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Original Article

Mortality in Patients Undergoing Emergency Laparotomy and its comparison with Physiological and Operative Severity Score for the Enumeration of Mortality and Morbidity Scoring

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ABSTRACT

Objective: To evaluate the role of physiological and operative severity score for the enumeration of mortality and morbidity in predicting mortality in patients undergoing emergency laparotomy.

Study Design: Prospective Comparative study.

Place and Duration of Study: General Surgical Ward 1 and 2, Combined Military Hospital, Rawalpindi, from Jan to Aug, 2018.

Methodology: Adult patients between 12 and 60 years of age admitted from Emergency Department in Surgical ward who underwent emergency laparotomy within 48 hours of admission were enrolled in the study. Physiological and operative scores were measured for Physiological and Operative Severity Score for the enumeration of Mortality and Morbidity and predicted mortality calculated. Patients were stratified into three groups according to the predicted mortality. Patients were then followed up 30 days post-operatively and mortality noted. Observed to predicted (O:P) mortality was calculated.

Results: A total of 94 patients were enrolled out of which 85 were followed up. All patients were male with a mean age of 56.5±16 years. Most common indication for surgery was intestinal obstruction and gut perforation. Mean duration of admission was 7.97±3.5 days. Out of 85 patients 13 patients died within 30 days of surgery which equals a crude mortality rate of 15.2%. Observed to predicted mortality ratio (O:P) was 0.65.

Conclusion: Physiological and Operative Severity Score for the enumeration of Mortality and Morbidity slightly over predicted the mortality in or study. Still it is a useful tool in risk stratification of patients according to expected outcome and for comparison of mortality between hospitals and surgeons.

Keywords: Emergency laparotomy, Mortality, Physiological and operative severity Score for the enumeration of Mortality and Morbidity.

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INTRODUCTION

Emergency laparotomy is a high risk surgery and the ability to predict mortality inthis group allows a better risk stratification. Emergency laparotomy being defined as laparotomy being done within 48 hours of presentation to the hospital. Comparison of post-operative outcomes of any surgery using a standardized tool allows a better self-assessment and helps in comparison of results between surgeons, units and hospitals.

Different scoring systems are used to predict surgical outcome in terms of mortality such as ASA.[1] (American Society of Anesthesiologist), APACHE.[2] (Acute Physiology, Age, Chronic Health Evaluation) and POSSUM.[3,4] (Physiological and Operative Severity Score for the enUmeration of Mortality and morbidity). ASA score is the easiest one to calculate but does not consider the operative severity. APACHE score is better suited for ICU settings and like in ASA score does not include the operative score.[5,6] POSSUM was first described by Copeland *et al* in 1991. It uses 12 physiological and 6 operative parameters to predict 30 day mortality and morbidity in surgical procedures as shown in Table-I & II.

Since its original publication a number of modification and validation have been done for different surgical specialties such as O-POSSUM (orthopedic-POSSUM), P-POSSUM (Portsmouth-POSSUM), V-POSSUM7 (Vascular-POSSUM) and CR-POSSUM (Colorectal-POSSUM) but the original POSSUM score has been used in this study.[7,8] A number of studies have been done to establish the usefulness of POSSUM score as a predictor of mortality.[9,10]

METHODOLOGY

The prospective comparative study was conducted from January to August 2018 in General

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Surgical Ward 1 and 2 of Combined Military Hospital, Rawalpindi after approval from the ethical committee.

A total of 94 patients who underwent emergency laparotomy were enrolled in this study. Sample size was calculated by using the WHO sample size calculator by using population prevalence proportion of mortality in laparotomy as 18%.[11] written informed consent was taken from all the patients. All patients were male as female patients have separate wards. Non probability consecutive sampling technique was used to gather the sample for this study.

Inclusion Criteria: Patients of either gender, aged between 12 and 60 years who were admitted from the Emergency Department and underwent laparotomy within 48 hours of admission were included in the study.

Exclusion Criteria: Patients who had a history of trauma, who underwent multiple surgeries or those who did not consent were excluded from the study.

Physiological score was measured in the emergency department and operative score was noted down on printed forms post-operatively in wards. Predicted mortality was calculated using the POSSUM score equation for mortality.[12-15]

Log (R/1-R)=5.91±(0.16xphysiological score)± (0.19 x operative score).

Patients were divided into 3 groups according to the predicted mortality. Low risk group with a predicted mortality between 0-20%, moderate risk group with a predicted mortality between 20- 50% and high risk group with a predicted mortality more than 50% as per POSSUM score.

Predicted number of deaths in each group was calculated by multiplying the number of patients in each group with the median POSSUM predicted mortality for that group.Patients were then followed up post-operatively for 30 day. Data was entered in SPSS 23.0. Mean and standard deviation was calculated for quantitative variables. Frequency and percentages were calculated for qualitative variables. Observed to predicted (O:P) mortality ratio was calculated.

RESULTS

Out of 94 patients that were included in the study, 9 were lost to follow-up. The 85 remaining patients were followed up for 30 days. Mean age of patients who underwent surgery was 56.5±16 years. Table-I & II show POSSUM score with different parameters. Indicationsfor emergency laparotomy with percentages were as shown in Table-III with intestinal obstruction and gut perforation being the most common indication. The median duration of hospital stay for all cases of emergency laparotomy was 7.97±3.5 days. Follow up of patients revealed a mortality of 13 patients. Hence approximate mortality rate of 15 percent was observed. O:Pmortality ratio was 0.65. O:P for individual group was calculated as shown in Table-IV.

