

Comparison of Possum & P-Possum Scores in Predicting Mortality Among Patients Undergoing Emergency Abdominal Surgery**Himen Baidya¹, Damodar Chatterjee², Diptendu Chaudhuri³**¹Senior Resident, MBBS, MS, Department of General Surgery, Agartala Government Medical College, Agartala, Tripura 799006²Associate Professor, MBBS, MS, Department of General Surgery, Agartala Government Medical College, Agartala, Tripura 79900.³Associate Professor, MBBS, MS, Department of General Surgery, Agartala Government Medical College, Agartala, Tripura 799006

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Conflict of interest: Nil

Abstract

Introduction: Laparotomies are among the most common surgical procedures. It is widely acknowledged that patients in these situations have bad outcomes. Although emergency laparotomies are among the most frequently performed urgent surgical operations, little is known about their results. The post-operative mortality rate for peritonitis is still high, currently estimated to be between 14.9 to 19.4%, despite countless advancements in surgical techniques, antimicrobial medications, and supportive care.

Aims: To compare POSSUM and P-POSSUM scoring in predicting mortality in patients undergoing emergency abdominal surgery.

Materials & Methods: Prospective study. Department of General Surgery, Agartala Government Medical College, Agartala, West Tripura from December 2019 to June 2022 and total sample size 150 patients

Result: The average Possum score (mean $\pm$ s.d.) for patients who died was 92.7000 $\pm$ 5.8678. The mean Possum score (mean $\pm$ s.d.) for patients who survived was 35.4343 $\pm$ 19.6384. The mean Possum score and outcome distribution was statistically significant ($p < 0.0001$).

Conclusion: We came to the conclusion that POSSUM and P-POSSUM scores are statistically significant predictors of death ($p < 0.0001$ for both) for patients undergoing emergency abdominal surgery at AGMC & GBP Hospital. The mean scores of patients who expired were substantially higher than those of survivors (POSSUM: 35.4, P-POSSUM: 18.9).

Keywords: Possum & P-Possum Scores, Abdominal Surgery, General surgery, AGMC & GBP Hospital and Risk stratification.

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Introduction

Laparotomies are among the most common surgical procedures. It is widely acknowledged that patients in these situations have bad outcomes. Although emergency laparotomies are among the most frequently performed urgent surgical operations, little is known about their results. The post-operative mortality rate for peritonitis is still high, currently estimated to be between 14.9 to 19.4%, despite countless advancements in surgical techniques, antimicrobial medications, and supportive care.

We may choose the high-risk individuals for more intensive treatment if we evaluated these patients' prognoses early. In order to advance medical science and improve patient care, clinical practice must be continuously monitored and audited. Enhancing hospital treatment quality and making

sure patients are aware of the risks are also crucial. A crucial part of a surgical audit is comparing the rates of morbidity and mortality. Since the outcome is directly connected to the risks involved with surgery, a good audit should compare the risk-adjusted mortality and morbidity rates rather than the crude rates. Several risk score methods have been developed for this purpose. [1]

In 1991, Copeland et al. [2] initially presented POSSUM as a way to normalize data so that patient outcomes may be directly compared in spite of variations in case mix. [3]. Six operative elements and twelve physiological factors are used to calculate the score. Each element is given 1, 2, 4, or 8 points, depending on how severe the irregularity is. Large operating datasets have been used to generate the majority of surgical risk

ratings, which use statistical analysis to identify the characteristics most closely linked to result.

POSSUM [Physiological and Operative Severity Score for the enumeration of Mortality and Morbidity] and P-POSSUM [Portsmouth-Physiological and Operative Severity Score for the enumeration of Mortality and Morbidity] scores continue to be the most researched and validated across specialties and patient populations, despite the use of several surgical outcome scores, such as APACHE II and Surgical Apgar Score, to predict mortality in patients undergoing emergency laparotomy.

Material and Methods

Study Design: Prospective study.

Study Place: Department of General Surgery, Agartala Government Medical College, Agartala, West Tripura.

Study Period: December 2019 to June 2022.

Sample Size: All patients undergoing Emergency abdominal surgery cases, aged between 18 and 60 years in one and half years. It has been observed that in last one and half year a total of 150 patients have undergone emergency laparotomy. So the sample size is 150.

Inclusion Criteria

- All patients aged 18 to 60 years undergoing emergency abdominal surgery.
- Patients willing to give written informed consent

Exclusion Criteria

- Patients not willing to participate in the study.

