# Usefulness of Boey Score In Predicting the Outcome In Patients With Perforated Peptic Ulcer Disease

Manzoor Ahmed,[1] Muhammad Iqbal,[1] Maria Mehmood,[1] Mukhtar Mehboob,[2] Shoaib Ahmed Qureshi,[1] Hira Nadeem[1]

*ABSTRACT*

*Objective* *To evaluate the reliability of Boey scoring system in patients presenting with perforated peptic ulcer disease.*

*Study design* *Prospective cohort study.*

*Place & Duration of study* *Department of Surgery Bolan Medical College and Mohtarma Shaheed Benazir Bhutto General Hospital Quetta, from March 2023 to June 2024.*

*Methods* *All patients with perforated peptic ulcer disease were prepared according to surgical protocol and laparotomy was done. A primary closure of perforation with Graham's omentopexy were done followed by a copious peritoneal lavage. Patients were followed for 30-days after laparotomy for any complication. Boey score assessment was made which has three parameters. The score ranges from 0-3. The data were analyzed and receiver-operating characteristic (ROC) curve and area under curve (AUC) analysis were used to estimate the predictive ability of the Boey score in assessing the postoperative morbidity and mortality. Chi squire test was applied for significance.*

*Results* *The study was conducted on 95 patients. There were 80 males and 15 females with M: F ratio of 5.3:1. The mean age was 39.4+14.3 years. Majority of the patients (n=72 - 75.6%) reached the tertiary care hospital after 24 hours and 90 (94.74%) were in the state of shock. Comorbid conditions were present in 32 (33.7%) patients. Forty-nine (51.6%) patients had a Boey score of 2, while 27 (28.4%) had a score of 3. The overall mortality was 12 (12.6%). It was more in patients who had score of 3 followed by Boey score 2. This was statistically significant with p< 0.001.*

*Conclusion* *The Boey scoring system is simple and easy to use. It was found efficient in predicting the clinical outcome in patients with peptic ulcers perforation.*

*Key words* *Peptic ulcer, Perforation, Boey score, Morbidity, Mortality, Prognosis.*

[1] Department of Surgery, Bolan Medical College Quetta

[2] Department of Surgery, Mohtarma Shaheed Benazir Bhutto General Hospital Quetta

Correspondence:
Dr. Manzoor Ahmed [1*]
Department of Surgery
Bolan Medical College
Quetta
E mail: drmanzoorbaloch@gmail.com

**INTRODUCTION:**

The lifetime prevalence of peptic ulcer disease is estimated as 5-10% in the general population and the incidence is 0.1-0.3% per year.[1] The increasing Helicobacter pylori infection, the extensive use of NSAIDs and the increase in alcohol and smoking lead to frequent complications.[2] Hemorrhage is the most common outcome of peptic ulcer disease, with an incidence of 0.02-0.06% and a mortality of 8.6%, followed by perforation with a frequency of 0.004-0.014% and a mortality of 23.5%.[3] This is a major healthcare issue with high morbidity and mortality.

In order to predict the mortality of perforated peptic ulcers, a variety of scoring systems are in use. This includes Boey score, Hacettepe score, Jabalpur score, Peptic ulcer perforation (PULP) score, ASA score, Mannheim Peritonitis Index, Acute physiology and chronic health evaluation II score (APACHE II), Simplified acute physiology score II (SAP II), Mortality probability model II (MPM II), quick sepsis-related organ failure assessment (qSOFA), and the Physiological and Operative Severity Score for the enumeration of Mortality and Morbidity physical sub-score (POSSUM-phys score).[4,5] All the scoring systems have their own advantages and disadvantages. However, the Boey score and the ASA score are commonly used to predict the outcomes of patients with peptic ulcer perforation.

Among the scoring systems the Boey is the most commonly used for risk stratification because of its simplicity and good predictive value for mortality and morbidity in perforated peptic ulcer patients. The mortality rate increases progressively with increasing number of risk factors.[6] Most of the patients admitted in public sector tertiary care hospitals belong to a low socioeconomic group and delay in presentation is commonly reported. This adds to the poor outcome. The risk stratification at presentation can facilitate counseling with the patients and their family members. This study was conducted to find out the usefulness of Boey scoring systems for predicting the outcome in patients with perforated peptic ulcer disease.

## METHODS:

**Study design, place & duration:** This prospective observational cohort study was conducted at the Department of Surgery Unit I, Bolan Medical College and Mohtarma Shaheed Benazir Bhutto General Hospital Quetta, from March 2023 to June 2024.

