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Comparative analysis of P-POSSUM score at admission and pre-operatively in predicting postoperative mortality in patients undergoing emergency laparotomy

Vivek Kumar Roy[1,*], **Sukalyan Saha Roy**[2], **Mukesh Kumar**[1], **Saumya Sinha**[1], **Krishna Gopal**[1]

[1] *Dept. of General Surgery, Indira Gandhi Institute of Medical Sciences,, Patna, Bihar, India*
[2] *Dept .of Pharmacology, Indira Gandhi Institute of Medical Sciences,, Patna, Bihar, India*

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ABSTRACT

Introduction: Laprotomy remains one of the commonest emergency surgical procedure performed worldwide. But over the last few years, various perioperative quality improvement initiatives involving early interventions, intensive postoperative care, and indivisualised care approaches have ensured a decrease in the average mortality rate by 3.8%-8.3. An ideal scoring system should accurately predict outcomes, help determine who deserves more aggressive care, guide in deciding the extensiveness of surgery, and can be used broadly access emergency laprotomies for various disease pathologies. The scoring system should also be capable of analyzing risk adjusted morbidity and mortality amongst various healthcare providers.
Aim: To access the accuracy of P-POSSUM score on predicting the mortality and morbidity in emergency laparotomy patients and to establish that the preoperative score is more accurate that admission score.
Materials and Methods: 150 Cases of emergency laparotomy in General Surgery Department in IGIMS, Patna from September, 2020 to February, 2022 were taken up in this study. Patients below 18 years, routine surgery and 6 patients who could not be followed up for complete 30 days were excluded. Physiological P-POSSUM was calculated at the time of admission and just before operation, post resuscitation. Operative score was same for both Physiological P-POSSUM scores.
Results: Mortality predicted at admission had statistically significant difference and p value was<0 xss=removed>.05. Most common complication was wound infection followed by septicaemia.
Conclusion: P-POSSUM is a better predictor of mortality and morbidity in emergency laparotomies when scoring is done preoperatively.

1. Introduction

Laprotomy remains one of the commonest emergency surgical procedure performed worldwide. Despite advances in surgical skills, postoperative care and antimicrobial agents, mortality has remained high (14.9%- 19.4%). But over the last few years, various perioperative quality improvement initiatives involving early interventions, intensive postoperative care, and indivisualised care approaches have ensured a decrease in the average mortality rate by 3.8%-8.3% bringing the mortality rate to 11.1% in some studies.[1]

Recognising and evaluating prognostic factors early would aid in selecting the high risk patients for an aggressive treatment. Awareness about such risk factors will contribute to the quality of perioperative care and help in optimum utilisation of resources. Regular audit based continuous improvement of clinical practice is essential

* *Corresponding author*.
E-mail address: roykanu23@gmail.com (V. K. Roy).

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for providing quality medical care. A doctor is legally bound to discuss the prognosis and the possible outcome of the available treatment modalities.[2] Estimating the risk preoperatively will help predict which patient would need aggressive treatment, which patients would need damage control surgery versus definitive procedure, and who would benefit from postoperative intensive care and organ support.[3]

An ideal scoring system should accurately predict outcomes, help determine who deserves more aggressive care, guide in deciding the extensiveness of surgery, and can be used broadly access emergency laprotomies for various disease pathologies. The scoring system should also be capable of analyzing risk adjusted morbidity and mortality amongst various healthcare providers.

Physiological and operative severity score for enumeration of mortality and morbidity(POSSUM), as reported by Copeland et al.[4] and its Portsmouth modification (P-POSSUM),[5] as reported by Whiteley et al., remain one of the widely accepted risk assessment scoring system in surgical patients and help in apprising both the surgeon and the relatives with involved risk. They have been extensively studied science their development for various surgical procedures, and though most aspects of the scoring are standardized, the timing if physiological scoring is variable (admission vs preoperatively) in most of the studies. In a study of north Indian population, predictive risks were compared with the observed risks of mortality and morbidity, and were statistically analysed. There was no statistical difference between observed mortality-mortality and predicted mortality – morbidity(x). However, in our study patients undergoing emergency laparotomy are assessed for morbidity and mortality based on two p-possum scores calculated at admission and preoperatively. Their accuracy were later compared.

2. Aims and Objective

This prospective cross-sectional study aims to access the accuracy of P-POSSUM score on predicting the mortality and morbidity in emergency laparotomy patients and to establish that the preoperative score is more accurate that admission score.

