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Study of P-Possum Score in Management of Patient Undergoing "Gastrointestinal Surgery"

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ABSTRACT
Immediate surgical intervention for acute abdominal conditions is essential to reduce morbidity and mortality, especially with the increasing gastrointestinal emergencies in tropical regions. While the P-POSSUM scoring system aids in risk stratification, its effectiveness in developing countries needs validation within a Central Indian population. This prospective study conducted over 18 months in a tertiary care hospital evaluated the P-POSSUM scoring system in 300 patients undergoing gastrointestinal surgery, excluding those under 15 or over 75 years or unwilling to participate. Data on sociodemographic factors, vital signs, comorbidities and outcomes were collected. The findings showed a mortality rate of 8.33% and a morbidity rate of 56%. The P-POSSUM scoring yielded an observed to expected (O:E) mortality ratio of 0.78 and a morbidity ratio of 0.92, with no significant differences between predicted and observed values, confirming the scoring system's reliability in this patient population. The P-POSSUM score is essential for assessing care adequacy in gastrointestinal surgeries, effectively predicting postoperative complications and enhancing surgical audits to improve patient outcomes, warranting further evaluation.

INTRODUCTION

Acute abdominal conditions necessitate prompt surgical intervention to reduce morbidity and mortality[1]. Diagnosing acute abdominal pain, which can stem from causes like appendicitis and perforated peptic ulcers, requires sound clinical decision-making[2,3]. Chronic abdominal pain (CAP) also poses challenges, especially when functional abdominal pain syndrome (FAPS) mimics organic disorders[4]. Understanding the multifactorial origins of functional gastrointestinal disorders (FGIDs) is crucial for effective treatment, involving complex interactions between psycho social and physiological factors via the brain-gut axis[5]. Significant differences in gastrointestinal emergencies between tropical and temperate countries highlight various healthcare challenges[6]. The increasing incidence of penetrating abdominal injuries in tropical regions, along with elevated mortality and morbidity rates from emergency surgeries, emphasizes the urgent need for improved management strategies[7]. Accurate risk stratification is crucial in perioperative care, leading to the development of various scoring systems to predict postoperative outcomes and optimize patient management[8]. Traditional tools like the American Society of Anesthesiologists Physical Status (ASA-PS) classification and the Revised Cardiac Risk Index (RCRI) focus on preoperative health status but often overlook important intraoperative factors affecting surgical outcomes[9]. Among the predictors of morbidity and mortality, the Portsmouth-Physiological and Operative Severity Score for the enumeration of Mortality and Morbidity (P-POSSUM) is notable for its inclusion of both physiological and operative parameters[10]. Introduced by Copeland *et al.* in 1991, the P-POSSUM system enhances predictability through linear regression techniques[11]. It evaluates twelve physiological parameters, such as age and Glasgow Coma Score, along with six surgical parameters, including operative severity and estimated blood loss[12]. Each parameter is scored on a four-grade exponential scale of 1, 2, 4 and 8, making P-POSSUM essential for assessing surgical morbidity and mortality risks and aiding in treatment tailoring and performance auditing[13,14]. In developing countries, the applicability of scoring systems like P-POSSUM may be limited due to variations in healthcare infrastructure and patient characteristics, as factors affecting operative outcomes differ significantly across physiological, economic and socio-cultural contexts[15]. Therefore, a study validating the P-POSSUM score in a Central Indian population undergoing gastrointestinal surgery is essential. This research aims to assess the effectiveness of the P-POSSUM scoring system in predicting morbidity and mortality outcomes, thereby enhancing clinical decision-making and resource management in surgical care.

MATERIALS AND METHODS

This study was designed as a prospective investigation conducted in the surgery department of a tertiary care hospital over a duration of 18 months. The study aimed to assess all patients undergoing gastrointestinal surgery, thereby providing a comprehensive evaluation of the P-POSSUM scoring system.

Inclusion and Exclusion Criteria: The inclusion criteria encompassed all patients scheduled for gastrointestinal surgery. Conversely, patients were excluded from the study if they were aged under 15 or over 75 years, if they died before intubation, or if they were unwilling to participate in the study.

Sample Size: The sample size was calculated based on a reference study by Rana DS *et al.* (2018), which reported an expected morbidity of 64.19%.

$N=4PQ/L^2$

Where,

P= 64.19%

Q=100-64.19%=100-64.19=35.81.

L=Allowable error =10%(absolute error)

Sample size =4*64.19* 35.81/40.19=300

Sample size Rounded To=300

Thus, the sample size for this investigation is 300.

