ABSTRACT

Introduction: Acute Pancreatitis (AP) is among leading cause of acute abdomen in the study institution. There is a need of simple criteria to stratify patients in Emergency Department. The Bedside Index for Severity in Acute Pancreatitis (BISAP) score is one such score.

Aim: This study evaluates the BISAP score to predict organ failure, pancreatic necrosis and moderately severe/severe AP in tertiary health care center in India and promote its use.

Materials and Methods: This prospective observational study was conducted on 50 consecutive patients diagnosed as AP from May 2019 to April 2020 and admitted in Emergency Department of DMC Hospital, Ludhiana, India. BISAP score was calculated based on data obtained within 24 hours of hospitalisation. Severity of AP was defined according to the Revised Atlanta Classification, 2012. Organ failure was defined using the Modified Marshall scoring system. Data was expressed in terms of median, frequencies (number of cases) and relative frequencies (percentages); range; mean±Standard Deviation (±SD). All statistical calculations were done in Microsoft Windows Statistical Package for the Social Science (SPSS) version 21.0.

RESULTS: The leading cause of AP in present study is gall stones, with maximum 26 (52%) cases. Second most common cause is alcohol with 11 (22%) cases. Systemic Inflammatory Response Syndrome (SIRS) is the most common component of BISAP score, present in 47 (94%) cases. Pancreatic necrosis present in 12 (24%) cases. Incidence of pancreatic necrosis rises at score ≥3 which is statistically significant (p-value < 0.008). Transient organ failure was present in 14 (28%) cases, persistent organ failure was present in 9 (18%) cases and 27 (54%) cases had no organ failure. At score ≥3, there is increased risk of organ failure and it is statistically significant (p-value ≤ 0.001). There are 27 (54%) mild, 14 (28%) moderately severe and 9 (18%) severe cases of AP. At score ≥3, there is increased risk of moderately severe and severe pancreatitis and it is statistically significant (p-value ≤ 0.001).

Conclusion: There is statistically significant trend of increasing incidence of organ failure, pancreatic necrosis and moderately severe/severe AP at BISAP score ≥3. Thus, BISAP score is simple yet accurate scoring system to improve early risk stratification in AP.

INTRODUCTION

The AP is defined as an inflammatory process of the pancreatic parenchyma. It is among the leading cause of acute abdomen. AP requires hospitalisation, early evaluation and risk stratification. Mostly, AP follows mild course and but few patients may develop a severe disease course. In severe disease, parts of pancreatic tissue and adjoining tissue become necrotic. It can progress from Systemic Inflammatory Response Syndrome (SIRS) to multiorgan failure. An early and accurate risk stratification protocol in AP would help in early initiation of appropriate therapy for patients with severe AP to prevent adverse outcomes and thus improving survival rates among patients.

The revised 2012 Atlanta classification is a valuable tool to assess AP. It has improved present understanding about AP, its course and classify pancreatic and peripancreatic fluid collections. It divides AP into two phases, early phase which is first one or second weeks and late phase. It also classifies AP as interstitial edematous pancreatitis or necrotising pancreatitis. Severity of the AP divided as mild, moderately severe and severe AP [1].

A model score should allow an early, accurate, quick and reliable risk stratification of the severity of disease. Multiple scores have been defined to evaluate the severity of disease, including Ranson criteria [2], Glasgow-imrie prognostic criteria, Acute Physiology And Chronic Health Evaluation (APACHE) II [3], and Computed Tomography Severity Index (CTSI) [4]. However, all of them have their pros and cons. The limitation of Ranson criteria is that it needs data that require 48 hours of hospitalisation, which may lead to missing an early therapeutic window and increased mortality [5]. Also, Ranson criteria is accurate at extreme scores (<3 indicate mild and ≥6 predicts severe disease) but not at intermediate scores [6]. APACHE II allows determination of severity of AP at admission but it is complex and needs number of parameters to calculate, some of which are not relevant to prognosis [7,8]. CTSI score is based upon CT findings of local complications and does not reflect the systemic inflammatory response [9,10]. Wu Bu et al., in 2008, proposed BISAP scoring system, a prognostic scoring system for early prediction of morbidity and mortality in AP [11]. Aim of the present study was to predict organ failure, pancreatic necrosis and moderately severe/severe AP in tertiary health care centre in India and promote its use.

