PROSPECTIVE EVALUATION OF BISAP SCORING IN ASSESSING SEVERITY IN ACUTE PANCREATITIS

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ABSTRACT

BACKGROUND
Several scoring systems have been used in the past to assess severity and outcome in acute pancreatitis. This study is to assess the ability of the BISAP score to predict, which patients are at risk for intermediate markers of severity including the development of organ failure, persistent organ failure and pancreatic necrosis.

MATERIALS AND METHODS
A prospective study was done between November 2014 to June 2015. 50 patients who presented to Government Royapettah Hospital and diagnosed as acute pancreatitis were included in the study. Full history, clinical examination, ultrasound abdomen and laboratory blood test were done for all patients and BISAP score assigned for all patients with acute pancreatitis.

RESULTS
90% were found to be males. 96% of patients were presented with abdominal pain as chief complaint. Mean length of hospital stay was found to be 13.98 days. Alcohol was found to be the commonest cause of acute pancreatitis in 54% of patients. BISAP score was found to have high sensitivity (80%) and specificity (88.89%) in predicting necrosis and high sensitivity (83.33%) and specificity (90%) in predicting organ failure. Sensitivity and specificity in predicting mortality was found to be 100% and 95.83%, respectively.

CONCLUSION
BISAP scoring is a simple and bedside scoring system with high sensitivity and specificity in predicting disease severity in terms of necrosis, organ failure and mortality.

KEYWORDS
Acute Pancreatitis, BISAP.

major disadvantage Ranson’s and as well as older Glasgow criteria being many of the parameters, which are components of this scoring are not collected at admission on a routine basis. Also, it does not predict the severity of the disease at admission as six of the parameters are assessed only after 48 hours. Hence, an early therapeutic window is missed.

The APACHE II, which is the most common scoring used worldwide was originally developed as a risk stratification tool in intensive care setting. But, it takes into account a huge list of parameters, some of which may not be related to the severity.

Hence, an accurate and relatively simple bedside scoring system BISAP was developed. This scoring system identifies patients with high morbidity as well as risk of mortality before organ failure sets in. Data for this scoring system is collected within 24 hours of hospitalisation, which helps in identifying patients who are at risk of developing a severe disease very early and helps in managing the same effectively, thus decreasing the mortality and morbidity.

AIMS AND OBJECTIVES OF THE STUDY
- To evaluate the ability of BISAP score to predict mortality in acute pancreatitis patients from our institution.
- To assess the ability of the BISAP score to predict, which patients are at risk for intermediate markers of severity including the development of organ failure, persistent organ failure and pancreatic necrosis.
- To correlate the outcome of the study with the scores observed in terms of disease severity and mortality.

BISAP (The Bedside Index for Severity in Acute Pancreatitis)-
This new scoring system has been developed recently for early detection of patients with risk of in-hospital mortality.

The BISAP score has been developed and validated retrospectively on a large population-based study done by Cardinal Health Clinical Outcomes Research Database, Marlborough, USA.6

This score was published recently for clinical and research purpose for its accuracy and reliability in patient stratification.

The BISAP includes-7
1. Blood Urea Nitrogen (BUN) >25 mg/dL.
2. Impaired mental status (GCS<15).
3. SIRS.
4. Age >60 years.
5. Pleural effusion.

SIRS was defined by presence of two or more of the following criteria-
1. Pulse rate >90/mins.
2. Respiratory rate >20/mins. or PaCO₂ <32 mmHg.
3. Temperature >100.4 F or <96.8 F/<36 or >38°C.
4. WBC count >12,000 or <4,000 cells/mm³ or presence of more than 10% immature blasts.

(SIRS - Systemic Inflammatory Response Syndrome).

One point will be given for each variable present for a total of 5, score ranges from 0 to 5.

The presence of a pleural effusion was determined by a CT scan, chest x-ray or abdominal ultrasound obtained within 24 hrs. of presentation. Imaging obtained within 24 hrs. of presentation at the hospital of origin for transferred patients was also collected and reviewed.

