Original Research Article

Application of portsmouth possum scoring system in predicting morbidity and mortality of patients undergoing gastrointestinal surgery

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Abstract

Background: The Physiological and Operative Severity Score for theenumeration of Mortality and morbidity (POSSUM) and its modification the Portsmouth POSSUM, have been proposed as a method for standardizing patient data so that direct comparisons can be made despite differing patterns of referral and population. **Objectives:** To use Portsmouth POSSUM scoring system in patients undergoing gastrointestinal surgeryfor predicting the outcome in terms of morbidity and mortality. **Methods**: Some 60 major gastrointestinal surgeries, as defined by the POSSUM scoring system criteriawere studied. Predicted mortality and morbidity rates were calculated using the Portsmouth POSSUM equation by linear analysis method. It was then compared with the actual outcomes. The risk factors as scored in the POSSUM criteria were noted. **Results:** Applying linear analysis, an observed to expected ratio of 1.14 was obtained for mortality and an observed to expected ratio of 1 was obtained for morbidity,indicating a significant fit for predicting the post-operative adverse outcome. There was nosignificant difference between the observed and predicted mortality and morbidity. **Conclusion:** Portsmouth POSSUM scoring system serves as a goodpredictor of post-operative outcome in major gastrointestinal surgical procedures and was applicable even in our setup and be used for comparing various treatment modalities and assessing the quality of care provided.

Key words: POSSUM; surgical scoring; mortality; morbidity**.**

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Introduction

The basic aim of any surgical procedure is to cause reduction in morbidity and mortality rates. It is by comparing the influence on adverse outcome; we can assess the efficiency of that particular procedure and assess the quality of care provided to the patient. But comparison using crude morbidity and mortality rates is fallacious, because of differences in general health of the local population and variable presentation of the patient's condition[1-3]. Risk scoring seeks to quantify a patient's risk of adverse outcome based on the severity of illness derived from data available at an early stage of thehospital stay[4]. The possible outcome of a surgical operation must be determined to make more effective treatment regimens. Therefore, there is a need for an accurate risk adjusted scoring system, which should be specific to the patient being studied, should incorporate the influence of the diagnosis for which he is being subjected for surgery, whether elective or emergency and allow for assessment of variable presentation of each patient, to allow assessment of the efficiency of the procedure performed. The Physiological and Operative Severity Scoring system for the enumeration of Morbidity and mortality (POSSUM) has been proposed as a risk adjusted scoring system to allow for direct comparison between the observed andexpected adverse outcome rates [5,6] . It has been called as a surgeon-based scoring system.The P-POSSUM scoring system, which includes both physiological and operative finding parameters, has been proposed to address these concerns. Therefore, there is a need to test whether the P-POSSUM scoring system can effectively address these concerns while arriving at the expected mortality rate in the Indian scenario. In this study we have used P-POSSUM scoring system in patients undergoing gastrointestinal surgeryfor predicting the outcome in terms of morbidity and mortality.

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Materials and Methods

It was a hospital based prospective observational study done in Department of general surgery Narayana Hrudayalaya hospital, Bangalore for a period of 10 Months (July 2017 to April 2018). Patients admitted to department of general surgery and surgical gastroenterology in Narayana Hrudayalaya Hospital will be considered for the study.Based on the previous study 30-day mortality 7.8%, precision 7% and with 95% confidence interval the minimum required sample size is 56.Following formula has been used for the sample size calculation.

Formula

$$n = \frac{Z^2_{1-\alpha/2}\, p\,(1-p)}{d^2}$$

Where,

p : Expected proportion
d : Absolute precision
1- α/2 : Desired Confidence level

Inclusion criteria

- Patients above age of 18 years
- Patients undergoing elective and emergency gastrointestinal surgery(esophagus , stomach, small ,large bowel and anorectum)

Exclusion criteria

- Age of patients less than18 years.
- Patients with significant immunosuppression (steroid use, post transplant, seropositive state).
- Patient with altered mental status (head injury, toxic encephalopathy).
- Patients managed conservatively i.e. not undergoing surgery

