

# PULP Score vs AAST EGS Grading System in Prediction of Outcome of Perforated Peptic Ulcer Disease: A Retrospective Study

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## ABSTRACT

**Introduction:** Peptic Ulcer Disease (PUD) is the most common diagnosis for upper abdomen pain, and it includes ulcerations and erosion in the stomach and duodenum. Complication such as Perforated PUD (PPUD) is only second to bleeding and remains a life-threatening emergency.

**Aim:** To compare the American Association for the Surgery of Trauma-Emergency General Surgery (AAST EGS) scoring system with a widely accepted Peptic Ulcer Perforation (PULP) scoring system for PULP to determine the discriminative capacity and pairwise comparison of both scoring systems.

**Materials and Methods:** This was a retrospective study conducted from September 2018 to August 2020 at Department of General Surgery, PES institute of Medical Science, Kuppam, Andhra Pradesh, India. All the adults diagnosed with perforated PUD were included. Preoperative, Intraoperative, and postoperative data were collected. The scores were generated for PULP and AAST EGS grades and analysed using Statistical Package for Social Sciences (SPSS) version 17.0. Spearman's rho test evaluated a comparison of each variable with the AAST EGS grade. The pairwise comparison was performed for complication

development, patient duration of stay, mortality and described using the Area Under the Receiver Operating Characteristic (AUROC) with 95% Confidence Intervals (CI).

**Results:** This study included 165 patients in this 87% male with a mean age of 56.89±16.79 years. All the total patients were divided into those ≥50 years (n=56, mean age: 36.8±9.04 years) and >50 years (n=109, mean age: 67.2±8.4 years) and comparative analysis was performed accordingly. Overall, the patients were categorised into the following AAST EGS grade I (9, 5.5%), grade II (99, 60%), grade III (42, 25.45%), grade IV (15, 9%), there were no patients with grade 5 AAST EGS. The AAST EGS grade was comparatively better than PULP score for postoperative complications, but there is not much difference between the PULP score and AAST EGS score for the patient's duration of stay. AAST EGS grade and the PULP discriminated, patient 30-day mortality similarly, but if Area Under Curve (AUC) >0.8, it is a good predictor.

**Conclusion:** The AAST EGS scoring system and the PULP scoring system do similarly predict mortality and complication. But the presence of many variables with points and tabulation which requires laboratory investigation makes PULP scoring system inconvenient at bedside.

**Keywords:** American association for the surgery of trauma, Emergency general surgery, Laparotomy, Peptic ulcer perforation

## INTRODUCTION

The PUD is used to include ulcerations and erosion in the stomach, and duodenum, the risk factors of PUD are *Helicobacter Pylori* infection, non steroidal anti-inflammatory use, Zollinger Ellison Syndrome, and idiopathic [1]. The PPUD is only second to bleeding, has reported incidences of 4 to 14 per 100,000 individuals [2]. Many scoring systems such as Boey's score, the PULP, or the American Society of Anesthesiologists scores (ASA) are used to estimate PPUD severity and mortality [3,4]. Perforation of the ulcer in both the duodenum and stomach is an emergency surgical condition. It is a life-threatening emergency with 20-50% morbidity rates and 3-40% mortality rates in surgically treated Perforated Peptic Ulcer (PPU) patients [5]. A recent comparison of PULP scoring system indicated the inability to assess patient risk of mortality and suggested that a particular combination of clinical variables predicted mortality with better results [5]. Based on this, the AAST developed the AAST EGS grading system, which was based on a group of standard definitions based on the severity of the disease [6]. This new scoring system was validated by Hernandez MC et al., [7]. This study aimed to determine the discriminative power and compare it with the PULP scoring system with respect to the complication, duration of stay, morbidity, and mortality.

## MATERIALS AND METHODS

This retrospective study was undertaken at the Department of General Surgery, PES institute of Medical Science, Kuppam, Andhra Pradesh, India, situated in a rural part of the tri-state

junction of Southern India from September 2018 to August 2020. The PES Medical Research Centre approved the study (#PESIMSR/IHEC/25/2018).

**Inclusion criteria:** All patients who presented with PPUD who were willing to undergo surgery in the institute were included in the study.

