

EFFICACY OF P-POSSUM SCORING SYSTEM IN PREDICTING MORTALITY AND MORBIDITY IN POST EMERGENCY LAPAROTOMY PATIENTS IN A TERTIARY CARE INSTITUTE OF NORTH-EAST INDIA

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Abstract

Background: Since each surgical procedure is associated with inherent risks, and surgical safety is of foremost concern. Using only crude mortality rates for comparing surgeons can be extremely misleading as other factors such as patient factors, presentation time, surgical setup, and pre and post-operative care also play a role. This prospective study aimed at establishing the efficacy of Portsmouth Physiological and Operative Severity Score for the Enumeration of Mortality and Morbidity (P-POSSUM) scoring by comparing the expected and observed rate of morbidity and mortality after emergency exploratory laparotomy. **Materials and Methods:** Data were collected prospectively from 70 patients admitted in department of General Surgery, JMCH over 12 months and expected rates of morbidity and mortality calculated and compared with the observed rates. **Result:** Data were collected and analyzed which resulted in p-value of 0.997 ($\chi^2 = 0.358$, d.f=8) for mortality and p-value of 0.255 ($\chi^2 = 10.144$, d.f=8) for morbidity by using Hosmer Lemeshow test which signifies P-POSSUM score is accurate predictor for mortality and morbidity in patients undergoing emergency exploratory laparotomy. **Conclusion:** Hence the P-POSSUM is capable of accurately predicting the morbidity and mortality following emergency exploratory laparotomy for acute abdominal conditions as per the present study.

INTRODUCTION

Acute abdomen signifies an underlying surgical abnormality that requires immediate diagnosis and surgical treatment.^[1] Since each surgical treatment carries its own set of risks, surgical safety is of the utmost importance. It can be quite misleading to compare surgeons based just on crude fatality rates because other variables, such as patient factors, presentation time, surgical setup, and pre- and post-operative care, also come into play. Thus, the necessity for risk assessment emerged, which may aid in precise outcome prediction. Consequently the Physiological and Operative Severity Scoring system for the enumeration of Morbidity and mortality (POSSUM) was proposed as a risk adjusted scoring system to allow for direct comparison between the observed and expected morbidity and mortality outcome rates proposed by Copeland GP et al in 1991.^[2] It was based on 12 physiological and 6

operative variables and the predicted mortality and morbidity calculated by using an equation.

The Portsmouth POSSUM (P-POSSUM) is a further modification of POSSUM scoring in which the parameters considered are same but a different equation is used to correct the over prediction of mortality which was observed in POSSUM scoring developed by Whitley MS et al to obtain better results.^[3]

In India, alongside the disease, there are several other problems such as delayed presentation and limited resources which has an overall effect on the adverse outcome even after providing adequate quality care. Therefore, it was necessary to validate P-POSSUM in the Indian context, and this study was conducted to evaluate the effectiveness of the scoring system's ability to predict mortality and morbidity in patients who presented with acute abdominal pain and underwent emergency exploratory laparotomy at our institution.

Aims & Objectives

To determine the efficacy of P- POSSUM scoring system in predicting morbidity and mortality in patients of acute abdomen undergoing emergency exploratory laparotomy in a tertiary care center in north east India

MATERIALS AND METHODS

This was a prospective study conducted at Jorhat Medical College & Hospital, Jorhat from 1 June 2021 to 31 May 2022. All patients receiving emergency laparotomies till the sample size of 70 was met underwent a 30-day post-operative follow-up. Patients with a minimum age of 12 years, those whose follow-up time requirements were not met, and those with considerable immunosuppression (HIV/HBsag positive and those taking immunosuppressive medications/chemotherapeutic medicines for cancer) were excluded from the study. All patients receiving emergency laparotomies within the designated time period had their data collected using a proforma created specifically for the study. At the time of admission, the physiological scores of each patient were recorded. Based on the operating surgeon's documentation of the intraoperative findings, an operative severity score was calculated.

