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POSSUM SCORE AMONG THE PATIENTS WITH EXPLORATORY LAPAROTOMY AND ITS ASSOCIATION WITH OUTCOME: AN OBSERVATIONAL STUDY.

Dr. Zeba Zohair Officewala*	Junior resident in Department of Surgery, Dr. Panjabrao Deshmukh Memorial Medical College, Amravati. *Corresponding Author
Dr. Narayan Umale	Head of Department in Department of Surgery, Dr. Panjabrao Deshmukh Memorial Medical College, Amravati.
Dr. Subodh Prakash Patankar	Junior resident in Department of Surgery, Dr. Panjabrao Deshmukh Memorial Medical College, Amravati.

ABSTRACT **INTRODUCTION:** POSSUM score was developed as one of the methods of surgical audit for wide application across the general surgical spectrum in both elective as well as emergency settings. Thus, the present study will focus on POSSUM scores among the patients undergoing exploratory laparotomy and its association with the outcome among these patients. **Materials and methods:** An observational study was conducted among 50 patients who underwent exploratory laparotomy. The study was conducted for period of 6 months in department of surgery of Dr Panjabrao Deshmukh Memorial Medical College, Amravati, Maharashtra. The institutional review board permission was sought before the start of the study. The study period was of 6 months [Jan 2021 to Jun 2021] and period of follow up of 30 days following surgical procedure. Data was collected using pre designed proforma. The proforma had details of demographic particulars, detailed history and physical examination, details of surgery performed, complications during and after the surgery. It has included variables described for POSSUM score. An observed mortality and morbidity rates were calculated by the operating surgeon. **Results:** The most common indication of exploratory laparotomy in the present study was peptic perforation (34%) followed by appendicular perforation (22%). The most common morbidity reported in the present study was chest infection (24%). The most common cause of mortality was multiple organ failure (16%). The O:E ratio shows good correlation between observed and expected values at higher predicted values of mortality and morbidity. **Conclusion:** Possum is a good tool for assessing the outcome of surgery and in turn to assess the quality of surgical care provided in variable settings. It can be used for surgical audit in assessing the outcome in cases undergoing surgeries in gastro intestinal perforations.

KEYWORDS : POSSUM score; Mortality; Morbidity; Laparotomy

INTRODUCTION:

Clinical governance is a system which is accountable for continuous improvement of quality if the service and maintaining the clinical standards of care.[1] Clinical audit is one of an important part of the present day clinical governance of the hospital.[2] As per as surgical audits are concerned, the main focus is to reduce the mortality and morbidity associated with the surgical procedures.[3] Comparing the influence of adverse outcome, we can assess the efficiency of that particular procedure and thus the quality of care.[2] Mere comparison of crude mortality and morbidity rates is fallacious, because of variable presentation of the patient and general health of local population. To address this role, risk scoring systems predict the risk of an adverse event based on the severity of illness at an early stage of disease. Numerous scoring systems have been developed for clinical audit such as APACHE-III (Acute Physiology and Chronic Health Evaluation III)[4-6], POSSUM score (Physiological and Operative Severity Scoring system for the enumeration of Morbidity and mortality)[7,8], ASA (American Society of Anaesthesiologist)[9], Goldman index for cardiac related complications and ACPGBI (Association of ColoProctology of Great Britain and Ireland).[10,11] POSSUM score was developed as one of the methods of surgical audit for wide application across the general surgical spectrum in both elective as well as emergency settings.[7,8] Thus, the present study will focus on POSSUM scores among the patients undergoing exploratory laparotomy and its association with the outcome among these patients.

MATERIALS AND METHODS:

An observational study was conducted among 50 patients who underwent exploratory laparotomy. The study was conducted for period of 6 months in department of surgery of Dr Panjabrao Deshmukh Memorial Medical College, Amravati, Maharashtra. The institutional review board permission was sought before the start of the study. The study period was of 6 months [Jan 2021 to Jun 2021] and period of follow up of 30 days following surgical procedure. Data was collected using pre designed proforma. The proforma had details of demographic particulars, detailed history and physical examination, details of surgery performed, complications during and after the surgery. It has included variables described for POSSUM score. An observed mortality and morbidity rates were calculated by the operating surgeon. The patients less than 15 years of age, more than 75 years of age, patients who died before intubation and re-exploration cases were excluded in the present study.