**Exclusion criteria:** Those patients who refused treatment, biopsy-proven malignant perforation, patient death before the surgery, and conservatively managed PPUD were excluded from the study.

## Study Procedure

Most of the patients who presented to the Emergency (ER) Department with severe abdominal pain were evaluated by ER consultants. If there is suspicion of perforation, the patient is resuscitated in an ER, upright chest x-ray (CXR) is done to detect air under the diaphragm, and the patient is seen by a surgeon within a maximum of 30 minutes. Once the diagnosis of perforated viscus is confirmed, the patient is operated on within 60-90 minutes postoperatively if needed, and patients are shifted to Intensive Care Unit (ICU) for further management.

The following data were collected: Baseline patient personal information, vital signs such as Heart Rate (HR) (beats per min), Systolic Blood Pressure (SBP) (mm hg), Respiratory Rate (RR) (breaths per min), and temperature (°C). Haemoglobin (mg/dL), albumin (mg/dL), leukocytosis (cell/L), intraoperative findings, types of complications, relaparotomy rate, histopathological report, duration of stay in the hospital including intensive care, and 30-day mortality.

The initial evaluation tabulated the score using the AAST EGS score for PPUD consists of five grades (I-V) that correlate with disease severity to clinical features, imaging reports, operative findings, and histopathological findings [Table/Fig-1] and the PULP score [Table/Fig-2]. Patients assigned AAST EGS scores for operative and pathological criteria since all the other criteria are inter-related.

| Grade | Operative criteria   | Pathologic criteria                               |
|-------|--|---|
| I     | Preservation of normal anatomy with dissection required to identify the perforation.               | Perforation with minimal bowel wall inflammation. |
| II    | Presence of inflammation and stigmata of perforation with a contained collection.                  | Perforation with bowel wall inflammation.         |
| III   | Inflammation and contamination of peritoneal cavity confined to the RUQ.                           | Perforation with bowel wall inflammation.         |
| IV    | Perforation with disseminated succus or purulent peritonitis.                                      | Perforation with bowel wall inflammation.         |
| V     | Perforation with disseminated succus or purulent peritonitis and erosion into adjacent structures. | Destructive erosion of involved structures.       |

[Table/Fig-1]: AAST-EGS grading system for Perforated Peptic Ulcer (PPU) [7]. RUQ: Right upper quadrant (abdomen)

| Variables considered for scoring           | Points      |
|--|-------------|
| Age >65 years                              | 3           |
| Co-morbid active malignant disease or AIDS | 1           |
| Co-morbid liver cirrhosis                  | 2           |
| Concomitant use of steroids                | 1           |
| Shock on admission (BP <100 and HR >100)   | 1           |
| Time from perforation to admission >24 hrs | 1           |
| Serum creatinine >1.47 mg/dL               | 2           |
| ASA score 2                                | 1           |
| ASA score 3                                | 3           |
| ASA score 4                                | 5           |
| ASA score 5                                | 7           |
| <b>Total PULP score</b>                    | <b>0-18</b> |

[Table/Fig-2]: Peptic Ulcer Perforation (PULP) score [4]. None of the patients in the present study had PULP score of 0; AIDS: Acquired immuno deficiency syndrome; BP: Blood pressure; ASA: American society of anaesthesiology; HR: Heart rate

The comparison of both the scoring systems was done based on duration of stay,clavien dindo classification of complication [8] and complications.

### STATISTICAL ANALYSIS

The data collected were analysed with Statistical Package for Social Sciences (SPSS) version 17.0. All the data is delineated using the mean with Standard Deviations (SD). The p-values <0.05 were considered statistically significant. Spearman's rho test evaluated a comparison of each variable with the AAST EGS grade. The pairwise comparison was performed for complication development,

patient duration of stay, mortality and described using the AUROC with 95% confidence intervals.

### RESULTS

In this study, a total of 165 patients with a mean age of 56.89±16.79 years were analysed. Out of these 165 patients, 87.27% (n=144) patients were males, and 12.72% (n=21) were female. And the majority of the patients belong to the age group >50 years. The Patients were divided into two groups to easily understand the severity of the disease and its complication, the first group is patients ≤50 years and the other >50 years.

