Original Research Article

Neutrophil-lymphocyte and hematocrit scoring in acute pancreatitis as an early predictor of severity and outcome

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ABSTRACT

Background: The management of acute pancreatitis (AP) is determined by an accurate assessment of severity of disease. Numerous severity indicators have been described till date, most of which require reassessment after admission and resuscitation. Authors propose a novel indicator, the neutrophil-lymphocyte and hematocrit (NLH) scoring as a predictor of acute pancreatitis at the initial time of diagnosis. NLH may have a role in predicting the length of hospital stay and intensive care unit admission and also to predict adverse manifestations of severe acute pancreatitis (SAP).
Methods: A retrospective analysis of 107 patients done who diagnosed with acute pancreatitis based on Atlanta 2012 definitions, who were admitted and treated between August 2018 and November 2019. NLH score calculated by adding NLR (neutrophil lymphocyte ratio) and Ht (hematocrit) i.e., NLH=NLR+Ht. NLH was also compared with APACHE II score as a standard predictor of prognosis in acute pancreatitis.
Results: Median NLH score among the severe group is significantly higher compared to mild and moderate group. NLH score significantly correlated with length of hospital stay and also had a statistically significant correlation with ICU stay. NLH scoring is comparable with APACHE II scoring system in predicting prognosis in acute pancreatitis.
Conclusions: NLH score can be used as a predictor of severity of acute pancreatitis, right at the time of initial diagnosis. Further it may predict adverse outcomes, need for ICU care as well as the length of hospital stay. NLH score can be used as a tool to refer at risk patients to tertiary center needing ICU admission.

Keywords: Acute pancreatitis, Neutrophil to lymphocyte ratio, Neutrophil-lymphocyte and hematocrit score, Severe acute pancreatitis

INTRODUCTION

Acute pancreatitis (AP) is an inflammatory condition of the pancreas causing local tissue and systemic complications. The presentation may vary widely from no symptoms to systemic inflammatory response syndrome (SIRS), persistent organ failure (POF), and death.[1] The incidence of the disease is increasing throughout the world, especially in developed countries. The aetiology most commonly includes alcohol use and gallstones. Other causes of AP include invasive procedures such as endoscopic retrograde cholangiopancreatography, surgery, medications, infections, hyperlipidemia, hypercalcemia, biliary system anomalies, and idiopathic causes.[2,3] The management of these patients will be determined from accurate assessment of severity of the disease. Multiple severity scoring systems have been designed to help clinicians in triaging AP patients and predicting their prognosis due to the diverse presentations of AP like The Ranson score, the acute physiologic assessment and chronic health evaluation II (APACHE II) score, the Bedside index for severity in AP (BISAP)

score, and the Glasgow-Imrie criteria. However, these systems are time-consuming and difficult to apply to patients outside of intensive care settings because they use many variables.[4] Also, they are unsuitable for the evaluation of patients at the time of admission or shortly thereafter. Simplified serum markers such as C-reactive protein (CRP), procalcitonin, interleukin-6, and interleukin-8 have been applied to predict the prognosis or severity of AP, but they are expensive, not readily available, and cannot adequately predict the prognosis or severity of AP.[5]

Neutrophil lymphocyte hematocrit (NLH) score in predicting severity and outcome of AP is a novel, less expensive prognostic indicator at the time of admission. Many studies have shown superiority of NLR (neutrophil lymphocyte ratio) over white blood cell count used in Ranson, APACHE-11 scoring system. The NLH scoring study will add more accuracy to the NLR scoring system by adding hematocrit, which is almost always increased in AP as there is fluid sequestration.

Aims and objectives

The aims and objectives of the study were to determine the severity of AP at an early stage using the NLH score and correlate with other established severity indices like revised Atlanta classification and to demonstrate the usefulness of NLH in predicting the length of hospital stay and ICU admission.

METHODS

This retrospective observational cohort was conducted from August 2018 to November 2019 in department of general surgery at Kempegowda Institute of Medical Sciences and Research Centre, Bengaluru. The study included all patients aged above 18 years as diagnosed case of AP based on clinical/laboratory/ radiological diagnosis as per revised Atlanta criteria.[4] Exclusion criteria's included patients aged below 18 years of age, patients diagnosed as acute on chronic pancreatitis and in patients with incomplete investigations or missing medical records.

Definitions

Patients were diagnosed with AP if more than 2 of the following conditions were satisfied abdominal pain consistent with AP (acute onset of a persistent, severe, epigastric pain often radiating to the back), serum amylase and/or lipase level at least 3 times greater than the upper limit of the normal value, characteristic manifestation of AP on contrast-enhanced computed tomography, magnetic resonance imaging, or transabdominal ultrasonography.[6]

2012 revision of the Atlanta classification and definition

This classification identifies two phases (early and late) i.e. mild AP, which is characterized by the absence of organ failure and local or systemic complications, moderately severe AP, which is characterized by transient organ failure (resolves within 48 hours) and local or systemic complications without persistent organ failure (>48 hours) and severe AP, which is characterized by persistent organ failure that may involve one or multiple organs.