The risk of morbidity and death were calculated using POSSUM equations.

POSSUM equations[7,8]:

1. Log R1 /1-R1 = -7.04 + (0.13 x physiological score) + (0.16 x operative severity score)
2. Log R2 /1-R2 = -5.91 + (0.16 x physiological score) + (0.19 x operative severity score).

R1 = risk of mortality, R2 = risk of morbidity.

POSSUM equation for Morbidity Logn R1/1-R1= -5.91 + (0.16 x Physiological score) + (0.19 x Operative severity score), where R1 is the predicted risk of morbidity. POSSUM equation for Mortality Logn R2/1-R2 = -7.04 + (0.13 x Physiological score) + (0.16 x Operative severity score), where R2 is the predicted risk of mortality.

The patients were then followed up for a period of 30 days following the surgical procedure and complications if any, were noted depending upon the criteria as defined for POSSUM scoring system.

Table a: Physiological score (To be scored at the time of surgery)

Factors	1	2	4	8
Age	<60	61 to 70	>71	
Cardiac signs Chest radiograph	No failure	Diuretic, digoxin, anti-anginal or hypertensive therapy	Peripheral edema; Warfarin therapy,	Raised jugular venous pressure
			Borderline Cardiomegaly	Cardiomegaly
Respiratory history	No dyspnoea	Dyspnoea on exertion	Limiting dyspnoea (One flight)	Dyspnoea at rest (Rate>30/min)
Chest radiograph		Mild COAD	Moderate COAD	Fibrosis or consolidation

Blood pressure (systolic)	110-130	131-170 100-109	>171 90-99	- <89
Pulse (beats/min)	50-80	81-100 40-49	101-120	>121 <39
Glasgow coma score	15	12-14	9-11	<8
Haemoglobin (g/100ml)	13-16	11.5-12.9 3.1-4.0	10.00-11.4 17.1-18.0	<9.9 >18.1
White cell count ($x10^{12/l}$)	4-10	10.1-20.00 3.1-4.00	>20.1 <3.0	
Urea (mmol/l)	<7.5	7.6-10.00	10.1-15.00	>15.1
Sodium	>136	131-135	126-130	<125
Potassium	3.5-5.0	3.2-3.4 5.1-5.3	2.9-3.1 5.4-5.9	<2.8 >6.0
Electrocardiogram	Normal		Atrial fibrillation (rate 60-90)	Any other abnormal rhythm or >5 ectopics/min Q waves or ST/T wave changes

Table b: Operative severity score (To be scored at the time of surgery)

Factors	**1**	**2**	**4**	**8**
Operative severity	Minor	Moderate	Major	Major +
Multiple procedures	1		2	>2
Total blood loss	<100	101-500	501-999	>1000
Peritoneal soiling	None	Minor (Serous fluid)	Local pus	Free bowel content, pus or blood
Presence of malignancy	None	Primary only	Nodal metastasis	Distant metastasis
Mode of surgery	Elective		Emergency resuscitation of >2 hours possible Operation <24 hour after admission	Emergency (Immediate surgery <2 hour needed)

Statistical Analysis:
The data was collected, compiled, and analyzed using EPI info (version 7.2). The qualitative variables were expressed in terms of percentages. The quantitative variables were both categorized and expressed in terms of percentages or in terms of mean and standard deviations. The difference between the two proportions was analyzed using chi-square or Fisher exact test. The expected mortality rate was obtained using linear regression analysis and the O:E ratio was calculated. Rate of increment in deaths for each risk factor was calculated based on the hypothesis that deaths were linearly related with the score for each of the studied risk factors and't' test was applied to validate this hypothesis. All analysis was 2 tailed and the significance level was set at 0.05.

RESULTS:

We have included 50 cases in the present study.

Table 1: Distribution based on the indication of laparotomy

Diagnosis	**Frequency**	**Percentage**
Peptic perforation	17	34.00
Appendicular perforation	11	22.00
Ileal perforation	8	16.00
Band obstruction	3	6.00
Other obstruction (Carcinoma)	2	4.00
Sigmoid volvulus	2	4.00
Gall bladder perforation	2	4.00
Obstructed hernia	3	6.00

The most common indication of exploratory laparotomy in the present study was peptic perforation (34%) followed by appendicular perforation (22%).