**AAST EGS grading:** Overall, the AAST EGS patient grades were divided based on the age as equal or below 50 years and greater than 50 years basically to categorise the severity based on the age of the patient and it included (n,%) grade: I (9, 5.5%) there was no patients in grade I category above age 50, II (99, 60%) with total patients ≤50 year was 40 patients and >50 years was 59 patients, III (42, 25.45%) with total patients ≤50 year was three patients and >50 years was 39 patients, IV (15, 9%) with total patients ≤50 year was four patients and >50 years was 11 patients, there were no patients with grade 5 AAST EGS in the present study [Table/Fig-3].

The risk factors which patients presented (more than one possibility for each patient) for ulcers: 62 patients were diagnosed with *Helicobacter pylori* which accounted for 38% of the total patients, smoker 115 (69.7%), nine patients were diagnosed to be retropositive, and the majority of these patients were aged ≤50 years (7 patients) and in this, six patients were categorised in grades 3 and 4. There was a significant association between smoking tobacco, tobacco chewing, chronic alcohol consumption [Table/Fig-4].

The patient demographics stratified based on AAST EGS grade [Table/Fig-3] with an overall mean age of 56.89±16.79 years, and the majority of the patient <50 years belong to 36.8±9.04 years and >50 years was 67.2±8.4 years. Overall the significant finding is that majority of the patient were aged >50 years, and as the grade increases; tachycardia and low blood pressure are noted, White Blood Cell (WBC) count too raised similarly [Table/Fig-3].

The postoperative outcome tabulated using the AAST EGS grades is presented in [Table/Fig-5]. Postoperative complications such as mortality rates, acute kidney injury (AKI) are associated with increasing AAST EGS grade. The duration of hospital stay was not associated with AAST EGS grade and was statistically non-significant; the average number of days stayed was 10.1±1.01 days.

On laparotomy, the site of perforation, the majority was pre pyloric perforation which was 119 (72.12%), and duodenal perforation 46 (27.87%). A 10.30% (n=17) of the patients were suffering from ischemic heart disease, 44.24% (n=73) were suffering from Chronic Obstructive Pulmonary Disease (COPD). A total of 54 patients (33%) needed inotropic support and presented with preoperative shock to

| Patient demographics                                    |            |           |            |            |         |           |            |         |            |            |         |             |            |         |
|---|------------|-----------|------------|------------|---------|-----------|------------|---------|------------|------------|---------|-------------|------------|---------|
| Parameters  | I          |           | II         |            | p-value | III       |            | p-value | IV         |            | p-value | Overall     |            | p-value |
|   | ≤50 years  | >50 years | ≤50 years  | >50 years  |         | ≤50 years | >50 years  |         | ≤50 years  | >50 years  |         | ≤50 years   | >50 years  |         |
| Total   | 9          | 0         | 40         | 59         |         | 3         | 39         |         | 4          | 11         |         | 56          | 109        | -       |
| Age (years) (Mean±SD)                                   | 35.7±5.7   | 0         | 38.2±9.34  | 65±7.7     | <0.001  | 29.6±12   | 68.1±7.30  | 0.001   | 28.25±3.6  | 76.2±9.4   | 0.001   | 36.8±9.04   | 67.2±8.4   | -       |
| Female Sex  | 2          | 0         | 4          | 7          | 0.77    | 1         | 5          | 0.04    | 1          | 1          | 0.04    | 8           | 13         | -       |
| Heart rate (HR) (beats per minute)                      | 102.1±13.1 | 0         | 103.6±12.2 | 108.9±13.6 | 0.04    | 109±16.5  | 106±12.4   | 0.7     | 110.8±13.2 | 112.5±32.4 | 0.94    | 105.8±12.35 | 109±16     | 0.18    |
| Systolic Blood Pressure (SBP) (mm Hg)                   | 90.2±2.4   | 0         | 90.4±3.1   | 90±2.9     | 0.49    | 91±1      | 89.2±2.97  | 0.31    | 84.2±3.77  | 79.5±8.55  | 0.99    | 89.52±3.09  | 88.80±3.80 | 0.37    |
| White blood cell count (WBC) (cell ×10 <sup>9</sup> /L) | 11.6±1.26  | 0         | 16.04±2.32 | 15.11±2.43 | 0.04    | 15.5±2.59 | 15.82±2.40 | 0.51    | 16.25±3.19 | 16.74±1.50 | 0.68    | 16.02±2.35  | 15.53±2.38 | 0.21    |