AP was categorized in accordance with the revised Atlanta classification. Data collected included demographics, symptoms, vitals at admission, laboratory investigations and NLH at admission was noted.
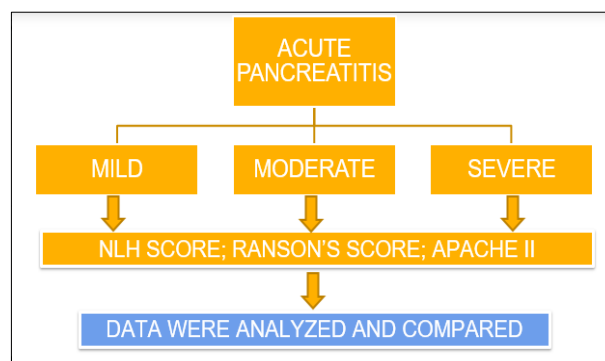

Figure 1: Grading the severity of pancreatitis.

Design of study

NLH scoring is calculated by adding neutrophil to lymphocyte ratio and hematocrit (NLR + Ht) NLH score is compared with APACHE-II as shown in the Figure 1.

Statistical analysis

Data was analysed manually and computer analysis was done. Number and percentages were used for the categorical variables. Mean and median were calculated for the normally distributed continuous variables.

RESULTS

A total of 107 patients were studied (n=107). Mean age 40.9 years. Male-to-female ratio of 7.9:1. Most common aetiology in this study was found to be alcoholism (76%) followed by gall stones (11%). Other causes also included post ERCP (4%), trauma (2%), drug induced (2%), idiopathic (5%). All these patients presented with Pain abdomen (100%). Other associated symptoms included nausea and vomiting (62.5%), fullness of abdomen (21%), dyspnoea (16.2%).

Out of 107 cases, 26 cases were admitted to ICU. 7 cases were shifted down after 24 hours. Rest 19 severe cases needed prolonged ICU care with 2 mortality (Table 1). NLH score is more sensitive then NLR scoring system and is comparable to APACHE II score in detecting severe AP (Figure 6). The mean NLH was 56.22 and median NLH was 56.87. NLH of >67.8 at admission,

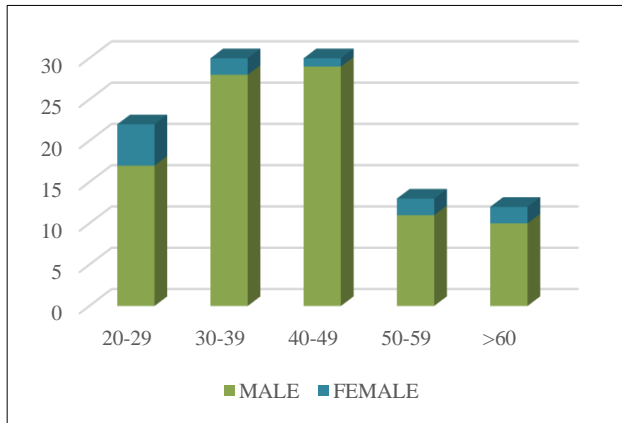correlated with severity of AP, longer duration of hospital stay and ICU stay.

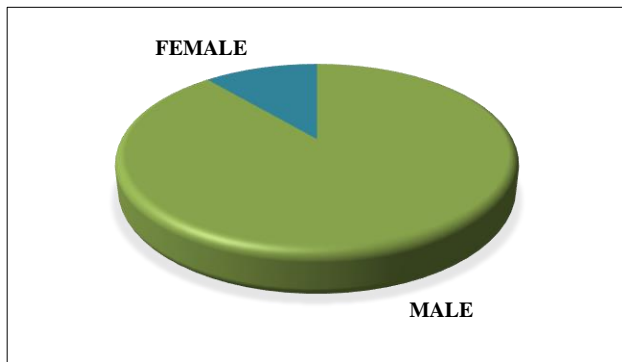**Figure 2: Age distribution in study population.**

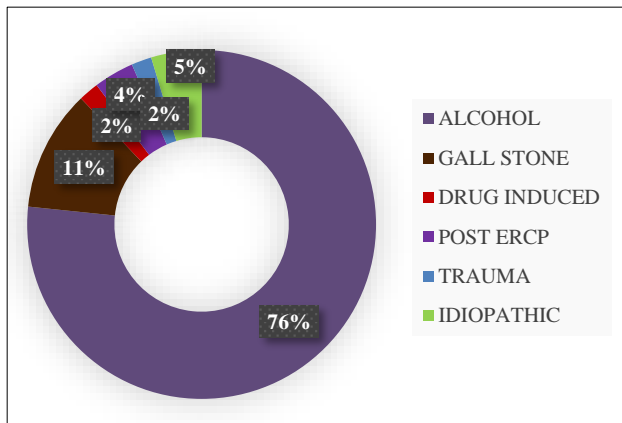**Figure 3: Gender distribution in study population.**

Figure 4: Etiology for pancreatitis.