Methodology

Patients were educated about the study and only those patients consenting to participate in the study was included.Database collection include documentation of medical history, age, sex, prehospital interval, vital signs, abdominal signs, drug history and

chronic health condition. Blood was drawn routinely on admission of the patient to the general surgery department for hemoglobin, whole blood cell count, renal function tests and serum electrolytes at the time of admission.The categorization of age, systolic blood pressure, pulse rate, Glasgow coma score, hemoglobin, white blood cell count, blood urea, serum electrolytes and operative details are done as mentioned in the table earlier.The detailed cardiac and respiratory history with chest radiograph findings of the patient are considered. According to the P-POSSUM score dyspnoea has been classified into no dyspnoea or dyspnoea on exertion or limiting the ordinary activity or at rest.Chest radiograph to look for COAD changes such as flattening of the diaphragm, increased retrosternal air space, long narrow heart shadow, rapidly tapering vascular shadows accompanied by hyperlucency of the lungs. Radiographs in patients with chronic bronchitis show increased bronchovascular markings and cardiomegaly and classified accordingly to the score.The pre-operative preparation essentially consisted of correction of dehydration, overcoming shock if it was present, gastric aspiration, parental broad-spectrum antibiotic coverage, and tetanus prophylaxis. The treatment to be adopted in each case was decided based on the status, necessity, and health condition of the patient. The data of all the patients was put in Microsoft Access database and POSSUM morbidity and P-POSSUM mortality scores were calculated through the online software program designed for the same.

Statistical Analysis

Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance. The Statistical software namely SPSS 18.0, and R environment ver.3.2.2 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc**.**

Results

Table 1: Age distribution of patients studied

Age in years	No. of patients	%
<20	2	3.3
20-30	7	11.7
31-40	12	20.0
41-50	12	20.0
51-60	11	18.3
61-70	8	13.3
>70	8	13.3
Total	60	100.0

Mean ± SD: 50.07±17.29

Table 1 shows age distribution of the population according to the criteria mentioned in the physiological score. Majority of the population, 73.3% of patients were ≤60 years. The mean age of the study population was 50.07 years. Gender distribution in the study population. 73.3% of the population were males and the remaining 26.7% were females.

Table 2: Etiology distribution of Study patients

Etiology	No. of patients	%
Adenocarcinoma colorectum	21	35
Adenocarcinoma stomach	5	8.3
Corrosive oesophageal stricture	3	5.0
Periampullary carcinoma	3	5.0
Prepyloric perforation	3	5.0
Acute mesenteric ischemia with gangrenous bowel	2	3.3
Ascending colon perforation with fecal peritonitis	2	3.3
Cholangiocarcinoma	2	3.3
Sigmoid volvulus	2	3.3
Chronic smv thrombosis with gangrenous ileum	2	3.3
Mesenteric ischemia with extensive bowel gangrene	2	3.3
Jejunal gangrene secondary to smv thrombosis	2	3.3
Bleeding duodenal ulcer	1	1.7
Closed loop obstruction with gangrenous bowel	1	1.7
Crohn's disease of small bowel	1	1.7
Distal ileal obstruction with ileocaecal TB	1	1.7
DJ flexure stricture secondary to tuberculosis	1	1.7
Esophageal carcinoma	1	1.7
Ileal perforation with peritonitis	1	1.7
Ileocaecal mass	1	1.7
Intestinal obstruction secondary to ileal stricture	1	1.7
Morbid obesity	1	1.7
Squamus cell carcinoma of GE junction	1	1.7
Total	60	100

Table 2 demonstrates the etiology distribution of the population. Adenocarcinoma of colon and rectum form the major group, 35% among the study population. Rest all causes are present as a single patient.

Table 3: P-POSSUM Score in predicting the mortality of patients studied

P-POSSUM score	No of patients	Mean Risk(%)	Observed frequency	Expected frequency	O:E Ratio	P value
1-20	45	4.93	1	1	1.0	<0.001**
20-40	8	24.41	1	0	0.0	1.000
40-60	1	50.70	1	0	0.0	0.131
60-80	1	59.40	0	1	-	1.000
80-100	5	89.82	5	5	1.0	<0.001**
1-100	60	16.44	8	7	1.14	<0.001**

P<0.001, Significant, Fisher Exact Test**

As per table 3 POSSUM score has been used in predicting mortality of patients. Mostly patients have the score from 1-20 where the mean risk was low, and it was significant. Overall score was found to be significant which indicates that the score was highly suggestive and valuable in predicting mortality.