[Table/Fig-3]: Patient demographics stratified using American Association for the Surgery of Trauma-Emergency General Surgery (AAST EGS) Grade. N=0 patients in Grade V

| Type                        | Age (years) | I | II | III | IV | Chi-square (3 df) | p-value |
|-----------------------------|-------------|---|----|-----|----|-------------------|---------|
| Smoking                     | ≤50         | 7 | 33 | 3   | 2  | 22                | 0.001   |
|                             | >50         | 0 | 39 | 22  | 9  |                   |         |
| Tobacco chewing             | ≤50         | 5 | 18 | 1   | 0  | 16.8              | 0.001   |
|                             | >50         | 0 | 25 | 12  | 5  |                   |         |
| Chronic alcohol consumption | ≤50         | 7 | 34 | 3   | 3  | 21.9              | 0.001   |
|                             | >50         | 0 | 35 | 22  | 9  |                   |         |
| Chronic NSAID use           | ≤50         | 1 | 5  | 2   | 2  | 4.9               | 0.179   |
|                             | >50         | 0 | 25 | 13  | 9  |                   |         |
| Chronic steroid use         | ≤50         | 5 | 19 | 1   | 3  | 16.5              | 0.001   |
|                             | >50         | 0 | 32 | 17  | 4  |                   |         |
| <i>Helicobacter pylori</i>  | ≤50         | 4 | 14 | 1   | 0  | 16.6              | 0.001   |
|                             | >50         | 0 | 23 | 16  | 4  |                   |         |
| HIV                         | ≤50         | 0 | 1  | 2   | 4  | -                 | -       |
|                             | >50         | 0 | 0  | 0   | 2  |                   |         |

**[Table/Fig-4]:** The ulcer aetiologies of the patients.  
HIV: Human immunodeficiency virus; NSAIDS: Non steroidal anti-inflammatory drugs

predicting mortality. The sensitivity of the PULP score in predicting complication was 83.2%, whereas the specificity was 73.06% with PPV of 5.33% (CI: 3.29%-8.54%) and NPV 40% (CI: 21.28%-62.18%) and the sensitivity of the AAST EGS scoring system in predicting complication was 96.8% whereas the specificity was 75.36%, with PPV of 24.56% (CI: 20.18%-29.54%) and NPV 100%. AAST EGS in predicting complications was better than the PULP score [Table/Fig-7].

### DISCUSSION

There are numerous studies about the PULP scoring system in predicting 30-day mortality of the PPU [5]. In this study, numerous clinical factors predict 30-day mortality, such as increased age, delay in presentation to the hospital, including delayed surgery, high ASA score, and shock on admission. The AUC for both the PULP and AAST EGS scores is similar, i.e., 0.56, which is comparatively less than the study done by Møller MH et al., which is 0.83, Thorsen K et al., which is 0.75, and study done by Patel S et al., which is 0.804 [4,5,9]. The AUC in predicting mortality by Menekse E et al., 0.955, by Anbalakan K et al., is 0.75 [10,11].

| Parameters                         | Patient outcome |     |            |            |         |            |            |         |            |           |         |            | TOTAL      |  |
|------------------------------------|-----------------|-----|------------|------------|---------|------------|------------|---------|------------|-----------|---------|------------|------------|--|
|                                    | I               |     | II         |            | p-value | III        |            | p-value | IV         |           | p-value | (n)        | (%)        |  |
|                                    | ≤50             | >50 | ≤50        | >50        |         | ≤50        | >50        |         | ≤50        | >50       |         |            |            |  |
| Mortality                          | 0               | 0   | 0          | 0          | 0       | 1          | 2          | 0.06    | 0          | 11        | 0.011   | 14         | 8.48%      |  |
| Surgical site infection            | 4               | 0   | 11         | 22         | 0.31    | 1          | 16         | 0.79    | 0          | 6         | 0.06    | 60         | 36%        |  |
| Dehiscence                         | 0               | 0   | 1          | 1          | 0.78    | 0          | 0          | -       | 0          | 0         | -       | 2          | 1%         |  |
| Postoperative pneumonia            | 0               | 0   | 9          | 11         | 0.97    | 1          | 8          | 0.6     | 2          | 3         | 0.409   | 34         | 21%        |  |
| Inotrope support                   | 1               | 0   | 8          | 15         | 0.53    | 2          | 15         | 0.33    | 2          | 11        | 0.012   | 54         | 33%        |  |
| Perforation to operation >24 hours | 0               | 0   | 0          | 0          | -       | 0          | 0          | -       | 1          | 0         | 0.09    | 1          | 1%         |  |
| Duration of hospital stay          | 10.33±1.22      | 0   | 10.12±0.92 | 10.17±0.98 | 0.79    | 10.33±0.57 | 10.05±1.12 | 0.65    | 10.25±1.25 | 9.90±1.04 | 0.59    | 10.10±1.01 | 10.33±1.22 |  |
| Acute kidney injury                | 0               | 0   | 5          | 6          | 0.7     | 1          | 13         | 1       | 2          | 9         | 0.04    | 37         | 22.4%      |  |