Study Parameters

- Age
- Sex
- Diagnosis
- Physiological score
- Operative score
- Possum score
- P-possum score

Statistical Analysis: For statistical analysis, data were initially entered into a Microsoft Excel spreadsheet and then analyzed using SPSS (version 27.0; SPSS Inc., Chicago, IL, USA) and GraphPad Prism (version 5). Numerical variables were summarized using means and standard deviations, while Data were entered into Excel and analyzed using SPSS and GraphPad Prism. Numerical variables were summarized using means and standard deviations, while categorical variables were described with counts and percentages. Two-sample t-tests were used to compare independent groups, while paired t-tests accounted for correlations in paired data. Chi-square tests (including Fisher's exact test for small sample sizes) were used for categorical data comparisons. P-values ≤ 0.05 were considered statistically significant.

Result

Table 1: Association between diagnoses: Outcome

Outcome				
Diagnosis	Expired	Survived	Total	p-value
Appendicitis	0 (0.0%)	30 (28.6%)	30(25.0%)	0.037
Obstruction	3 (20.0%)	9 (8.6%)	12 (10.0%)	
Perforation	12 (80.0%)	66 (62.9%)	78 (65.0%)	
Total	15 (100.0%)	105 (100.0%)	120 (100.0%)	

Table 2: Comparative Distribution of Mean Physiological, Operative, POSSUM, and P-POSSUM Scores

		Number	Mean	SD	Minimum	Maximum	Median	p-value
Physiological score	Expired	15	50	5.7071	42	58	52	<0.0001
	Survived	105	25.5429	5.6142	18	37	25	
Operative score	Expired	15	21.6	1.5492	20	24	22	<0.0001
	Survived	105	18.6	2.0125	15	20	20	
Possum score	Expired	15	92.7	5.8678	83.4	98.7	96.2	<0.0001
	Survived	105	35.4343	19.638	9.1	72	35.6	
P-possum score	Expired	15	90.438	8.8036	75.79	98.8	95.8	<0.0001
	Survived	105	18.8829	16.023	2.4	57.33	14.9	

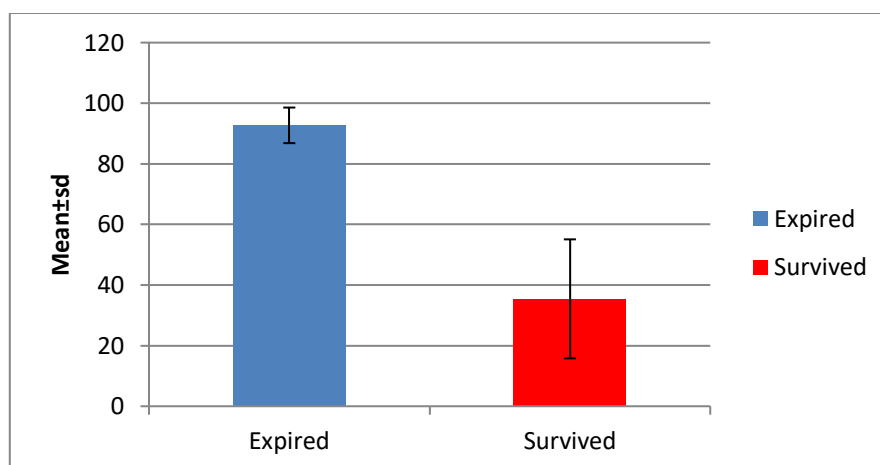


Figure 1: Distribution of mean possum score: outcome

Among the 120 patients included in the study, 15 (12.5%) expired while 105 (87.5%) survived. A statistically significant association was observed between the type of diagnosis and patient outcome ($p = 0.037$). Of the 30 patients diagnosed with appendicitis, none expired (0.0%), while all 30 (28.6% of survivors) survived. In contrast, among 12 patients with intestinal obstruction, 3 (20.0%) expired and 9 (8.6% of survivors) survived. The majority of patients, 78 (65.0%), were diagnosed with perforation, of whom 12 (80.0% of all deaths) expired and 66 (62.9% of survivors) survived. These findings indicate that mortality was highest among patients with perforation and lowest among those with appendicitis.

In the present study, significant differences were observed in the Physiological score, Operative score, POSSUM score, and P-POSSUM score between patients who expired and those who survived. The mean Physiological score was markedly higher in the expired group (50 ± 5.71) compared to the survived group (25.54 ± 5.61), with a p -value of <0.0001 . Similarly, the Operative score was significantly elevated in the expired group (21.6 ± 1.55) versus the survived group (18.6 ± 2.01), also with a p -value of <0.0001 . The mean POSSUM score among the expired patients was 92.7 ± 5.87 , significantly higher than the 35.43 ± 19.64 observed in survivors ($p < 0.0001$). Likewise, the P-POSSUM score was substantially greater in the expired group (90.44 ± 8.80) compared to the survived group (18.88 ± 16.02), with a statistically significant p -value of <0.0001 . These findings indicate that higher preoperative risk scores are strongly associated with postoperative mortality.