Table 4: POSSUM Score in predicting the Morbidity of patients studied

POSSUM score	No of patients	Mean Risk(%)	Observed frequency	Expected frequency	O:E Ratio	P value
1-20	0	0.0	0	0.0	0.0	1.000
20-40	19	24.61	1	12.4	0.08	<0.001**
40-60	11	50.76	8	7.2	1.11	0.552
60-80	6	67.25	6	3.9	1.54	0.058+
80-100	24	92.03	24	15.6	1.54	<0.001**
1-100	60	60.63	39	39.0	1.000	-

P<0.001, Significant, Fisher Exact Test**

As per table 4 POSSUM score has been used in predicting morbidity of patients. Mostly patients have the score from 80-100 where the mean risk was very high, and it was significant. Overall score was found to be significant which indicates that the score was highly suggestive and valuable in predicting morbidity

Table 5: POSSUM score according to Survived or death

SCORE	Survived or death		Total	P value
	Survived	Death		
POSSUM Morbidity	55.23±28.09	95.75±6.45	60.63±29.66	<0.001**
P-POSSUM Mortality	8.68±12.20	66.88±33.42	16.44±25.58	<0.001**

Table 5 demonstrates mean morbidity and mortality score in the survived and expired patients. Mean POSSUM morbidity score of 55.23% and 95.75 % were observed in the survived and expired patients respectively. Mean P-POSSUM mortality score of 8.68% in the survived and 66.88% in the expired patients was tabulated. A highly significant statistical difference is observed between the survived and expired patients and the POSSUM morbidity and mortality scores.

Discussion

The basic tenet in medical care has been to provide quality care to the patient to cause reduction in adverse outcome. It is by comparing the adverse outcome rates that we can assess the adequacy of care provided to the patient and evolve new treatment strategies. However, comparison using crude mortality rates can be misleading as it cannot adequately account for the patient's general condition and the disease process for which he was subjected to surgery. To overcome this shortcoming POSSUM, a risk adjusted scoring system was proposed [8]. P-POSSUM, a modification of POSSUM, has been proposed as a better scoring system as it better correlates with the observed mortality rate[7,8]. But P-POSSUM must be correlated to the general condition of the local population for it to be effective [7-10]. This is especially true in patients in developing countries like India where the general health of the population is poor, malnutrition is a common problem and presentation frequently delayed[11-13].The present study included the patients undergoing elective and emergency gastrointestinal surgery(esophagus , stomach, small ,large bowel and anorectum). A total 60 patients undergoing surgery with a post operative one month follow up period were included in our study.The present study shows morbidity of 65% in comparison to 28.8% as shown by Sarah Mohammed Ahmed Yosif et al in 2015[14] and 50% by Jhobta RS et al in 2006[15].The mortality rate of the study was 13%, which was comparable to 14.3% by Sarah Mohammed Ahmed Yosif et al[14] obtained overall mortality rate of 19.1%. The most common complication being chest infection in 29% patients as compared to 18% and 20% shown in study by Jhobta RS et al[14] and Afridi SP et al[18] respectively. On application of linear analysis for POSSUM Morbidity Score, the observed morbidity was 39 and POSSUM expected morbidity was 39, O:E ratio being 1.The O:E ratio of the study was comparable to the original study by Copeland GP et al[16] for cases of gastrointestinal surgery showed O:E Ratio of 1.03:1and higher when compared with O:E Ratio of 0.68. The study conducted by Sarah Mohammed Ahmed Yosif et al in 2015[14],the observed morbidity was 28.8%, while POSSUM expected morbidity was 67.2%, O:E ratio is 0.43. On application of linear analysis for Portsmouth POSSUM Mortality equation, showed O:E Ratio 1.14 with observed and expected rates being 8 and 7 respectively comparable to the original study by Copeland GP et al [16]. for gastrointestinal surgery showed O:E Ratio of 1.04:1 validating its use in patients undergoing gastrointestinal surgery. Mean POSSUM morbidity score of 55.23% and 95.75 % were observed in the survived and expired patients respectively whereas mean P-POSSUM mortality score of 8.68% in the survived and 66.88% in the expired patients respectively. The present study showed a highly significant statistical difference, p value <0.0001 between the survived and expired patients and the POSSUM morbidity and P-POSSUM mortality scores denoting that higher the morbidity score, more the number of complications and higher the mortality score, more the number of deaths. Sunil Kumar[17] compared POSSUM and P-POSSUM in 172 cases studied in single surgical unit over period of two years and found that POSSUM over predicted mortality and morbidity by linear and exponential analysis.

Conclusion

The present study showed a highly significant statistical difference, p value <0.0001 between the survived and expired patients and the Portsmouth POSSUM morbidity and mortality scores denoting that higher the morbidity score, more the number of complications and higher the mortality score, more the number of deaths. Thus, to summarize, Portsmouth POSSUM score is easier, faster, and convenient in estimating morbidity and mortality in patients undergoing gastrointestinal surgery.

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