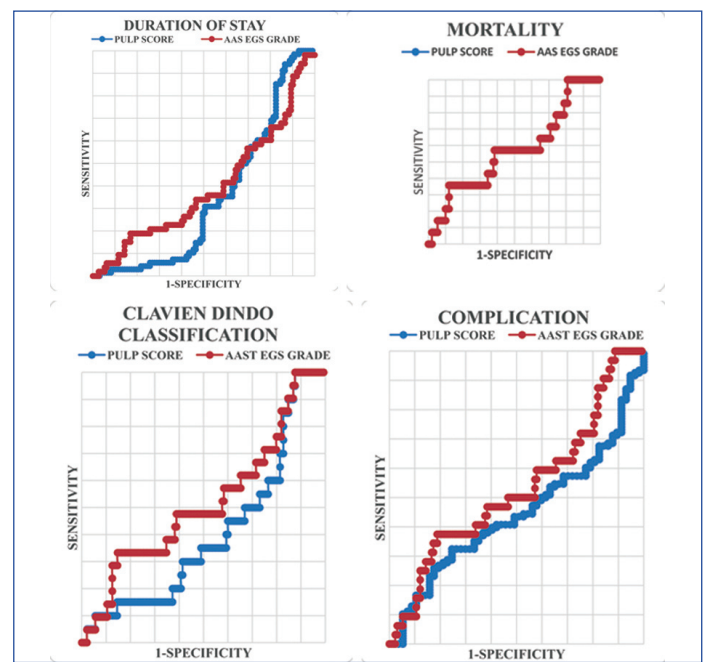
**[Table/Fig-5]:** Patient outcome stratified using AAST EGS Grade; N=165 patients.

emergency. A total of 147 (89.09%) patients had a history of PUD previously, 41 (24.84%) were diabetics, 9 (5.45%) were suffering from AIDS.

Out of 165 patients who presented with PPUD, all were treated by Graham omental patch procedure, and two patients developed acute wound dehiscence (burst abdomen). A 21% (n=34) of patients had postoperative pneumonia, 22.4% (n=37) had AKI, and 8.48% (n=14) died due to complications. Patients with the increased comorbid condition had increased AAST EGS grades.

**Pairwise comparison of PULP score and AAST EGS:** Pairwise comparisons of the PULP scores and the AAST EGS grade for the selected outcomes of 30-day mortality, duration of hospital stay, postoperative complication, and complication are demonstrated in [Table/Fig-6]. The AAST EGS grade was comparatively better than the PULP score for postoperative complications. For the patient duration of stay, there is not much difference between the PULP score and AAST EGS score. AAST EGS grade and the PULP discriminated patient 30-day mortality similarly, but if AUC >0.8, it is a good predictor.

