ORIGINAL RESEARCH

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HAPS (Harmless AP Score) in Determining Poor Prognosis in AP

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Abstract

Objective: Acute pancreatitis (AP) is a common disease of the gastrointestinal tract. Gallstones are the most common cause of AP etiology. Most prognosis scoring systems are non-practical in emergency departments (EDs). Harmless acute pancreatitis score (HAPS) is a scoring system that is easily used for detecting non- severe AP (SAP).

Materials and Methods: In this study, patients aged >18 years and with International Classification of Diseases code K85 were retrospectively reviewed. After excluding trauma, recurrent pancreatitis, and cancer, 150 patients were included in the study. First, all patients were divided into two groups; HAPS0 and HAPS+. Radiological examination, necrosis, need for intensive care unit, mortality rates, and hospitalization durations of HAPS0 and HAPS+ were compared. Then, we calculated the HAPS and Ranson score (RS) for all patients and compared their odds ratio (OR).

Results: Of all patients, 58.5% were male. Biliary pancreatitis was observed in 72% of HAPS0 patients and 66.2% of HAPS+ patients. There was no in-hospital mortality in the HAPS0 group. ORs were 4.229 and 0.885 for HAPS and the RS, respectively.

Conclusion: HAPS can be useful for discriminating between non-severe and SAP at the ED.

Keywords: AP, prognosis, HAPS, Ranson

Introduction

Acute pancreatitis (AP) is a gastroenterological disease that is frequently associated with hospitalization, with more than 275,000 cases per year [1,2]. The incidence of AP is 34 per 100.000 people per year [3]. The most common causes of AP are gallstones and alcohol abuse, which account for 30-50% of the etiology [4].

The diagnosis of AP is based on the presence of two of the following three features: (a) Abdominal pain compatible with AP (acute onset of a persistent, severe, epigastric pain often radiating to the back); (b) serum lipase activity (or amylase activity) at least three times greater than the upper limit of normal; and (c) characteristic findings of AP on radiological imaging [contrast-enhanced computed tomography (CECT) and less commonly magnetic resonance imaging or transabdominal ultrasonography] [5-7].

The following diagnosis, clinicians must determine the severity of AP to inform subsequent management. The Atlanta classification, revised in 2012, categorizes AP according to severity as follows: mild, moderate, and severe [1]. Patients were divided into two groups: those with severe AP (SAP) and those without (non-SAP), based on the Harmless AP Score (HAPS) and the Ranson score (RS).

The mortality rate in all acute cases was between 3% and 10%. In patients with SAP, this rate increases to 36-50% [8,9].

Although benign AP can have a poor prognosis, it is important to accurately assess disease severity to select an appropriate initial treatment to improve prognosis. The severity of the disease is

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correlated with the presence and extent of pancreatic necrosis and the extent of inflammatory changes [10].

Despite the limitations of scanning in the first 48 hours, which may not fully develop necrosis and its extent, CECT is considered the gold standard for the diagnosis of necrotizing pancreatitis [11]. At the emergency department (ED), CECT was utilized to identify local complications (necrosis, abscess, etc.) subsequent to examination, laboratory tests, or consultation.

In Türkiye, the number of admissions to EDs exceeded 130 million in 2022. The proportion of all hospital admissions resulting in admission to the ED was 28% [12]. Consequently, there is an increasing need for simple, effective, and cost-efficient scoring systems to predict prognosis. Several scoring systems have been developed to determine the severity of AP, including the RS, Bedside Index of Severity in AP (BISAP), Acute Physiology and Chronic Health Examination (APACHE II), and modified Glasgow Prognostic Score (mGPS). The limitations of these scoring systems include the time required to complete them, which can range from 24 to 48 hours, and the difficulty of applying many of the parameters in EDs.

Ranson et al. (13) established the Ranson criteria for the prognosis of AP, which included 11 parameters. Each criterion was assigned a value of 1. A score of less than 3 was considered to indicate a non-severe form of AP, whereas a score of 3 was considered to indicate severe pancreatitis (Table 1) [13]. Admission RS was used.

In 2009, Lankisch et al. (14) reported the results of a prospective study in which they found a scoring system called HAPS, which is capable of detecting non-severe pancreatitis with ease. HAPS0 was defined as patients who did not exhibit signs of peritonitis, had a serum creatinine level of less than 2 mg/dL, and had a hematocrit level of less than 43% in men and less than 39.6% in women at the time of admission. Consequently, patients classified as HAPS0 did not require further examination or interventional treatment [14].