MATERIALS AND METHODS

This prospective observational study was conducted on 50 consecutive patients diagnosed as AP from May 2019 to April 2020 and admitted through emergency in Dayanand Medical College and Hospital (DMC&H), Ludhiana, Punjab, India. Ethical clearance was taken from Research and Ethics Committee of this hospital (DMCH/ P/2019/1762). BISAP score was calculated based on data collected within 24 hours of hospitalisation of patient, and then patients were followed throughout hospitalisation for development of severe AP. BISAP score was calculated using data of patients collected within first 24 hours of admission in this hospital.

Inclusion criteria: Patients diagnosed as case of AP, admitted in Emergency Department of DMC&H and willing to participate in
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study after informed consent from patient/family were included in this study.

Exclusion criteria: Patient having history/features of chronic pancreatitis and acute on chronic pancreatitis were excluded from this study.

BISAP Score
1. Blood Urea Nitrogen (BUN) >25 mg/dL
2. Impaired mental status defined by Glasgow Coma Scale (GCS) score <15
3. Systemic Inflammatory Response Syndrome (SIRS)
   If more than two of following criteria present
   - Pulse >90 bpm
   - Respiration Rate (RR) >20/min or PaCO₂ <32 mmHg
   - Temperature >38°C (100.4°F) or <36°C (96.8°F)
   - Total Leucocyte Count (TLC) >12000 or <4000 cells/mm³ or >10% immature neutrophils
4. Age >60 years
5. Pleural effusion (on chest X-ray or ultrasound or CT scan)
Each point on BISAP score is given 1 point.

Diagnosis [12]
If any two of the following three were present, patient was considered as case of AP.
• Characteristic pain that is epigastric and/or periumbilical pain that radiates to back and relieved by sitting and leaning forward.
• Serum amylase and/or lipase level at least three times above normal.
• Findings on ultrasound abdomen and/or Computerised Tomography (CT) scan abdomen and/or Magnetic Resonance Imaging (MRI) scan of abdomen characteristic of AP.

Pancreatic Necrosis, i.e. focal or diffuse area of dead pancreatic tissue with peripancreatic fat necrosis. It contains abscess like material and may be sterile or infected. In the present study, all the subjects were confirmed by radiological investigation or by guided aspiration and was associated with BISAP score.

Revised Atlanta Classification, 2012 [13]
It is an update of the 1992 Atlanta classification. It is a multidisciplinary, international classification of the severity of AP. The severity grading of Acute Pancreatitis (AP) is classified as mild, moderately severe or severe [13].

Mild AP: It is absence of organ failure and absence of local or systemic complications. These patients usually got discharge during the early phase and do not require pancreatic imaging, and risk of mortality is very low.

Moderately severe AP: It is transient organ failure that is presence of organ failure for less than 48 hours. Any local and systemic complications may or may not be present. It may resolve without intervention or it may need prolonged intensive care. Mortality is less in moderately severe when compared to that of severe AP.

Severe AP: It is persistent organ failure that is presence of organ failure for more than 48 hour. If patient develop persistent organ failure within first few days, risk of death increases with high mortality rate.

Organ Failure
Organ failure was defined as a score of two or more for one among the following three systems (respiratory, cardiovascular, and renal) as per Modified Marshall scoring system as shown in [Table/Fig-1] [13]. Duration of organ failure was taken as either transient (≤48 hours) or persistent (>48 hours). If failure occurs in more than one organ, it was termed as Multiple Organ Failure (MOF). Organ failure score was calculated for all cases of AP during each 24 hour duration or on the basis of clinical measurement and maximum laboratory results within 72 hours of admission to present hospital. Duration of organ failure was taken as either transient (≤48 hours) or persistent (>48 hours). MOF was defined as organ failure affects more than one organ system.