Variables related to high mortality and morbidity in the present study are treatment delay >24 hours, shock on admission, high ASA score, age >65 years. The sensitivity of the PULP SCORE in predicting mortality was 83.33%, whereas the specificity was 87.27%. with Positive Predictive Value (PPV) of 15.33% CI: 12.69%-18.41%) and NPV 40% (CI: 20.36%-63.48%), and the sensitivity of the AAST EGS scoring system in predicting mortality was 82.1%, whereas the specificity was 79.26%. with Positive Predictive Value (PPV) of 63.16% (CI: 56.37%-69.46%) and Negative Predictive Value (NPV) 43% (CI: 32.36%-63.48%), PULP score is better than AAST EGS in



**[Table/Fig-6]:** Pairwise comparison of the scoring system.

| Scoring system | Outcomes     | Sensitivity | Specificity | PPV                        | NPV                     |
|----------------|--------------|-------------|-------------|----------------------------|-------------------------|
| PULP score     | Mortality    | 83.33%      | 87.27%      | 15.33% (CI: 12.69%-18.41%) | 40% (CI: 20.36%-63.48%) |
|                | Complication | 83.2%       | 73.06%      | 5.33% (CI: 3.29%-8.54%)    | 40% (CI: 21.28%-62.18%) |

|          |              |       |        |                            |                         |
|----------|--------------|-------|--------|----------------------------|-------------------------|
| AAST EGS | Mortality    | 82.1% | 79.26% | 63.16% (CI: 56.37%-69.46%) | 43% (CI: 32.36%-63.48%) |
|          | Complication | 96.8% | 75.36% | 24.56% (CI: 20.18%-29.54%) | 100%                    |

**[Table/Fig-7]:** Sensitivity, Specificity, Positive Predictive Value (PPV), and Negative Predictive Value (NPV) of the two scoring systems.

The sensitivity of the PULP score in predicting mortality in this study is 83.33% [Table/Fig-8] [5,7,8,10], which is high when compared to study done by Patel S et al., which is 75%, Anbalakan K et al., is 62.5% but lower when compared to study done by Thorsen K et al., is 92.9% [5,9,11]. The specificity of the PULP Score in predicting mortality was 87.27% which is similar to a study done by Patel S et al., which is 85.71%, Anbalakan K et al., is 87.3%, while it was lower in a study done by Thorsen K et al., is 58.3% [5,8,10]. The PPV of PULP Score in predicting mortality was 15.33% (CI: 12.69%-18.41%) which was less than the study done by Patel S et al., which is 36.8%, Anbalakan K et al., is 27.8% [9,11]. The NPV of PULP Score in predicting mortality was 40% (CI: 20.36%-63.48%) which was less than the study done by Patel S et al., which is 96.9%, Anbalakan K et al., is 96.8% [9,11].

| PULP Score (Mortality)     | Sensitivity | Specificity | PPV                        | NPV                     |
|----------------------------|-------------|-------------|----------------------------|-------------------------|
| Present study              | 83.33%      | 87.27%      | 15.33% (CI: 12.69%-18.41%) | 40% (CI: 20.36%-63.48%) |
| Thorsen K et al., [5]      | 92.9%       | 58.3%       | NA                         | NA                      |
| Patel S et al., [8]        | 75%         | 85.71%      | 36.8%                      | 96.9%                   |
| Anbalakan K et al., [10]   | 62.5%       | 87.3%       | 27.8%                      | 96.8%                   |
| AAST EGS score (Mortality) | Sensitivity | Specificity | PPV                        | NPV                     |
| Present Study              | 82.1%       | 79.26%      | 63.16% (CI: 56.37%-69.46%) | 43% (CI: 32.36%-63.48%) |
| Hernandez MC et al., [7]   | NA          | NA          | NA                         | NA                      |

**[Table/Fig-8]:** Comparison of Sensitivity, Specificity, PPV, and NPV of the two scoring systems [5,7,8,10].

The sensitivity for predicting mortality of the AAST EGS scoring system is 82.1%, whereas the specificity was 79.26%. with PPV of 63.16% (CI: 56.37%-69.46%) and NPV 43% (CI: 32.36%-63.48%) and the sensitivity of the AAST EGS scoring system in predicting mortality was 96.8% whereas the specificity was 75.36%, with PPV of 24.56% (CI: 20.18%-29.54%) and NPV 100%. While the study done by Hernandez MC et al., doesn't mention specificity, sensitivity, AUC, PPV, NPV [7]. But do mention that there is similar discrimination in predicting 30-day mortality and complication similar to the PULP score. This is the first study which has analysed these results and hence further more studies are required to validate the scoring system and its result.