**Ethical considerations:** The ethical review board approval was obtained from the IRB of Bolan University of Medical and Health sciences Quetta (0039/ BUMHS/IRB/23). Informed consent was taken.

**Inclusion criteria and exclusion criteria:** All patients with clinically and radiologically suspected of perforated peptic ulcer disease and confirmation of perforation in the first part of the duodenum or pre-pyloric stomach at laparotomy were included. Patients with traumatic perforation, perforation in other than the pre-pyloric region of the stomach and first part of duodenum and suspected or confirmed gastric malignancy, were excluded.

**Sample size estimation:** The sample size was calculated by the given formula: $n = Zalpha^2 \times Sn (100-Sn)/ L^2 \times Prevalence$. Where Zalpha = Standard table value for 95% CI = 1.96, Sn = Sensitivity, L= 5% of Precision prevalence.[7] The sample size calculated was 95.

**Study protocol:** A purposive non probability sampling technique was used for data collection. Patients were admitted through the emergency department with a clinical presentation of secondary peritonitis. It was further confirmed by presence of free air under the right dome of the diaphragm in an erect chest x-ray and a supine plain X-ray of the abdomen. The CT scan was done only if the diagnosis was in doubt. The demographic data were entered, history was taken and physical examination performed. Boey score assessment was made. There are three parameters in this system namely: the presence of comorbid conditions, the onset of perforation of more than 24-hours duration that is calculated from the onset of symptoms to start of surgical management, and preoperative shock (systolic BP < 90 mm Hg). Each variable has a score of 1. The score ranges from 0-3.

Patients were prepared according to the surgical protocol. All patients underwent laparotomy. The primary closure of the perforation with classical or modified Graham's omentopexy followed by peritoneal lavage were done. Patients were followed for 30-days after surgery for any complications. The study variables included age, gender, history of steroids or NSAID use, smoking, alcohol consumption, any ongoing malignancies, other co-morbid conditions, preoperative duration of symptoms, blood pressure, hospital stay, and mortality.

**Statistical analysis:** The data were entered and analyzed using SPSS version 21. A 95% confidence interval was calculated. Chi squire used for significance and a p value < 0.05 was considered as statistically significant. For sensitivity and specificity Receiver-operating characteristic (ROC) curve and Area under curve (AUC) analysis were used to estimate the predictive ability of the Boey score in assessing the postoperative morbidity and mortality.

## RESULTS:

In this study 95 patients were enrolled. There were 80 males and 15 females. Male to female ratio was 5.3:1. The age was from 20 - 80 years with the mean age of 39.4+14.3 years. The reporting time to the hospital in most of the patients (n=72 - 75.8%) was

more than 24-hours. Details are given in table I. Thirty-eight (40%) patients developed postoperative organ failure, in which renal failure was the most common, followed by respiratory and liver failure. Other complications observed are given in table II. Superficial surgical site infection (SSSI) occurred in 17 (17.9%) and deep surgical site infection (DSSI) in 10 (10.5%) patients. Predictive sensitivity and specificity for mortality on receiver operating characteristic (ROC) curve analysis of age, preoperative shock, and Boey score are shown in Figures I and II. On ROC curve, the sensitivity was 77% and the specificity was 27%. AUC for Boey score was 0.795 and for age 0.782. This is highly sensitive for predicting mortality. AUC for symptoms duration was 0.639 and preoperative shock 0.530, which showed intermediate and low sensitivity.

**DISCUSSION:**

Boey score was effective in predicting the outcome of patients with a perforated peptic ulcer disease. However, one variable, the preoperative shock, was not significant. Mortality of complicated peptic ulcer disease is 70% due to perforation and is 10-folds higher than other acute abdominal diseases such as acute appendicitis and acute cholecystitis.[8,9] Standardization and implementation of evidence based practice in perioperative care reduced the mortality and morbidity.[10] However, in a limited resource setting with a large number of referrals, the situation may remain challenging. The individual risk stratification and accurate identification of high risk outcomes in these patients are therefore of prime importance.

Ideally, the scoring system should be easy to calculate, preferably applied preoperatively and on bedside. The Boey scoring system has three parameters. Score of more than one is associated with a high risk. The morbidity increases several fold in the stepladder pattern. As the Boey score increases from 1 to 2, the morbidity increases from 9.2% to 55.5% and even more.[7] Same was noted in our study.