Discussion

In similar study by Ahuja A et al [4](2013) found that between January 2010 and June 2011, 50 patients with a confirmed diagnosis of intestinal perforation participated in the 18-month trial. Our study showed that, most of patients had Perforation

Diagnosis in Expired Group [12 (80.0%)] compared to Survived Group [66 (62.9%)] but this was statistically significant ($p=0.0370$).

In others study by Pratt W et al [5](2008) found that the other risk groupings were distributed fairly evenly, even though none of the patients had POSSUM scores lower than 20%. and Das DK et al [6](2019) found that According to ROC curve analysis of P POSSUM scores, mortality could be predicted with a sensitivity of 70.80% and a specificity of 83.30% if a cutoff value of 42.45% was used. In our study, mean Possum score was higher in Expired Group [92.7000 ± 5.8678] compared to Survived Group [35.4343 ± 19.6384] but this was statistically significant ($p < 0.0001$).

In similar study by Mercer SJ et al [7](2013) found that in terms of physiologic and operative scores, the patients' mean [SD] scores were 18.83 [5.07] and 18.09 [3.75], respectively and Singh R et al [8](2020) found that POSSUM scoring system with its 12 physiological score and 6 operative score was used to predict the expected morbidity and mortality. We showed that, mean Operative score was higher in Expired Group [21.6000 ± 1.5492] compared to Survived Group [18.6000 ± 2.0125] but this was statistically significant ($p < 0.0001$).

In similar study by Jain and Sharma [9] (2016) found that P-POSSUM accurately predicted mortality with an O:E ratio of 0.98, whereas POSSUM overpredicted mortality with an O:E ratio of 0.44. We found that, mean P-possum score was higher in Expired Group [90.4380 ± 8.8036] compared to Survived Group [18.8829 ± 16.0231] but this was statistically significant ($p < 0.0001$).

Conclusion

We came to the conclusion that both POSSUM and P-POSSUM scores are statistically significant predictors of death ($p < 0.0001$ for both) for patients undergoing emergency abdominal surgery at AGMC & GBP Hospital. The mean scores of patients who expired were substantially higher than

those of survivors. The P-POSSUM score appears to provide a more accurate and dependable estimate of mortality, with a median that is closer to the highest value among deceased patients and a smaller standard deviation. Therefore, P-POSSUM is a better tool for mortality prediction in this clinical setting and may enhance surgical risk assessment.

Reference

1. Haq MZ, Ahmad N, Nasir II. Surgical audit of emergency surgery with the POSSUM system. *Journal of Medical Sciences*. 2012 Dec 12;20(3):116-8.
2. Copeland GP, Jones D, Walters MP. POSSUM: a scoring system for surgical audit. *Journal of British Surgery*. 1991 Mar;78(3):355-60.
3. Ng KJ, Yui MK. Possum- A model for surgical outcome audit in quality care. *Medical Journal of Malaysia*. 2003 Oct 1;58(4):516-21.
4. Ahuja A, Pal R. Prognostic scoring indicator in evaluation of clinical outcome in intestinal perforations. *Journal of Clinical and Diagnostic Research: JCDR*. 2013 Sep 10;7(9):1953.
5. Pratt W, Joseph S, Callery MP, Vollmer Jr CM. POSSUM accurately predicts morbidity for pancreatic resection. *Surgery*. 2008 Jan 1;143(1):8-19.
6. Murray GD, Hayes C, Fowler S, Dunn DC. Presentation of comparative audit data. *Journal of British Surgery*. 1995 Mar;82(3):329-32.
7. Mercer SJ, Guha A, Ramesh VJ. The P-POSSUM scoring systems for predicting the mortality of neurosurgical patients undergoing craniotomy: further validation of usefulness and application across healthcare systems. *Indian Journal of Anaesthesia*. 2013 Nov 1;57(6):587-91.
8. Singh R, Rina T, Nongmaithem MS, Salam SS, Thokchom C, Harish M, Lombi N, Tripathi V. Accuracy of POSSUM Scoring System in Predicting Mortality and Morbidity in Patients of Performative Peritonitis.
9. Jain AK, Sharma D. A prospective study of risk stratification in patients undergoing emergency laparotomy with POSSUM and P-POSSUM. *IntSurg J*. 2016;3(1):227-231. doi:10.18203/2349-2902.isj20160227.