Although other prognostic systems place greater reliance on laboratory values, HAPS incorporates physical examination (palpation).

It is recommended that HAPS be employed to distinguish between mild and severe cases, as evidenced by the literature. The objective of this study was to demonstrate that HAPS is effective in detecting severe cases and contribute to the existing literature on this topic.

Materials and Methods

We conducted this retrospective study in the ED of a tertiary university hospital, to which approximately 300.000 patients applied annually. Approval for this study was session of the Non-interventional Research Ethics Committee of Fırat University (decission number: 2020/02-52, date: 10.02.2022). The files of patients who applied to the ED between 2019-2022 and entered the K85 ICD-10 code were retrospectively reviewed in the patient registration system. Based on the results of laboratory and radiological examinations, 150 patients were included in the study, and trauma, cancer, and recurrence cases were excluded from the study. The study was planned as a retrospective file review, informed consent was not obtained from the patients.

The demographic, clinical, laboratory, and radiological data of 150 patients were recorded as AP. We initially divided all patients into two groups according to HAPS scores: HAPS0 and HAPS+. The rate of computed tomography, rate of necrosis, need for intensive care unit (ICU), death rates and hospitalization durations of HAPS0 and HAPS+ were statistically compared.

Table 1. Ranson criteria [13]

Biliary	Non-biliary
At admission or diagnosis	At admission or diagnosis
Age> 70/year	Age> 55/year
WBC> 18000/mm^3	WBC> 16000/mm^3
Glucose> 220 mg/dL	Glucose> 200 mg/dL
LDH> 400 IU/L	LDH> 350 IU/L
AST> 250 IU/L	AST> 250 IU/L
During the initial 48 h,	During the initial 48 h,
Hematocrit fall> 10%	Hematocrit fall> %10
BUN rise > 2mg/dL	BUN rise> 5mg/dL
Calcium< 8 mg/dL	Calcium< 8 mg/dL
Arterial PO_2< 60 mm Hg	Arterial PO_2<60 mm Hg
Base deficit> 5 mEq/L	Base deficit>4 mEq/L
Estimated fluid sequestration> 4 lt	Estimated fluid sequestration>6 lt

WBC: White blood cell, LDH: Lactic dehydrogenase, AST: Glutamic oxaloacetic transaminase, BUN: Blood urea nitrogen

Each criterion is 1 point. A score of less than 3 is considered non-severe, and a score of 3 or more is considered severe pancreatitis [13].

In-hospital mortality, ICU admission, and necrotizing pancreatitis were considered poor prognoses, and then we compared the prediction value of HAPS and Ranson for poor prognosis.

Statistical Analysis

Data were analyzed using SPSS (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.). Continuous variables are expressed as mean±standard deviation. Categorical data are expressed as numbers and percentages. The chi-square test was used to compare categorical variables, and the Mann-Whitney U test was used to compare continuous variables that were non-normally disturbed variables. Logistic regression analysis, receiver operating characteristics (ROC), analysis curve, and area under the curve (AUC) were used to compare HAPS and RS for predicting poor prognosis. Statistical significance was set at $p<0.05$.

Results

After excluding cases of trauma, cancer, and recurrence cases, the remaining 150 patients were included in the study. 82 patients had non-SAP according to the HAPS. Of these patients, 48 (58.5%) were male and 34 (41.5%) were female. The sex of the HAPS0 and HAPS+ groups was similar (p=0.612) (Table 2).

Biliary pancreatitis was identified as the underlying cause in 72% of HAPS0 patients and 66.2% of HAPS+ patients. Only one patient had a history of alcohol consumption. There was no significant difference in the etiology between the two groups (p=0.445) (Table 2).

Computed tomography (CT), scanning was performed in 24.4% and 39.7%, respectively, in the HAPS0 and HAPS+ groups The CT scan and necrosis rates were found to be statistically similar between the two groups (p=0.044 and p=0.130) (Table 2).

A total of 16.2% of HAPS+ patients and 3.7% of HAPS0 patients were treated in the ICU. A greater proportion of patients with HAPS+ were followed up in the ICU (p=0.009) (Table 2).