Table-I: Physiological and operative severity score for the enumeration of mortality and morbidity

	Physiological score			
	1	**2**	**4**	**8**
Age	**<60**	**61-70**	**>71**	
Cardiac Signs	No failure	Diuretic, digoxin, antianginal, antihypertensive	Peripheral edema, warfarin therapy, borderline cardiomegaly	Raised jugular venous pressure, cardiomegaly
Respiratory history	No dyspnea	Dyspnea on exertion	Limiting Dyspnea	Dyspnea at rest
Blood pressure	110-130	131-170,100-109	>171 90-99	<89
Pulse	50-80	81-100,40-49	101-120	>121<39
Glasgow coma scale	15	12-14	9-11	<8
Hemoglobin (g/dl)	13-16	11.5-12.9,16.1-17	10-11.4,17.1-18	<9.9>18.1
White blood cell count (x1012/l)	4-10	10.1-20 3.1-4	>20.1<3.1	
Urea (mmol/l)	<7.5	7.6-10	10.1-15	>15.1
Sodium (mmol/l)	>136	131-135	126-130	<125
Potassium (mmol/l)	3.5-5	3.2-3.4,5.2-5.3	2.9-3.1,5.4-5.9	<2.8>6
Electrocardiogram	normal		Atrial fibrillation	Any other abnormal rhythm or >5 ectopics/min, Q waves or ST/T wave changes

DISCUSSION

Emergency laparotomy is a high risk procedure and the ability to stratify the risk and predict mortality

Table-II: Physiological and Operative Severity Score for the enUmeration of Mortality and Morbidity

Operative Score				
	1	**2**	**4**	**8**
Operative severity	Minor	Moderate	Major	Major plus
Multiple procedures	1		2	>2
Total Blood Loss (ml)	<100	100 - 500	501-999	>1000
Presence of malignancy	None	Primary Only	Nodal metastases	Distal Malignancy
Mode of Surgery	Elective		Emergency resuscitation of >2hr, operation <24 hour after admission	Emergency (immediate surgery<2 hours)

Table-III: Diagnosis wise distribution (n=85)

Diagnosis	Number of cases n(%)
Intestinal Obstruction	31(36%)
Gut Perforation	27(32%)
Obstructed Hernia	8(9%)
Diverticulitis	3(4%)
Mesenteric Ischemia	2(2%)
Other	23(27%)

Table-IV: Observed and predicted mortality ratio (n = 85)

Predicted Mortality Group	**Number Of Patients In Group**	**Predicted Mortality**	**Observed Mortality**	**Observed to Predicted Ratio**
0-20%	54	7	3	0.42
20-50%	24	9	7	0.78
> 50%	7	4	3	0.75
0-100%	85	20	13	0.65

helps in better preparation and better counselling of the patient regarding the possible outcome. The measurement of risk adjusted post-operative mortality is a good tool for comparing the results of surgical units as well as individual surgeons.[3] This also allows the comparison in terms of quality of care between hospitals who are dealing with different types of surgical emergencies.

POSSUM score has widely been studied as an audit tool in different fields of surgery and in different countries.[3,4] The reason for such an interest in this scoring is due to its relatively easy collection of data and the fact that operative parameters are included in the prediction of outcome.[3] Although in addition to the physiological and surgical parameters, other factors are also constantly affecting the outcome of any patient, such as the pre and post-operative care and experience of the surgeon but these factors are beyond the scope of this score.

There are two methods of using the equation i.e. exponential and linear method of analysis. We in our study have used the linear method of analysis. A number of modifications have been done to more accurately predict the outcome such as Portsmouth-POSSUM.[9]

Study conducted by Harinatha *et al* followed up 100 patients of emergency laparotomy which revealed a mortality of 15 patients. Hence a crude mortality rate of 15%. POSSUM predicted mortality was 20. Observed to expected mortality ratio of 0.71was obtained 10. Similar study conducted by Amarnath *et al* included 100 patients of perforation peritonitis who underwent surgery. Follow up of patients showed a mortality of 20 patients hence the crude mortality rate of 15%. POSSUM predicted motility was 23% and O:E ratio of 0.87 was observed 11. Study conducted by Dheeret al in Kenya followed up 104 patients of emergency midline laparotomy which showed that 15 patients died within 30 days post-operatively. Crude mortality was 14.4%. POSSUM predicted mortality using linear analysis was 24 patients and a O:E ratio of 0.63 was observed 12. The results of the afore mentioned studies were comparable to this study which showed a crude mortality rate of 15% and a O:P ratio of 0.65.The common observation in these studies was the fact that POSSUM score has slightly over predicted the rate of mortality although results vary in other studies.[13,14] Despite this fact it remains a useful tool in terms of comparison.

POSSUM score also helps the surgeon identify the strata of patients on which he operates and hence the respective outcome.[16] Therefore risk adjusted measurement of outcome of surgery by POSSUM enables the comparison of surgeons operating in two different

setups on different target population.[17] In addition to afore mentioned uses Serial POSSUM score measurement of patients being operated by one surgeon regardless of the hospital settings allows self-assessment.[3] Owing to the success of the POSSUM score they are now increasingly being usedas an adjunct to clinical decision making.[18]

Our study was limited by the fact that only male patient are included in the study and as studies have shown that mortality is higher female patients undergoing emergency laparotomy. Therefore further studies need to be performed in larger samples.

CONCLUSION

POSSUM slightly over predicts the mortality in cases of emergency laparotomy when compared to observed mortality however it is useful tool for risk stratification of patients and for comparing the quality of care in terms of mortality.

Further studies with larger number of patients are needed to validate its accuracy as well as to establish its use in elective and emergency settings separately.

Conflict of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

MTA & MUA: Conception, study design, drafting the manuscript, approval of the final version to be published.

AUDN & SMH & TA: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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