The morbidity and mortality rates were calculated by using the following equations

$$\text{Loge}[R/1-R] = (0.1692 \times \text{PS}) + (0.155 \times \text{OS}) - 9.065$$

Where R=risk of mortality

$$\text{Loge}[R/1-R] = -5.91 + (0.16 \times \text{PS}) + (0.19 \times \text{OS})$$

Where R=risk of morbidity.

PS=physiological score and OS=operative score

Any post-operative death or complication were recorded and the data thus obtained were analysed.

Statistical analysis: IBM SPSS software was used to analyze the data that had been collected. The unpaired sample t-test was employed to determine the significant difference between the bivariate samples in Independent groups. The logistics regression risk prediction model uses the Hosmer-Lemeshow test to determine the goodness of fit. A significant level is judged to have a p-value of 0.05.

RESULTS

Demography: Out of total seventy patients, fifty patients were males and nineteen were females. It

was also observed that most of the participants belonged to the age group 21-30 years (28%).

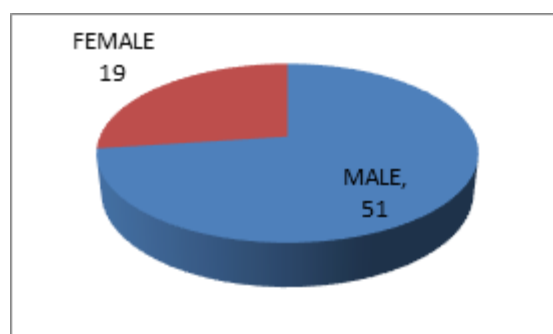


Figure 1: Distribution of Gender

It shows that perforation peritonitis due to duodenal perforation was the most common cause of acute abdomen patients undergoing emergency exploratory laparotomy (27%) of the total cases followed by appendicular perforation with abscess (18.6%), gastric perforation (15.7%). The different procedures which were performed on the patients presenting with acute abdomen undergoing emergency exploratory laparotomy. Graham's patch repair (42.8%) was the most common procedure done followed by appendectomy with abscess drainage (18.6%), primary repair of perforation (14.2%).

The most common was Surgical Site Infection (14.2%) and the least common morbidities (1.5%) included cardiac failure, fistula, and pulmonary embolism. Other morbidities included wound dehiscence (10%), lower respiratory tract infection (8.5%), respiratory failure and acute kidney injury (5.7%), burst abdomen, sepsis and urinary tract infection (4.2%). A total of 7 deaths were observed (10%).

The Hosmer and Lemeshow Test analysis of the data revealed that the P-POSSUM score or mortality was a reliable predictor of mortality ($\chi^2 = 0.358$, d.f=8) with a p-value of 0.997. Given that there is no statistically significant difference between the observed and projected frequencies and the p-value is >0.05 , it may be considered that the P-POSSUM score is a reliable indicator of morbidity.

The Hosmer and Lemeshow Test analysis of the data revealed that the P-POSSUM score of morbidity was a reliable predictor of morbidity ($\chi^2 = 10.144$, d.f = 8), with a p-value of 0.255. Given that there is no statistically significant difference between the observed and projected frequencies and the p-value is >0.05 , it may be considered that the P-POSSUM score is a reliable indicator of morbidity.

Table 1: Distribution of age

Age Group	Frequency	Percentage
12-20	11	16%
21-30	20	28%
31-40	14	20%
41-50	10	14%
51-60	5	8%
61-70	7	10%
71-80	3	4%

Indications and procedures performed

Table 2: Distribution of Cause of Acute Abdomen

Diagnosis	Frequency
Gastric Perforation	11 (15.7%)
Duodenal Perforation	19 (27%)
Appendicular perforation with abscess	13 (18.5%)
Ileal Perforation	6 (8.5%)
Jejunal Perforation	6 (8.5%)
Band adhesions	7 (10%)
Sigmoid Perforation	1 (1.5%)
Intussusception	3 (4.2%)
Volvulus	3 (4.2%)
Colonic Perforation	1 (1.5%)