<table>
<thead>
<tr>
<th>Organ system</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Respiratory (PaO₂/FiO₂)</td>
<td>&gt;400</td>
</tr>
<tr>
<td>Renal (serum creatinine, mg/dL)</td>
<td>&lt;1.4</td>
</tr>
<tr>
<td>Cardiovascular (SBP, mmHg)</td>
<td>&gt;90</td>
</tr>
</tbody>
</table>

[Table/Fig-1]: Modified Marshall scoring system.
PaO₂: Arterial oxygen partial pressure; FiO₂: Fractional inspired oxygen; SBP: Systolic blood pressure.

STATISTICAL ANALYSIS
Data was expressed in terms median, frequencies (number of cases) and relative frequencies (percentages); range; mean±standard deviation (±SD). All statistical calculations for this study were done in Microsoft Windows SPSS 21.0 version.

RESULTS
In present study, range of age was from 17-76 years with a mean age of 41.8 years with standard deviation of 15.7 years. Patients in age group <30 are 14 (28%), 31-50 years are 21 (42%), and >50 years are 15 (30%). Mean age of patients increase with increase in BISAP score with significant p-value (0.016) as summarised in [Table/Fig-2].

There was a male predominance among study population. Out of 50 patients, 33 (66%) were males and 17 (34%) were females. All the 50 patients presented with pain abdomen with or without pain radiation to back. Symptoms of nausea/vomiting present in 17 (34%) patients. Aetiology of pancreatitis in present study summarised in [Table/Fig-3]. The leading cause of AP in present study is gall stones, with maximum 26 (52%) cases.

The BISAP score was calculated based on data obtained within 24 hours of hospitalisation. Cases with Score 1 are 11 (22%), Score 2 is 18 (36%), Score 3 is 14 (28%), Score 4 is 5 (10%) and Score 5 is 2 (4%).

Out of 50 cases, there are 27 (54%) mild, 14 (28%) moderately severe and 9 (18%) severe cases according to revised Atlanta classification. In present study, SIRS is most common component of BISAP score, present in 47 (94%) cases. Three patients have MOF. One patient has score of four and two patients have score of five. Pleural effusion, especially left-side is common in AP; 27 (54%) patients have pleural effusion.

In present study, pancreatic necrosis present in 12 (24%) cases. Distribution of pancreatic necrosis among study group according to BISAP score shown in [Table/Fig-4]. At <3 score, necrosis presents only in three cases, while at ≥3, necrosis present in nine cases. Thus, incidence of pancreatic necrosis rises at score ≥3. This correlation has significant p-value (0.008).

<table>
<thead>
<tr>
<th>BISAP</th>
<th>Mean</th>
<th>SD</th>
<th>Mean</th>
<th>SD</th>
<th>Mean</th>
<th>SD</th>
<th>Mean</th>
<th>SD</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>35.09</td>
<td>11.95</td>
<td>40.11</td>
<td>11.72</td>
<td>41.07</td>
<td>17.99</td>
<td>53.40</td>
<td>18.32</td>
<td>70.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

[Table/Fig-2]: Mean age among study group according to BISAP Score.
Aetiology | No. of cases | Percentage
---|---|---
Biliary | 26 | 52.0%
Alcohol | 11 | 22.0%
Drug | 2 | 4.0%
Hypercalcaemia | 1 | 2.0%
Autoimmune | 1 | 2.0%
Trauma | 1 | 2.0%
Idiopathic | 8 | 16.0%
Total | 50 | 100.0%

The most remarkable feature of BISAP score is that it is easy and quick to calculate. It needs vital signs, general and abdominal examination, laboratory values and radiology to detect presence of pleural effusion that is routine work-up for any acute abdomen.