3. Materials and Methods

150 Cases of emergency laparotomy in General Surgery Department in IGIMS, Patna from September, 2020 to February, 2022 were taken up in this study. All such patients above 18 years were included in this one year period. Patients below 18 years, routine surgery and 6 patients who could not be followed up for complete 30 days were excluded. A informed consent was taken from all the patients. CTRI registration number is 042365. At the time of admission Physiological P-POSSUM was calculated and then patient was properly resuscitated and posted for emergency laparotomy. Just before the operative intervention started another post resuscitation preoperative Physiological P-POSSUM score was calculated. Operative score was same for both Physiological P-POSSUM scores.

Formula for calculating P-POSSUM based on POSSUM scoring system using outcome (dead or alive) as a dichromatous dependent variable were multiple logistical regression equation derived by P-POSSUM, will be adopted for predicting mortality rate. The equation is given below:

In log(R/1 – R) = (0.1692 X Physiological score) + (0.155 x Operative score) – 9.065.

R = predictive mortality rate.

Post operative death was noted.

Difference between expected and actual observed mortality were assessed by Chi-square test.

4. Results

Total physiological score was higher in more patients at admission time whereas post resuscitation, preoperative total physiological score was less in maximum patients. Usually higher physiological score is associated with poorer outcomes. Patient aged between 18 to 70yr old were taken in the study. Mortality was higher in patients above 60 year.

As shown in Table 3, maximum predicted mortality risk (i.e., 20-100%) was in mean predicted mortality of 42.74 and predicted death was 18.97 which was 0-100% (total predicted mortality risk).

As shown in Table 4, mean of predicted mortality was 63.16 which was in 20-100% and same as in total (0-100%). Predicted death, observed death and O:E ratio were same in 20-100% and in total (0-100%).

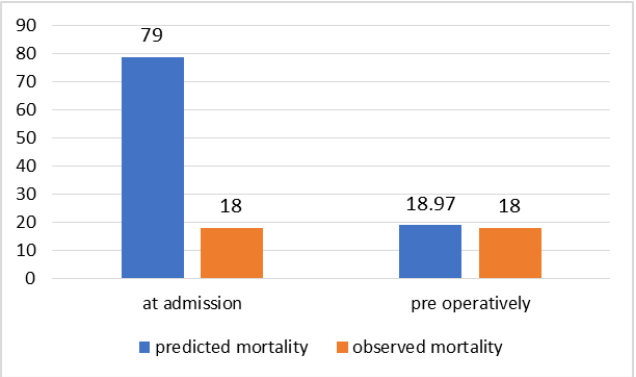

Fig. 1: Difference between predicted and observed mortality at two time points

Mortality predicted at admission had statistically significant difference and p value was<0.05.

Whereas preoperative P-POSSUM value had insignificant difference and was marginally high that the actual observed death rate.

Table 1: Physiological POSSUM score

Score	1	2	4	8
Age	<60 or =60	61-70	>70 or=70	
Cardiac signs	No failure	Diuretic, digoxin, anti anginal or hypertensive therapy	Peripheral edema or warfarin therapy	Raised central venous pressure or cardiomegaly
Respiratory signs	No dyspnoea	Dyspnoea on exertion, mild obstructive airway disease	Limiting dysnoea (one flight) or moderate obstructive airway disease	Dyspnoea at rest (rate > or= 30/min), fibrosis or consolidation
Systolic blood	110-130 pressure (mmhg)	131-170 100-109	>or=171 90-99	<or=89
Pulse(rate/ minutes)	50-80	81-100 40-49	101-120	>or=121<=39
Glasgow coma scale	15	12-14	9-11	<or=8
Haemoglobin(g/dl)	13-16	11.5-12.9 16.1-17.0	10.0 – 11.4	
White cell count	4-10 (10^9cells/L)	10.1-20 3.1-4.0	>or=20.1<or=3.0	<or=9.9>or=18.1
Urea(mmol/l)	<or= 7.5	7.6-10	10.1-15.0	>or=15.1
Sodium (mmol/l)	>or=136	131-135	126-130	<or=125
Potassium (mmol/l)	3.5-5-5	3.2-3.4 5.1-5.3	2.9-3.1 5.4-5.9	>or=2.8>or=6.0
Electrocardiogram	Normal		Atrial fibrillation (rate 60-90)	Any abnormal rhythm or >or=5 ectopics/minute or Q waves or ST/T Wave changes