Table 3: Distribution of Different Procedure Executed

Procedure	Frequency
Appendectomy with abscess drainage	13 (18.6%)
Graham's Patch repair	30 (42.8%)
Adhesiolysis	4 (5.7%)
Resection Anastomosis with Transverse Loop Colostomy	6 (8.5%)
Primary Repair	10 (14.2%)
Repair with Transverse loop Colostomy	1 (1.5%)
Resection Anastomosis with Ileostomy	4 (5.7%)
Resection Anastomosis	1 (1.5%)
Adhesiolysis with Ileostomy	1 (1.5%)

Mortality and Morbidity Analysis

Table 4: Distribution of Morbidities

Morbidities	Frequency
Acute Kidney Injury	4 (5.7%)
Burst Abdomen	3 (4.2%)
Cardiac failure	1 (1.5%)
Dehiscence	7 (10%)
Fistula	1 (1.5%)
Lower Respiratory Tract Infection	6 (8.5%)
None	27 (38.8%)
Pulmonary embolism	1 (1.5%)
Respiratory failure	4 (5.7%)
Sepsis	3 (4.2%)
Surgical Site Infection	10 (14.2%)
Urinary Tract Infection	3 (4.2%)

Table 5: Mortality analysis

Mortality = No		Mortality = Yes		Total
Observed	Expected	Observed	Expected	
8	8.000	0	0.000	8
7	7.000	0	0.000	7
8	8.000	0	0.000	8
7	7.000	0	0.048	7
8	8.000	0	0.057	8
6	6.000	0	0.071	6
8	8.000	0	0.000	8
7	7.000	0	0.270	7
2	1.289	3	3.711	5
2	1.907	4	4.093	6

Table 6: Mortality analysis results

Chi-square	Degree of freedom	p-value
0.358	8	0.997

Table 7: Morbidity analysis

Mortality = No		Mortality = Yes		Total
Observed	Expected	Observed	Expected	
4	3.637	2	2.363	6
4	6.163	5	2.837	9
3	2.911	2	2.089	5
3	2.268	3	3.732	6
3	3.020	5	4.980	8
4	3.289	4	4.711	8
2	2.328	5	6.672	7

3	3.952	5	4.048	8
1	1.745	6	5.255	7
0	0.688	6	5.312	6

Table 8: Morbidity analysis results

Chi-square	Degree of freedom	p-value
10.55	8	0.255

DISCUSSION

In developing countries like India, morbidity and mortality rates continues to be the main endpoints by which the quality of care is judged. The outcome of any surgical intervention, whether proper recovery, complications leading to short term or long term morbidity or death is not solely dependent on the surgeon alone. The patient's status at the time of presentation, the disease they are suffering from, nature of the intervention along with the pre-operative and post-operative care always has a major effect on the final outcome. As each case is unique in its own way, it should be kept in mind that raw mortality and morbidity and morbidity rate does not fully justify the skill of a surgeon and hence should not be used for surgical audit of the patients. Thus, this leads to our search for a proper and accurate risk scoring systems that can be used to compare patient outcomes according to each patient's presentation, status and intervention applied in that case.

In the present study, 70 patients with initial presentation of acute abdomen undergoing emergency exploratory laparotomy, admitted in Jorhat Medical College and Hospital from 1st June 2021 to 30th May 2022 were taken into consideration. It was a time bound and prospective study.

In our study male outnumbered female accounting a ratio of 2.68:1 which is in accordance to studies conducted by Delibegovic S et al,^[4] with male to female ratio of 3.1:1; Naveen P et al,^[5] with a ratio of 5.6:1; Malik AA et al,^[6] with a ratio of 2.2:1 and Sharma S et al,^[7] with a ratio of 5.1:1.