The median length of hospitalization was 7.4±7.5 days for HAPS0 and 8.9±6.8 days for HAPS+ (p=0.08) (Table 2).

The overall mortality rate was 2%. Although no in-hospital deaths occurred in the HAPS0 group, there was no significant difference between the two groups (p=0.091) (Table 2).

Table 2. Demographic and radiological profile of the patients

		Total	HAPS0	HAPS+	p
Gender, n (%)					
	Male	85 (56.7)	48 (58.5)	37 (54.4)	0.612*
	Female	65 (43.3)	34 (41.5)	31 (45.6)	
Age, (mean±SD)		54.8±18.5	50.4±18.6	60.1±17.1	**0.001****
Cause, n (%)					
	Biliary	104 (69.3)	59 (72)	45 (66.2)	0.445*
	Non-biliary	46 (30.7)	23 (28)	23 (33.8)	
Computed tomography, n (%)					
	CT performed	47 (31.3)	20 (24.4)	27 (39.7)	**0.044***
	CT not performed	103 (87.7)	62 (75.6)	41 (60.3)	
Complications, n (%)					0.130*
	Necrosis	5 (3.33)	1 (0.67)	4 (2.67)	
Intensive care unit					
	ICU (+)	14 (9)	3 (3.7)	11 (16.2)	**0.009***
	ICU (-)	136 (91)	79 (96.3)	57 (83.8)	
Hospital stay time (days), (mean±SD)		8.1±7.2	7.4±7.5	8.9±6.8	0.08**
Exitus, n (%)					
	Exitus (+)	3 (2)	0	3 (5)	0.09*
	Exitus (-)	147 (98)	82	65 (95)	

*Chi-square test, **Mann-Whitney U test

HAPS: Harmless acute pancreatitis score, US: Ultrasonography, CT: Computed tomography, ICU: Intensive care unit, SD: Standard deviation

The specificity and positive predictive value of HAPS were 75% and 95.1%, respectively, and the odds ratio (OR) was 4.229 [95% confidence interval (CI) for EXP(B) 1,283-13,941, p=0.012] (Table 3).

The ROC curves of HAPS and RS demonstrated that the AUC of HAPS was significantly greater than that of RS (p=0.03, p=0.893) (Figure 1, Table 3).

Discussion

Acute abdominal pain represents a significant proportion of ED admissions. A study of 5.340 cases of acute abdominal pain revealed that AP constituted 1.89% of all cases [15]. The pathogenesis of AP is attributed to the reflux of pancreatic enzymes, bile, duodenal fluid, and increased duct pressure [16].

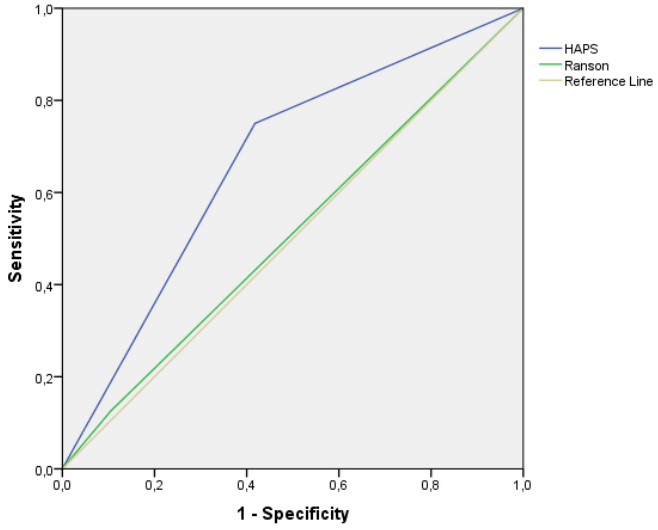

Figure 1. Receiver operating characteristic analysis for Ranson and HAPS

HAPS: Harmless acute pancreatitis score

Gallstones and alcohol consumption are the most common etiological factors of AP [17]. A prospective study of 2144 patients was conducted in 17 tertiary care centers in Türkiye revealed that the most common etiologies were biliary (67.1%), idiopathic (12%), hypertriglyceridemia (6%) and alcohol (4.2%) [18]. In the current study, 72% of patients exhibited gallstones. It is postulated that the rate of alcohol consumption in the current study was lower than that reported in the literature. This is attributed to the low rate of alcohol consumption in Türkiye and the reluctance of patients to provide an accurate history. Given the absence of a division of etiology according to HAPS and the use of RS for comparison, we divided etiology into biliary and non-biliary categories.

