the etiology correlated to severity of pancreatitis. This was aligned with data reported by the study by Carnovale *et al.* [15].

The etiology had no significant influence on the scores or the final outcome of AP, suggesting that once inflammatory process started, there is no role of the underlying cause. This is similar to the data reported by the study by Woo *et al.* [16].

Regarding local complication and systemic complication in our study according to CT findings, we obtained the following:

Pancreatic necrosis

According to CT findings, 19 (63%) patients had pancreatic necrosis with variable degrees. According to APACHE-II score more than 8, 14 (47%) patients had pancreatic necrosis, and according to Ranson score more than 3, nine (30%) patients had pancreatic necrosis.

In our study, we compared both APACHE-II and Ranson's scores, which are multifactorial scores in prospectively collected patients with AP to evaluate severity and prognosis according to both scores.

Our study underwent the same maneuvers regarding correlation with Atlanta grading system and CT severity index scoring system. Our prospective study showed 16 patients with APACHE-II score less than or equal to 8, where eight patients evaluated as mild in Atlanta's grade, five patients as a moderate, and three patients as severe. However, 14 patients with APACHE-II score more than 8, where two patients were evaluated as mild, four patients as moderate, and eight patients as severe.

Regarding the correlation of Ranson's score system with the Atlanta grade, the data showed 21 patients with mild Ranson's score less than or equal to 3, where 14 patients were evaluated as a mild, four patients as moderate, and three patients as severe in the Atlanta's grade. However, nine patients with severe Ranson's score (>3) showed that one patient was evaluated as mild, two patients as moderate and six patients as severe in the Atlanta's grade.

Interestingly, we found a significant correlation between Atlanta grading and Ranson's and APACHE-II score, with P value=0.04.

Of the 30 cases in this study, 14 (46%) cases experienced severe AP according to APACHE-II score, whereas only nine (30%) cases experienced severe AP according to Ranson score.

The percentage of severe cases was higher in our study as compared with many of other studies [17].

The AUC for computed tomography scoring index (CTSI) was the highest for all the four characteristics for severity evaluation of AP, which were pancreatic necrosis (0.993), need for ICU admission (0.993), severe AP (0.919), and organ failure (0.893).

Most of the studies performed on the same issue used CTSI, which was observed to be simpler and more accurate than modified CTSI and has a stronger statistical correlation with length of stay, development of infection, organ failure, and mortality, and is better in evaluation of local complications but less good in evaluation of distant organ affection.

In our study according to the terms of severity, APACHE-II was matched with CTSI ($P=0.13$), but the AUC of CTSI was significantly higher than Ranson's score ($P=0.02$) and so did the APACHE-II. On the contrary, Ranson's score was better than APACHE-II in evaluation of pancreatic necrosis, but the difference was not significant (both $P>0.05$).

The results of our study revealed that the severity of AP increased as the Ranson increased, whereas as to APACHE-II score, differences were found between either mild AP and severe AP group or moderate AP and severe AP group. These results demonstrated the discriminatory ability of these scores.

ROC curve analyses demonstrated that APACHE-II score achieved the highest AUC among single predictors in predicting AP, whereas Ranson criteria achieved less results. The combination of severity scores improved their performance in predicting AP.

Our study had some limitations. The sample size was too small to make the best choice among the two scoring systems. As alcohol in our country is not common, the main etiology for pancreatitis was gall stones, so we need more studies comparing both scores for different causes.

Conclusion

APACHE-II is a helpful scoring system and better than Ranson's score in evaluation of patients who are suspected to complain of severe attack early in the course of their disease.

Moreover, APACHE-II is a helpful indicator for further need of more care of patients, such as ICU admission and referral to higher centers, which are able to deal with suspected complication and surgical interference if needed.

Moreover, at primary health care units, we can apply APACHE-II scoring system for evaluation and follow-up of patients and referral to tertiary care hospitals only when needed according to follow-up.

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Conflicts of interest

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