Table 1: Grading of pancreatitis according to Atlanta classification in study.

Severity	No. of cases
Mild	60
Moderate	28
Severe	19

Table 2: Mean NLH in study group according to severity.

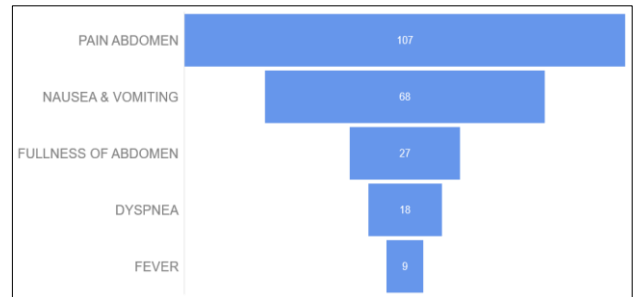| Severity	Mean NLH
Mild	51.55
Moderate	58.38
Severe	67.80

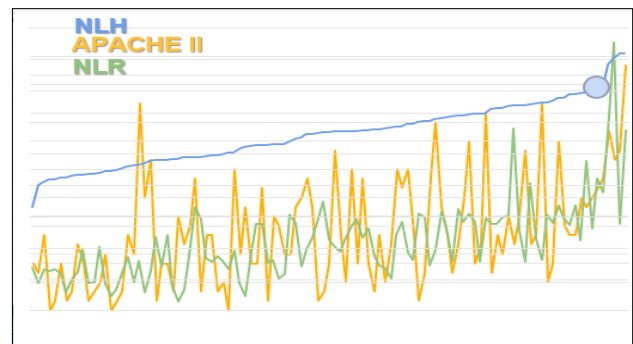

Figure 5: Symptoms of pancreatitis.

Figure 6: Comparison of NLH with NLR and APACHE II.

Table 3: Cut-off NLH scores to classify pancreatitis according to severity.

Severity	Optimal cut off value
Mild	<56
Moderate	57-63
Severe	>64

DISCUSSION

AP is an inflammatory process in which local pancreatic injury leads to systemic inflammation through cytokine cascade activation.[7] Due to varied presentations of AP, multiple severity scoring systems have been designed, to help clinicians in triaging AP patients and predicting their prognosis. The severity of AP is related to extra pancreatic organ failure secondary to the patient's systemic inflammatory response, and a poor prognosis of SAP is thought to be the result of uncontrolled systemic inflammatory response syndrome (SIRS) or multi-organ dysfunction syndrome (MODS).[8,9]

Ranson's score presents a great advantage to assess disease severity, its disadvantage being it requires 48 hours data. Similarly, although it is very easy to use, the Atlanta classification is unable to differentiate between moderately AP and severe AP within 48 hours of onset. Although bedside index of severity in AP BISAP provides quick data, it is complicated, cumbersome, and with low sensitivity. In addition, the white blood cell (WBC) count is correlated with poor prognosis as a compositional element of Ranson's criteria, acute physiology and chronic health evaluation-II (APACHEII), and bedside index of severity in AP (BISAP), which are the prognostic scoring systems of AP.[5,10] However, fluctuations have been noted in WBC count depending on the various physiological and pathological conditions including hydration status, stress, and pregnancy in addition to handling of blood specimen.[10] Neutrophils and lymphocytes reflect the immune response better than the white blood cell count.

As severity of AP, at the initial stage of manifestation is critical to improve the patient's prognosis.[6,11] Therefore, there is a need for a simple indicator that can easily predict the patient's prognosis within 24 hours of the manifestation of the disease.[6,11] NLH scoring is calculated by adding Neutrophil to Lymphocyte Ratio and Hematocrit (NLR + Ht) NLH score is compared with APACHE-II. This study demonstrated that the NLH was elevated in patients presenting with AP and that NLH can be used to classify patients according to disease severity and the presence of organ failure. NLH is predictive and can be assessed at the early stages which is repeatable, easily accessible and inexpensive. Drawbacks of this study included small sample size, also NLR is not specific for AP, as it is only measurable parameter of systemic inflammation. NLH scoring is a novel study hence when compared to other scoring systems, NLH scoring was found better and easy to assess the severity of AP at the time of admission. NLR was initially described by Zahorec et al.[12] Zhang et al performed a single-center retrospective study with 974 AP patients.[1] They found a significant association between NLR and the duration of intensive care, the risk of developing persistent organ failure, and mortality. Suppiah et al revealed an association between NLR measured in the first 48 hours and the risk of developing severe AP.[5] Also, this study needs further prospective validation cohort.

CONCLUSION

Neutrophil lymphocyte hematocrit (NLH) score, a novel scoring system that can be used as a predictor of severity of AP. It is a simple, inexpensive, rapid score can be done in emergency setting to direct patient towards appropriate management. NLH can be used as a tool to refer at risk patients to tertiary center needing ICU admission.

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