A BISAP score of three or more has been found to have high mortality and have predicted the necrosis and organ failure very well.8

ADVANTAGES
Simple and easy to calculate, usually done at the time of admission or within 24 hrs. of hospitalisation.

The scores prediction ability was tested across 390 hospitals among large number (36,248) of populations in contrast to other studies, which were based on small number of patients.

MATERIALS AND METHODS
Study design- Prospective study.
Setting- Department of General Surgery, Government Royapettah Hospital, Chennai.

Inclusion Criteria
Acute pancreatitis is defined as 2 or more of the following-
- Characteristic abdominal pain.
- Increased levels of serum amylase and/or lipase 3 times the normal value.
- Ultrasonography of the abdomen demonstrating changes consistent with acute pancreatitis.

Individual Components of the BISAP Scoring System
- BUN >25 mg/dL.
- Impaired mental status (Glasgow Coma Scale Score <15).
- SIRS- is defined as two or more of the following-
  1. Temperature of <36 or >38°C.
  2. Respiratory rate >20 breaths/mins. or PaCO₂ <32 mmHg.
  3. Pulse >90 beats/mins.
  4. WBC <4,000 or >12,000 cells/mm³ or >10% immature bands.
- Age >60 years.
- Pleural effusion detected on imaging.

One point is assigned for each variable within 24 hrs. of presentation.

A CT or MRI or USG of the abdomen obtained at any time from interstitial pancreatitis.

Organ failure is defined as a score of ≥2 in one or more of the three (respiratory, renal and cardiovascular) out of the five organ systems initially described in the Marshall score.9

Organ failure scores were calculated for all patients during the first 72 hrs. of hospitalisation based on the most extreme laboratory value or clinical measurement during each 24 hrs. period.

Duration of organ failure was defined as transient (≤48 hrs.) or persistent (>48 hrs.) from the time of presentation.
For non-ventilated patients, FiO$_2$ can be calculated by-

<table>
<thead>
<tr>
<th>Supplemental Oxygen (l/mins.)</th>
<th>FiO$_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room air</td>
<td>21%</td>
</tr>
<tr>
<td>2-3</td>
<td>25%</td>
</tr>
<tr>
<td>4-5</td>
<td>30%</td>
</tr>
<tr>
<td>6-8</td>
<td>40%</td>
</tr>
<tr>
<td>9-10</td>
<td>50%</td>
</tr>
</tbody>
</table>

Exclusion Criteria
- Proven cases of chronic pancreatitis.
- Hereditary pancreatitis.
- Acute pancreatitis patients with organ failure at or within 24 hrs. of presentation.

MATERIALS AND METHODS

First 50 patients attending the general surgery department with clinical features of acute pancreatitis are evaluated clinically and subjected to laboratory and radiological investigations. Data pertinent to the scoring systems will be recorded within 24 hrs. of admission to the hospital.

For each of 50 patients included in the study, BISAP scores were calculated by the Cardinal Health Database System for BISAP scoring.

Patients were classified to have mild or severe acute pancreatitis according to the definitions set by the Atlanta Classification Guidelines (1992).

Survivors were defined as patients discharged alive from the hospital and non-survivors were those who died from pancreatitis or its complications during hospitalisation.

Patients were observed prospectively until discharge or death.

OBSERVATION AND RESULTS

This study was conducted in the Department of General Surgery, Government Royapettah Hospital, Chennai, for a period of 8 months. The 50 persons with features of acute pancreatitis who fulfilled the inclusion criteria were enrolled in this study after obtaining an informed consent.

Age Distribution

<table>
<thead>
<tr>
<th>Age Range (Years)</th>
<th>Number of Patients</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 yrs.-30 yrs.</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>31 yrs.-40 yrs.</td>
<td>17</td>
<td>34</td>
</tr>
<tr>
<td>41 yrs.-50 yrs.</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>51 yrs.-60 yrs.</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>
On clinical presentation, 96% of patients were presented with abdominal pain as chief complaint. Rest of 4% who didn’t have abdominal pain had vomiting and fever as presenting symptoms.