Table 2: Operative score

	1	2	4	8
Operative severity	Minor	Moderate	Major	Major+
Multiple procedures	1		2	>2
Total blood loss[a] (ml)	<or=100	101-500	501-999	>or=1000
Peritoneal soiling	None	Minor(serous fluids)	Local pus	Free bowel content
Malignancy	None	Minor(serous fluids)	Nodal metastasis	Distant metastasis
Mode of surgery	Elective		Urgent	Emergency

Table 3: Predicted and observed mortality by P-POSSUM (pre operatively) in laparotomy patients

Predicted Mortality Risk	**Mean of Predicted Mortality**	**Predicted Death**	**Observed death**	**O:E ratio**
0-5%	1.71	2.88	3	1.04
5-10%	9	2.89	3	1.04
10-20%	18.77	3.39	4	1.18
20-100%	42.74	9.83	11	1.11
0-100%	7.84	18.97	21	1.12

Table 4: Predicted and observed mortality by P-POSSUM (at admission) in laparotomy patients

Predicted Mortality Risk	**Mean of Predicted Mortality**	**Predicted Death**	**Observed death**	**O:E ratio**
0-5%	0	0	0	0
5-10%	0	0	0	0
10-20%	0	0	0	0
20-100%	63.16	79	18	4.38
0-100%	63.16	79	18	4.38

Similarly, comparison of observed and predicted morbidity rates was done using linear analysis. The O:E ratio was 0.67 and p value was insignificant for preoperative P-POSSUM. O:E ratio and p value for at admission P-POSSUM had significant statistical difference and significant p value = >.05.

Table 5: Listing of complications encountered in the patients post-operatively

Complications	No. of patients	%
Wound infection	36	25%
Chest infection	2	1.38%
UTI	2	1.38%
Septicaemia	10	7%
Pyrexia of unknown origin	7	5%
DVT and Pulmonary embolism	0	0.00
Cardiac Failure	13	9%
Impaired renal failure	23	16%
Anastomotic leak	25	17.36%

Most common complication was wound infection followed by septicaemia.

5. Discussion

There are several programs that focuses on the morbidity and mortality of the patients such as NSQIP (American College of Surgeons National Surgical Quality Improvement Program, NELA (National Emergency Laparotomy Audit, POSSUM, P-POSSUM.[6] P-POSSUM is a risk adjusted scoring system consisting of 12 physiological and 6 operative variables. P-POSSUM is an important tool in surgical audit. In a study by JS Nagabhushan P-POSSUM and O-POSSUM were compared to predict the risk of postoperative death. Here P-POSSUM provided a better fit to observed results that O-POSSUM.[7] In another study APACHE-II and P-POSSUM score were compared to predict postoperative mortality in emergency laparotomies said that on compairing the sensitivity and specificity of both score there were no significant statistical difference.[8] Our study focuses on P-POSSUM scoring done at admission and repeated preoperatively post resuscitation. It was observed that P-POSSUM done at admission falsely predicted higher mortality rates with a very high statistical difference. Hence, was considered inefficient method of predicting mortality risk in emergency laparotomies. P-POSSUM score done pre operatively had a marginally higher prediction rate with insignificant statistical difference and was close to accurate. Handsdown, P-POSSUM score done preoperatively should be opted to access the mortality risk over the other one. Accuracy of P-POSSUM score done preoperatively could be contributed due to proper resuscitation as a unresusitated patient or a patient who is improperly resuscitated would have given poorer scores. It was also noted that the operative score were subject to individual judgement done peroperatively and was not standardized. These could be the limitation to our study. Likewise morbidity rate predicted by preoperative P-POSSUM score were better that P-POSSUM done at admission.

In our study geriatric population owned about 50% of the deaths alone. It was supported by another study done on geriatric population which stated that they are more prone to emergency laparotomy and are accured to higher morbidity and mortality.[9]

6. Conclusion

This study concluded that P-POSSUM is a better predictor of mortality and morbidity in emergency laparotomies when scoring is done preoperatively and there is no significant of P-POSSUM if done at admission.

7. Source of Funding

None.

8. Conflict of Interest

The authors declare no conflict of interest.

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Author biography

Vivek Kumar Roy, Assistant Professor https://orcid.org/0000-0002-4831-3650

Sukalyan Saha Roy, Assistant Professor https://orcid.org/0000-0001-6550-7994

Mukesh Kumar, Associate Professor

Saumya Sinha, Senior Resident https://orcid.org/0000-0001-9315-3281

Krishna Gopal, Professor https://orcid.org/0000-0003-2518-9834

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