Male predominance was another important observation in the index study with male to female ratio of 5.3:1. However, it was not significantly related with mortality (p=0.114). This was also reported in

**Table I: Demographic Profile of Patients**

| Demographic Variables | Sub variables | Frequency |
|---|---|---|
| Gender | Male | 80 (84.2%) |
| | Female | 15 (15.8%) |
| Age group (Years) | 16 - 30 | 29 (30.5%) |
| | 31 - 50 | 46 (48.4%) |
| | 51 - 80 | 20 (21.1%) |
| Duration of symptoms | <24-hours | 23 (24.2%) |
| | >24-hours | 72 (75.8%) |
| Preoperative shock | No | 05 (5, 26%) |
| | Yes | 90 (94.74%) |
| Co-morbid conditions | None | 63 (66.3%) |
| | Yes | 32 (33.7%) |
| Boey score | 0 | 01 (1.06%) |
| | 1 | 18 (18.95%) |
| | 2 | 49 (51.57%) |
| | 3 | 27 (28.42%) |
| Hospital stay | 7 days | 40 (42.10%) |
| | 8 - 15 days | 43 (45.26%) |
| | > 15 days | 12 (12.64%) |
| Outcome | Improved and discharged | 43 (45.3%) |
| | Complications noted later improved and discharged | 40 (42.1%) |
| | Expired | 12 (12.6%) |

**Table II: Significance of Boey Score and other Variables**

| Variables | Sub variables | Outcome | | | Significance level |
|---|---|---|---|---|---|
| | | Improved and discharged | Complications noted but improved and discharged | Expired | |
| Gender | Male | 39 | 35 | 06 | 0.004* |
| | Female | 04 | 05 | 06 | |
| | Total | 43 | 40 | 12 | |
| Age group (Years) | 16 - 30 | 21 | 07 | 01 | 0.001* |
| | 31 - 50 | 18 | 25 | 03 | |
| | 51 - 80 | 04 | 08 | 08 | |
| | Total | 43 | 40 | 12 | |
| Duration of symptoms | <24-hours | 23 | 00 | 00 | 0.001* |
| | >24-hours | 20 | 40 | 12 | |
| | Total | 43 | 40 | 12 | |
| Preoperative shock | No | 05 | 00 | 00 | 0.024* |
| | Yes | 38 | 40 | 12 | |
| | Total | 43 | 40 | 12 | |
| Co-morbid conditions | None | 33 | 27 | 03 | 0.003* |
| | Yes | 10 | 13 | 09 | |
| | Total | 43 | 40 | 12 | |
| Boey score | 0 | 01 | 00 | 00 | 0.001* |
| | 1 | 16 | 02 | 00 | |
| | 2 | 20 | 26 | 03 | |
| | 3 | 06 | 12 | 09 | |
| | Total | 43 | 40 | 12 | |
| Hospital stay | 7 days | 26 | 07 | 07 | 0.03* |
| | 8 - 15 days | 15 | 25 | 03 | |
| | > 15 days | 02 | 08 | 02 | |
| | Total | 43 | 40 | 12 | |

Significant*

another study.[11] Although both genders are equally affected but perforation is more common in male patients. This may be due to more frequent smoking and alcohol consumption among males. With regards to age a higher mortality was observed in patients above 50-years (40%). Thus a significant correlation was found with increasing age (p=0.001). Similar observations were noted in other studies.[7,12] However, our study showed higher mortality among those patients who presented late and were in shock at presentation. The mortality was significant with this combination (p=0.001). The preoperative shock as an independent variable did not reach a significant level (p=0.024). In a study conducted by Koranne et al, no significant correlation was reported with age, duration, and preoperative shock with mortality. This may be due to retrospective analysis of a small sample size.[11]

Patients who had comorbid conditions and those with postoperative complications, especially the organ failure, had significantly higher mortality in our study. Similarly, patients with higher Boey scores were more prone to develop complications. In this study increasing age was significantly associated with the highest Boey score and more prone to organ failure, and thus major mortality rate. Similar pattern was reported in other study.[13] In the present study, overall mortality was 12.63%. This was high with Boey scores of 2 and 3 and was found significant.