**Clinical Features**

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Number of Patients</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain abdomen</td>
<td>48</td>
<td>96</td>
</tr>
<tr>
<td>Fever</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Vomiting</td>
<td>22</td>
<td>44</td>
</tr>
<tr>
<td>Jaundice</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Abdominal distension</td>
<td>7</td>
<td>14</td>
</tr>
</tbody>
</table>

**Aetiology**

<table>
<thead>
<tr>
<th>Aetiology</th>
<th>Number of Patients</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol</td>
<td>27</td>
<td>54</td>
</tr>
<tr>
<td>Gallstone Disease</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>Drug induced</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Hypertriglyceridemia</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Trauma</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Idiopathic</td>
<td>7</td>
<td>14</td>
</tr>
</tbody>
</table>

History of consumption of alcohol and the possibility of it being the aetiological factor were found in 27 patients. Gallstone disease was attributed in 12 patients. Hyperlipidaemia and drugs as causative factor presented in 1 and 1 patients, respectively. There was clear-cut history of blunt trauma with CT scan showed isolated pancreatic laceration presented in 2 cases. No cause could be attributed in rest of the 7 patients.

**SENSITIVITY AND SPECIFICITY OF BISAP SCORING**

<table>
<thead>
<tr>
<th>BISAP</th>
<th>Number of Patients</th>
<th>Organ Failure</th>
<th>Pancreatic Necrosis</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;3</td>
<td>41</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>&gt;3</td>
<td>9</td>
<td>5</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

**Organ Failure**

<table>
<thead>
<tr>
<th>BISAP</th>
<th>Total</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;3</td>
<td>5</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Score</td>
<td>&lt;3</td>
<td>1</td>
<td>40</td>
</tr>
<tr>
<td>Total</td>
<td>6</td>
<td>44</td>
<td>50</td>
</tr>
</tbody>
</table>

**Mortality**

<table>
<thead>
<tr>
<th>BISAP</th>
<th>Total</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;4</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Score</td>
<td>&lt;4</td>
<td>0</td>
<td>46</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td>48</td>
<td>50</td>
</tr>
</tbody>
</table>

**DISCUSSION**

Acute pancreatitis is a relatively common disease with varied clinical presentations. Severe acute pancreatitis has a high morbidity and mortality rate. Early hospitalisation and management according to disease severity maybe beneficial to identify those who require aggressive interventions to prevent the severe attack.

In this study, a relatively simple and bedside scoring system, BISAP is studied to assess the severity in patients with acute pancreatitis. An attempt also made to compare
this study with previous similar studies done by others.

Acute pancreatitis was found to be 9 fold more common in males than females in this study. However, this result did not exactly match with previous study results, Vikesh K. Singh et al\(^1\) (6:1), Papachristou et al\(^1\) (5:1:1). This could be explained by alcohol ingestion being the commonest aetiology in this study.

In this study, the mean age was 40.06 years, which matches with the study of Sarath et al (40.8 yrs.) and is comparable to the study done by Vikesh K. Singh et al\(^1\) (49.6 yrs.), Papachristou et al (51.7 yrs.).

The mean age of non-survivors in this study was found to be 52 years as compared to survivors being 41.23 years. Taking 52 yrs. of age as cut-off value, increasing age was found to be correlated well with increasing incidence of mortality. Thus, age is considered as a significant contributory factor in predicting the outcome of severe acute pancreatitis.

The most common aetiological factor in this study was alcohol (54%) and matches with Bidarkundi et al\(^10\) (46.67%), but didn't correlate with results of Vikesh K. Singh et al (21.4%), Papachristou et al (14%) in which gallstone disease found to be the most common cause 27% and 36%, respectively.

The mean length of hospital stay was 13.8 days in this study. In this study, increasing BISAP score was correlated well with the duration of hospital stay.