Table 2: Distribution based on the causes of morbidity (n=50)

Morbidity	**Frequency**	**Percentage**
Chest infection	12	24.00
Wound infection	10	20.00
Urinary tract infection	4	8.00
Septicaemia	3	6.00
Wound dehiscence	3	6.00
Deep infection	2	4.00
Renal failure	1	2.00
Anastomoses leak	1	2.00
Hypotension	1	2.00

The most common morbidity reported in the present study was chest infection (24%).

Table 3: Distribution based on the causes of mortality (n=50)

Mortality	**Frequency**	**Percentage**
Respiratory failure	3	6.00
Multiple organ dysfunction	8	16.00
Cardiac failure	1	2.00

The most common cause of mortality was multiple organ failure (16%).

Table 4: Linear analysis of observed to expected morbidity ratio

Predicted morbidity (%)	**Observed morbidity**		**Expected morbidity**		**O:E ratio**
	Number	%	Number	%	
<10	0	0	0	0	-
10 to 20	0	0	0	0	-
20 to 30	0	0	1	2.44	0.00
30 to 40	1	2.70	2	4.88	0.50
40 to 50	2	5.41	2	4.88	1.00
50 to 60	2	5.41	6	14.63	0.33
60 to 70	3	5.41	2	4.88	1.50
70 to 80	6	16.22	5	12.20	1.20
80 to 90	13	35.14	12	29.27	1.08
90 to 100	10	27.03	11	26.83	0.91
Total	37		42		0.88

The O:E ratio shows good correlation between observed and expected values at higher predicted values of morbidity. The relationship was found significant (p = 0.021).

Table 5: Linear analysis of observed to expected mortality ratio (n=50)

Predicted mortality (%)	**Observed morbidity**		**Expected morbidity**		**O:E ratio**
	Number	%	Number	%	
<10	1	8.33	1	5.00	1.00
10 to 20	0	0	2	10.00	0.00
20 to 30	2	16.67	2	10.00	1.00
30 to 40	1	8.33	2	10.00	0.50
40 to 50	0	0	3	15.00	0.00
50 to 60	2	16.67	4	20.00	0.50
60 to 70	1	8.33	3	15.00	0.33
70 to 80	3	25.00	1	5.00	3.00
80 to 90	1	8.33	1	5.00	1.00
90 to 100	1	8.33	1	5.00	1.00
Total	12		20		0.60

The O:E ratio shows good correlation between observed and expected values at higher predicted values of mortality. The relationship was found significant (p<0.001)

DISCUSSION:

Copeland GP et al[8] in 1991 first described the risk scoring system of POSSUM for prediction for morbidity and mortality in a surgical audit. Originally, it had 48 physiological factors and 14 operative and post operative factors for each patient. Later the variables were reduced to 12 physiological factors and 6 operative factors which are used in the present study.[7,8] Operative mortality is an important and objective measure of outcome. Risk scoring systems like POSSUM scores will help us in predicting the same and assist us in maintaining the standards of quality of care.

In our study, we assessed the validity of these score in 50 cases of

laparotomy. The expected morbidity according to POSSUM score was in 42 cases, but we found morbidity in 37 cases and this change was statistically significant. Similar inferences were drawn by Sreeharsha H et al[12], Mannvaran et al[13], Das DK et al[14], Dhanraj M et al[13], Rana D et al[15] and Paul VA et al[16]. The expected mortality in the present study was 20 cases but only 12 cases died because of various reasons like heart failure, multi organ failure, and respiratory failure. A study conducted by Cao Y et al[17] predicted mortality among geriatric patients who underwent emergency laparotomy. An observed to expected ratio of 0.71 and 0.60 was obtained for mortality and morbidity in a study conducted by Hota PK et al[18]. Similar inferences were drawn by our study with a better ratio.

The study had some limitations. It was of small sample size and a cross sectional study. Larger studies and multi-centeric studies have to be conducted to get better generalizable results. Per se POSSUM score doesn't include the surgical skills into consideration, which is another limitation of the score. Nonetheless, this is one of pioneer studies in our region validating the score in predicting mortality and morbidity

CONCLUSION:

Peptic peritonitis was the most common indication of laparotomy in the present study. Possum is a good tool for assessing the outcome of surgery and in turn to assess the quality of surgical care provided in variable settings. It can be used for surgical audit in assessing the outcome in cases undergoing surgeries in gastro intestinal perforations.

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