The literature revealed varying AUC values of Boey score from 0.62 to 0.92.[8,10,14] In present study it was 0.79. This diversity in literature may be due to the inclusion of older patients (more than 50 years) in the studies. In a systemic review, Niilonga et al

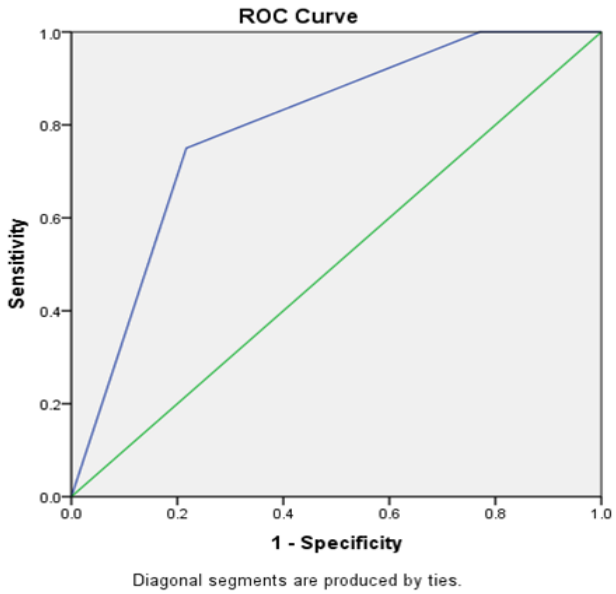


Fig. I: ROC Analysis Showing Sensitivity and Specificity of Boey score on Area Under Curve (AUC)

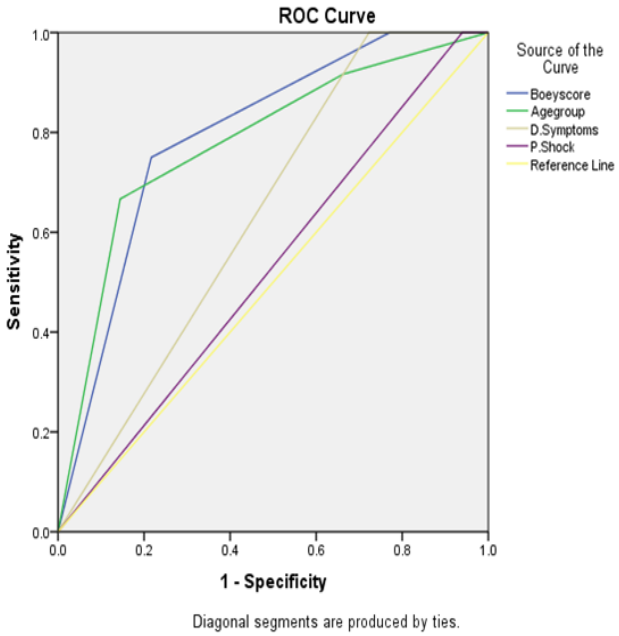


Fig. II: ROC Showing Sensitivity and Specificity of Boey Score and other Variables on Area Under Curve (AUC). Where colored line showing sensitivity as : Yellow= reference line, Purple= pre operative shock, Gray Duration of symptoms, green-age factor and blue = Boey score

mentioned four major risk factors; three factors of Boey score and added an age of more than 60 years.[15]

**Limitations of the study:** This is a single center study with small sample size and in a resource constraint setting. There are host of other factors like availability of highly equipped intensive care facility and efficient nursing care that may influence the outcome in these patients.

**CONCLUSION:**

Increasing Boey scores were significantly correlated with gender and increasing age group as well as with late presentation, postoperative complications and comorbid conditions. The hospital stay and preoperative shock were not found significant. Boey scoring system useful in predicting mortality and morbidity in patients with peptic ulcer perforation.

**REFERENCES:**

1. Lanas A, Chan FKL. Peptic ulcer disease. Lancet. 2017;390:613-24. doi: 10.1016/S0140-6736(16)32404-7

2. Tarasconi A, Coccolini F, Biffl WL, Tomasoni M, Ansaloni L, Picetti E, et al. Perforated and bleeding peptic ulcer: WSES guidelines. World J Emerg Surg. 2020;15:3. doi: 10.1186/s13017-019-0283-9.

3. Soreide K, Thorsen K, Harrison EM, Bingener J, Moller MH, Ohene-Yeboah M, et al. A perforated peptic ulcer. Lancet. 2015;386:1288-98. doi:Ê10.1016/S0140-6736(15)00276-7.