The most common presentation was predominantly abdominal pain (96%) followed by vomiting (44%), vomiting (30%) and other manifestations.

In this study, 41 patients were diagnosed to have mild acute pancreatitis and 9 patients found to have severe acute pancreatitis. All the 9 were correctly predicted by BISAP score. The severity was assessed by correlating the scores with three factors- organ failure, necrosis and mortality.

Set cut off of BISAP score ≥3 was used to assess disease severity based on previous studies done in this regard.

In this study, 5/9 with BISAP >3 developed pancreatic necrosis. Sensitivity and specificity of predicting organ failure in this study with a BISAP score of ≥3 was found to be 83.33% and 90.90%, respectively with a positive and negative predictive value of 55.56% and 97.56%, respectively.

Diagnostic accuracy of this study was found to be 90%. Sensitivity and specificity of predicting necrosis failure in this study with a BISAP score of ≥3 was found to be 80.00% and 88.89%, respectively with a positive and negative predictive value of 44.44% and 97.56%, respectively. Diagnostic accuracy of this study was found to be 88%.

BISAP ≥3 has significant correlation with prediction of pancreatic necrosis (p<0.01) (by Vikesh K. Singh et al).

In this study, 4% underwent surgical intervention, which is comparable with Sarath et al.

In this study, there was mortality in 2 patients. Both predicted by a score of >4. Cause of death in both patient was found to be MODS. The analysis for prediction of mortality showed a sensitivity of 100.00% and specificity of 95.83%, respectively. Positive and negative predictive values in the study were found to be 50 and 100%, respectively. Diagnostic accuracy of this study was found to be 96% for a BISAP score of >4.

This matches well with BU Wu et al,\(^12\) Papachristou et al, where specificity 87.6%, PPV 15.4%, NPV 98.1% for BISAP and respectively.

BISAP ≥4 was found to be significantly associated (p<0.04) with high mortality.

It was found to have high specificity, PPV and NPV for mortality. This again matches well with previous study by Vikesh K. Singh et al\(^3\) and Papachristou et al.

In this study, 35.7% developed acute renal failure, 21.4% developed MODS, 14.2% developed sepsis and 7.1% developed other complications like ARDS, UGI bleed, etc. These complications were more likely seen in patients with BISAP ≥3, hence concluded that these are the patients in high-risk group who requires intensive monitoring and probably early intervention if necessary.

BISAP score was found to have more sensitivity, specificity, positive and negative value and diagnostic accuracy in predicting the severity of acute pancreatitis. Hence, BISAP score found to predict more number of patients likelihood of progressing to severe disease. Larvin et al\(^13\) stated in their study that a prognostic scoring as say should preferably have high positive and negative predictive values or high negative predictive value to assess the severity of acute pancreatitis. Hence, BISAP is considered a simple and good bedside scoring system in predicting severity in acute pancreatitis.

**LIMITATIONS OF THIS STUDY**

- Small number of patients in this study.
- The aetiology in this study were found to be different from worldwide accepted one, hence might not be correct to compare with other studies.
- The GCS score used to assess the mental status of the patient got admitted were subject to interobserver variation.
- Recently, it has been suggested that severe acute pancreatitis may have variable disease progression; therefore, the lack of predictability might be associated with this disease variability.
- Variation in timing of presentation of patients to the hospital after onset of symptoms may interfere with assessment of the scoring systems.

**CONCLUSION AND SUMMARY**

- From this study, alcohol (54%) was found to be the most common aetiological factor for acute pancreatitis.
- Males were most commonly affected than female with a ratio of 9:1.
- The most common age groups of patients affected were in 4th decade of life.
- The overall mortality in patients with severe acute pancreatitis was 4%.
- The BISAP score predicted disease severity and mortality significantly in this study.
From this study, we conclude that the BISAP score can be a simple, bedside and accurate clinical scoring system for the evaluation of disease severity in acute pancreatitis. Hence, early identification and initiation of treatment can significantly alter the outcome.

REFERENCES