The mean age of present study population is 41.8 years. It is comparable to study by Pupelis G et al., that has 47 years as mean age [14]. Patient’s mean age of presentation increases with increasing BISAP score with significant p=0.016. The AP has variable presentation from mild disease requiring few days of hospital admission to life threatening course with significant morbidity and mortality. BISAP was found to be a simple bedside method to predict the severity of AP on admission and thus helps in triaging and prognostication of patients of AP presenting to the ED.

There was a male predominance in the present study with 33 (66%) male and 17 (34%) females. It is comparable to study by Buchler MW et al., [15]. All cases presented with pain abdomen with or without pain radiation to back. Tenderness on abdominal palpation present in 27 (54%) patients while guarding/rigidity present in 6 (12%) cases. Gall stone (52.0%) is most common cause of AP in the present study. Second most common cause is alcohol with 22% cases. Gall stone is also most common cause in study by Buchler MW et al., [15] and Chen L et al., [15,16]. SIRS is the most common component of BISAP score, present in 47 (94%) cases. There are 58% cases at <3 score and 42% cases at ≥3 score. It is comparable to study by Buchler MW et al., [15] and Khanna AK et al., [15,16,17]. There is one case having mortality present in this study, at BISAP score of four. In this study, 46% patient had organ failure. At score ≥3, there is increased risk of organ failure and it is statistically significant (p-value <0.001). It is comparable to study by Khanna AK et al., [43 (organ failure) and Maheshwari N et al., [50.7% organ failure] [17,18].

DISCUSSION
The most remarkable feature of BISAP score is that it is easy and quick to calculate. It needs vital signs, general and abdominal examination, laboratory values and radiology to detect presence of pleural effusion that is routine work-up for any acute abdomen.

All cases presented with pain abdomen with or without pain radiation to back. Tenderness on abdominal palpation present in 27 (54%) patients while guarding/rigidity present in 6 (12%) cases. Gall stone (52.0%) is most common cause of AP in the present study. Second most common cause is alcohol with 22% cases. Gall stone is also most common cause in study by Buchler MW et al., [15] and Chen L et al., [15,16]. SIRS is the most common component of BISAP score, present in 47 (94%) cases. There are 58% cases at <3 score and 42% cases at ≥3 score. It is comparable to study by Buchler MW et al., [15] and Khanna AK et al., [15,16,17]. There is one case having mortality present in this study, at BISAP score of four. In this study, 46% patient had organ failure. At score ≥3, there is increased risk of organ failure and it is statistically significant (p-value <0.001). It is comparable to study by Khanna AK et al., [43 (organ failure) and Maheshwari N et al., [50.7% organ failure] [17,18].

Limitation(s)
Present study consists of small portion of patients and the difference in duration of presentation of patients after onset of symptoms may interfere with assessment of the scoring systems.

CONCLUSION(S)
We conclude that BISAP score ≥3 is significantly predictive of organ failure, pancreatic necrosis and moderately severe/severe AP. It is an accurate means of risk stratification and prognostic prediction. It helps us to improve early risk stratification and do appropriate interventions in patients having severe pancreatitis.

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**PARTICULARS OF CONTRIBUTORS:**

1. Junior Resident, Department of General Surgery, Dayanand Medical College and Hospital, Ludhiana, Punjab, India.
2. Associate Professor, Department of Medicine, Dayanand Medical College and Hospital, Ludhiana, Punjab, India.
3. Associate Professor, Department of General Surgery, Dayanand Medical College and Hospital, Ludhiana, Punjab, India.
4. Professor, Department of General Surgery, Dayanand Medical College and Hospital, Ludhiana, Punjab, India.
5. Professor, Department of General Surgery, Dayanand Medical College and Hospital, Ludhiana, Punjab, India.
6. Medical Student, Department of Medicine, Himalyan Institute of Medical Sciences, Dehradun, Uttrakhand, India.

**NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:**
Ravinder Pul Singh,
86, Mayanagar, Near Rose Garden, Ludhiana, Punjab, India.
E-mail: doctordmclud@yahoo.com

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- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

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