The 30-day post PPU repair mortality (8.48%) of the current study was comparable to the PPU repair mortality reported in Thailand (9%), Singapore (7.2%), Norway (16.3%), and Denmark (17%) [5,10-13], but still on a higher side when compared to the recent study done by Saafan T et al., which was 0.7% [14]. Kocer B et al., stated that mortality was 37.3% above 65 years and 1.4% below 65 years [15]. Testini M et al., and Agarwal A et al., also revealed similar results [16,17].

A study by Taşlı et al., reported the familiar site of perforation was in the pre-pyloric region, accounting for 68.2% and duodenum in 31.8% [18]. As for patient characteristics, in terms of demography, our sample's mean age is 56.9, which is comparable to others Menekse E et al., 50.6 years, Lohsiriwat V et al., 48 years Bojanapu S et al., 52.3 years, but higher to Saafan T et al., which was 37.41 years and Arveen S et al., which was 40-43.4 years [10,12,14,19,20]. Numerous Studies in India determining the Sex ratio, such as the study by Bojanapu S et al., Sex ratio (male:female) was 2.3:1 and

study by Arveen S et al., is 10.5:1, which is comparable to the present study which was 6.8:1, and similarly in the African population, it is 4.8:1 [19-21] indicating more incidence of perforation in the male population. A study done in South Korea by Kim JM et al., found that female sex and age >60 years is associated with a high mortality rate [22].

In the present study, haemoglobin with a p-value of 0.12 and white blood cell count with a p-value of 0.21 was not significantly associated with 30-day morbidity. Lower haemoglobin was significantly associated with 30-day morbidity. Saafan T et al., has reported that reduced Hb is indicated too high 30-day mortality [14].

In the current study, morbidity and mortality might be due to mean age of the patient 56.89±16.79 years, and the majority of the patients were >50 year old, majority were chronic smokers and alcoholics with co-morbid conditions and predominantly male population, as was also observed in previous study [23].

In a study by Arveen S et al., done in South India, the mean hospital stay was 10.9±6.8 days, and Taşlı et al., reported a mean hospital stay of 8.7±4.6 days with a maximum duration of 44 days which was similar to the present study which is 10.09 days [18,19]. In the present study, alcohol consumption was 68.48%, and smoking was 63.6%, similar to a study in a tertiary hospital in Tanzania where 85.7% consumed alcohol, and 64.3% were smokers [24]. Chalya P et. al, Ekka NM and Malua S, also reported, similarly, 65.73% were chronic smokers while 42.86% of patients consumed alcohol [24,25]. But Bupicha JA et al., reported that the use of alcohol and smoking was found in 45.4 and 33% of the present study patients, respectively which was considerably lower [26]. A 75.3% of the present study patients gave a history of PUD, similar to reports from Tanzania [24], where 69% had a PUD history. Still, in the study in Iruua, Nigeria, 59.6% had no history of PUD [27]. The use of an ideal and widely accepted scoring system which has been validated in predicting mortality and complication of the disease, such as PULP score with AAST EGS classification, which is a relatively new scoring system that is entirely dependent on clinico- pathological and imaging and not on laboratory reports helps the clinician to predict the prognosis includes morbidity and mortality of the patient who plays a crucial part in the current scenario of counseling the family, cost-benefit and medicolegal implications.

### Limitation(s)

Incorporating co-morbidity status and the severity of the disease to the AAST EGS grade might improve the categorisation and early identification of the individuals at high risk. AAST EGS grade 5 was not present in the present study, which may have under-represented the extent of disease severity. Surgery for perforation was limited to Laparotomy followed by Graham omentoplasty, and procedures such as laparoscopic Grahams omentoplasty, ulcerectomy, or gastrectomy are limited.

### CONCLUSION(S)

The PPUD is a common surgical emergency with numerous aetiologies, hence, this study found that elderly age, preoperative organ dysfunction, and late presentation are associated with the poor outcome with a more extended stay in ICU. AAST EGS scoring system and the PULP scoring system do similarly predict mortality and complication. But the presence of many variables with points and tabulation which requires laboratory investigation makes PULP scoring system inconvenient at bedside, while AAST EGS scoring system is convenient to tabulate and predict the same result easily. Still, the lack of incorporation of co-morbid disease in AAST EGS for PPU points to the need for further more studies with a larger sample at different centres which needs to be prospectively analysed for more acceptability of this scoring system.

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