The mean age of the study population was 54.8±18.5 years, with 43.3% of patients being female. In a study comprising 398 patients, the mean age of patients with pancreatitis was 58.87±18.65 years [19]. Although the mean age of HAPS+ patients was older than that of HAPS0 patients (p=0.001), there was no statistically significant age difference between patients with severe and non-severe pancreatitis (p=0.230). Consequently, we hypothesized that age may not be an effective predictor of prognosis.

A comparison of the number of CECT examinations performed in patients with HAPS0 versus those with HAPS revealed a significant difference. The former group required less ICU treatment. A recent study indicated that patients with HAPS0 require less-invasive treatment [20]. As previously stated, SAP is associated with increased medical costs [21,22]. Therefore, it is crucial to identify these patients at an early stage and at

Table 3. Prediction of HAPS and Ranson for poor diagnosis (ICU, exitus and necrosis)

		HAPS0	HAPS+	Ranson< 3	Ranson≥ 3
Poor Diagnosis					
	Yes	4	12	14	2
	No	78	56	120	14
	Odds ratio	4.229		0.885	
	95% CI for EXP(B)	1.283-13.941		0.175-4.468	
	p*	**0.012**		**0.802**	
	Sensitivity	58,2		89.5	
	Specificity	75		12.5	
	PPV	95.1		89.5	
	NPV	17.6		12.5	
	Area under the curve	0.67		0.51	
	p**	**0.030**		**0.893**	

*Chi-square test. **ROC Analysis, PPV: Positive predictive value, NPV: Negative predictive value, CI: Confidence interval

a low cost. In this context, HAPS is an efficacious prognostic system capable of reducing examination and treatment costs.

In the medical literature, the mortality rate of patients diagnosed with HAPS0 is between 0% and 2.67%. In contrast, the mortality rate of patients diagnosed with HAPS+ is between 8.7% and 9.1% [23,24]. Although no HAPS0 patients died and the in-hospital mortality rate was 5% in the HAPS+ group, the mortality rates in the two groups were statistically similar and consistent with the literature.

In this study, the ORs for HAPS and Ranson were 4.229 (95% CI: 1.283-13.941, p=0.018) and 0.885 (95% CI: 0.175-4.468, p=0.882), respectively. The predictability of HAPS was found to be higher than that of Ranson. In one study, the OR of HAPS was 5.57 (1.51–20.50, p=0.009), indicating a statistically higher prognosis predictability of HAPS than that of Ranson [23].

In a study comparing five scoring systems, including HAPS, HAPS demonstrated the highest AUC value and OR [25]. In this study, the AUC of HAPS was significantly greater than that of the RS (p=0.03, p=0.893).

A plethora of scoring systems have been devised to predict the severity of AP, the earliest of which was the RS, developed in 1974. Other notable scoring systems include the Japan Severity Index, APACHE II, BISAP, and mGPS. However, these scoring systems require a minimum of 24-48 hours of evaluation and repeated evaluations to predict the severity of AP. For instance, the guidelines recommend APACHE II scoring as the most effective method for distinguishing the severity of AP at the time of initial admission, with the application of this scoring system recommended during the first 3 days [26]. Given the increasing number of patients presenting to ED and the inherent complexity of other prognostication systems, it is impractical to use these systems in the context of emergency care.

Study Limitations

This study employed a single-center, retrospective design with a relatively small sample size.

Conclusion

Consequently, the HAPS scoring system is a straightforward and cost-effective method for prognosticating the outcome of AP. It is our opinion that this issue should be subjected to further investigation in the form of multi-center, prospective studies involving a larger number of patients.

Ethics

Ethics Committee Approval: Approval for this study was session of the Non-Interventional Research Ethics Committee of Fırat University (approval number: 2020/02-52, date: 10.02.2022).
Informed Consent: Retrospective study.

Footnote

Authorship Contributions

Surgical and Medical Practices: A.K., Concept: A.K., Design: M.Ş., Data Collection or Processing: M.Ş., Analysis or Interpretation: A.K., M.Ş., Literature Search: M.Ş., Writing: A.K., M.Ş.

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