Maximum number of patients was found to be in the age group of 21-30 years accounting to 28% followed by 31-40 years which was 20%. comparable to the study by Sharma S et al,^[7] where the most common age group was 21-30 years (19.64%). Delibegovic S et al,^[4] showed 21-40 years as the most common age group. Perforation peritonitis was found to be one the most common etiology of acute abdomen which needed urgent exploration of the patient. Most common site for perforation was noted in Gastro Duodenal region that includes Duodenal (27%), Gastric (15.7%) perforation accounting for total of 42% followed by appendicular perforation with abscess (18.5%); jejunal (8.5%) and ileal (8.5%) perforation; colon (1.5%) and sigmoid perforation (1.5%). It is comparable to Malik AA et al [58] where the most common site for perforation was gastro duodenal (30.6%); Sharma S et al,^[7] with 35% of cases having duodenal perforation; Jhobta RS et al,^[8] with an incidence of 65.7% for Gastro Duodenal,

whereas Agarwal N et al,^[9] got small intestine as the most common site accounting 43% followed by Gastro Duodenal accounting 23%.

Graham's patch repair (42.8%) was the most common procedure done followed by appendectomy with abscess drainage (18.6%), primary repair of perforation (14.2%), resection anastomosis with transverse loop colostomy (8.5%), resection anastomosis with ileostomy (5.7%) and adhesiolysis (5.7%) and then least being repair with transverse loop colostomy (1.5%), resection anastomosis (1.5%) and adhesiolysis with ileostomy (1.5%). On following up the patients for a period of 30 days post operatively, we found that out of 70 patients, 7 patients expired resulting a crude mortality rate of 10% which is similar to Afridi SP et al,^[10] (10.6%); Jhobta RS et al,^[8] (10%); Dorairajan et al,^[11] (9.2%); Sharma S et al,^[7] (7.5%).

In our study, the crude morbidity rate was 62% which is comparable to Kumar A et al i.e. 61%; Jain NK et al,^[12] i.e. 63% and Sharma S et al,^[7] i.e. 80.7%. The most common morbidity was Surgical Site Infection (wound infection) (14.2%) and the least common morbidities (1.5%) included Cardiac Failure, Enteric Fistula and Pulmonary Embolism. Other morbidities included Wound Dehiscence (10%), Lower Respiratory Tract Infection (8.5%), Respiratory Failure and Acute Kidney Injures (5.7%), Burst Abdomen, Sepsis and Urinary Tract Infection (4.2%). In a study by Sharma S et al. most common complications is Wound infection (29%).

The P-POSSUM score of morbidity was found to be an accurate predictor of morbidity ($\chi^2 = 10.144$, $df=8$) with a p-value of 0.255, and the P-POSSUM score of mortality was found to be an accurate predictor of mortality ($\chi^2 = 0.358$, $d.f=8$) with a p-value of 0.997. These findings were interpreted using the Hosmer and Lemeshow Test. There is no significant discrepancy between the observed and projected frequencies, hence the P-POSSUM score can be assumed to be an accurate indicator of morbidity and mortality as the p-value is >0.05 .

CONCLUSION

The study is suggesting that P-POSSUM can be used as the preferred scoring system for providing risk adjusted performance measures among surgeons and predicting mortality and morbidity in patients with acute abdomen undergoing emergency exploratory laparotomy. It can also be suggested for use on a regular basis in high risk patients to support clinical judgement and improve patient care in order to improve the quality of surgical procedures,

counselling and is a beneficial audit tool despite inadequate resources and workforce.

P POSSUM has demonstrated good results in predicting the 30-day mortality and morbidity in this study, despite the small sample size. With a higher sample size and a greater range of patients experiencing routine and elective cases, which may have varied results, it is necessary to conduct ongoing monitoring and review.

This grading system, however, is quick, simple to use, and doesn't call for intricate imaging standards. In addition to being available as an online calculator, P-POSSUM provides specific software (applications) for the Android and iOS operating systems. Because they are freely available on smartphones and tablets, which can speed up computing, they are incredibly easy to use and will drive more widespread implementation.

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