4. Thorsen K, Soreide JA, Soreide K. Scoring systems for outcome prediction in patients with perforated peptic ulcer. Scand J Trauma Resusc Emerg Med. 2013;21:25. doi: 10.1186/1757-7241-21-25.

5. Kumar NKA, James S. Risk stratification in perforated peptic ulcer: The Peptic Ulcer Perforation Score. J Basic Clin Appl Health Sci. 2019;2:112-4.

6. Boey J, Choi SK, Poon A, Alagaratnam TT. Risk stratification in perforated duodenal ulcers: a prospective validation of predictive factors. Ann Surg. 1987;205:22-6. doi:

7. Saafan T, El Ansari W, Al-Yahri O, Eleter A, Eljohary H, Alfkey R, et al. Assessment of PULP score in predicting 30-day perforated duodenal ulcer morbidity, and comparison of its performance with Boey and ASA,

retrospective study. Ann Med Surg (Lond). 2019;42: 23-8. doi: 10.1016/j.

8. Putra IGAP, Sudiasa K, Mahadewa TGB. Validity of predictive score of mortality in peptic ulcer perforation (POMPP) in predicting perforated peptic ulcer mortality operated in Sanglah General Hospital, Denpasar, Bali. NeurologicoSpinale Medico Chirurgico. 2022;5:58-62. DOI: 10.36444/nsmc.v5i1.210.

9. Menekse E, Kocer B, Topcu R, Olmez A, Tez M, Kayaalp C. A practical scoring system to predict mortality in patients with perforated peptic ulcer. World J Emerg Surg. 2015;10:7. doi: 10.1186/s13017-015-0008-7.

10. Narayan SD. Boey score in predicting outcome in perforated peptic ulcer from tertiary referral center of Nepal. ARC J Surg. 2019;5:9-14. doi:dx.doi.org/10.20431/2455-572X. 0501002.

11. Koranne A, Byakodi KG, Teggimani V, Kamat VV, Hiregoudar A. A comparative study between peptic Ulcer Perforation Score, Mannheim Peritonitis Index, ASA Score, and Jabalpur Score in Predicting the Mortality in Perforated Peptic Ulcers. Surg J (N Y). 2022;8:e162-e8. doi: 10.1055/s-0042-1743526.

12. Harindranath HR, Mamatha VP. A comparative study between Mannheim's peritonitis index and Boey's score in predicting the morbidity and mortality in perforated peptic ulcer patients in a tertiary health care center in Bangalore. Int Surg J. 2022;9:644-8.

13. Rivai MI, Suchitra A, Janer A. Evaluation of clinical factors and three scoring systems for predicting mortality in perforated peptic ulcer patients, a retrospective study. Ann Med Surg (Lond). 2021;69:102735. doi: 10.1016/j.amsu.2021.102735.

14. Nichakankitti N, Athigakunagorn J. The accuracy of prognostic scoring systems for postoperative morbidity and mortality in patients with perforated peptic ulcer. Int Surg J. 2016;3:286-90. https://doi.org/10.18203/2349-2902.isj20160244

15. Niilonga EIU, Shatri AMN. Risk factors affecting morbidity and mortality in patients with perforated peptic ulcers in sub-Saharan Africa: A systematic review. Undergrad Res Health J. 2023;1(1):e78. https://doi.org/10.7196/URHJ.2023.v1i1.78.

Article Received on 26-02-2025
Send for Revision: 05-04-2025
Revised Received on: 08-04-2025

Authors' contributions:
Manzoor Ahmed. Concept, data collection, analysis, manuscript writing.
Mohammad Iqbal. Concept, data analysis and manuscript writing.
Maria Mehmood. Concept, data collection and manuscript writing.
Mukhtar Mehboob. Concept, data analysis and manuscript writing.
Shoaib Ahmed Qureshi. Concept, data analysis and manuscript writing.
Hira Nadeem. Data collection and analysis.

All authors approved final revised version and are responsible for the content of the article.

Ethics statement: Approval was taken from the institution review board (IRB) before conducting the study and informed consent was obtained. .

Competing interest: None declared.

Source of funding: Nil

Disclosure: Nothing to disclose.

Data availability: Corresponding author may provide data on request.

Use of Artificial intelligence AI app was not used.

How to cite this article?
Ahmed M, Iqbal M, Mehmood M, Mehboob M, Qureshi SA, Nadeem H. Usefulness of Boey score in predicting the outcome in patients with perforated peptic ulcer disease. J Surg Pakistan. 2024;29(4):100-5.