Ethical Considerations: Before the study began, ethical approval was obtained from the Institutional Ethics Committee (IEC) and informed consent was secured from all participants per government health regulations. A hospital-based prospective study was conducted involving 300 consecutive patients undergoing gastrointestinal surgery. These patients were scored using the P-POSSUM scoring system over an 18-month period.

Data Collection: Data collection involved gathering comprehensive sociodemographic information, including age and sex, as well as details on the prehospital interval, vital signs, abdominal signs, drug history and co-morbidities. Clinical parameters and laboratory tests were also recorded, alongside thorough physical examinations and physiological scores at admission. Findings were meticulously documented after obtaining ethical consent and patients were followed up until the 30th postoperative day, during which any complications were recorded according to the P-POSSUM scoring system.

P-POSSUM Scoring: The P-POSSUM score includes 12 physiological variables and 6 operative severity variables, each rated on a four-grade scale of 1, 2, 4 and 8. The summed scores for physiological and operative severity were used to predict 30-day postoperative morbidity and mortality, based on equations derived from logistic regression analysis.

Data Management and Analysis: Data management involved carefully checking and editing collected data daily during the data collection period. The data were entered into Microsoft Excel 2019, followed by rechecking and cleaning for quality assurance. Analysis was conducted using SPSS version 16, summarizing continuous variables as means with standard deviations and categorical variables as proportions, with significance assessed using the Pearson chi-square test and unpaired t-test at a level set at <0.05.

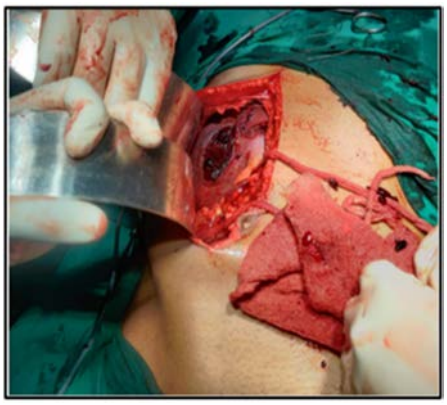

Fig. 1: Blunt Trauma to Abdomen with Liver Laceration

Fig. 2: Perforated Gall Bladder

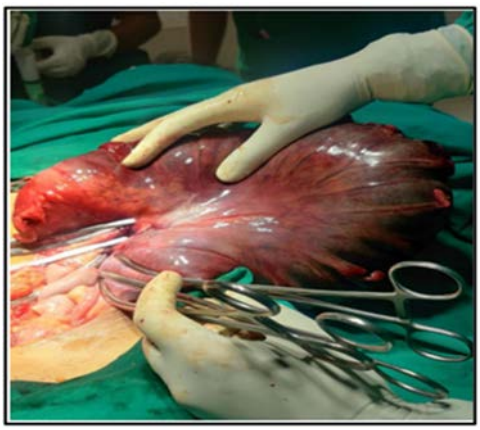

Fig. 3: Sigmoid Volvulus with Gangrenous Changes

Fig. 4: Multiple Ileal Perforation

Fig. 5: Acute Appendicitis

The analysis presented in (Fig. 1) indicates that patients with a high P-POSSUM score are at an increased risk of postoperative complications, such as abnormal liver function tests (LFTs), significant anemia, respiratory distress and delayed wound healing. These issues often arise from a complex interplay of pre-existing conditions and surgical effects, highlighting the need for comprehensive management. (Fig. 2) shows a patient with a P-POSSUM score of 39, who developed complications, including an infection at the suture site and respiratory distress after surgery. In (Fig. 3), patients with a high P-POSSUM score of 71 experienced postoperative mortality, emphasizing the significant risk for adverse outcomes. Similarly, (fig. 4) depicts a patient with septic shock and a P-POSSUM score of 60, who also faced postoperative mortality. Conversely, (Fig. 5) illustrates a patient with a lower P-POSSUM score of 23, indicating a relatively low risk for complications and this patient did not experience any postoperative morbidity or mortality.

RESULTS AND DISCUSSIONS

The study examined various health parameters in 300 patients. Most had a normal pulse rate (79.4%) and blood pressure within 110-130mmHg (64.5%). Abnormal electrocardiograms were noted in 24%, while 53.5% had a white blood cell count of 4-10. A comparison of observed and P-POSSUM predicted mortality and morbidity rates were done using linear analysis. An observed to the expected ratio (O: E) of 0.78 was obtained and there was no significant

Table 1: Comparison of Observed and Expected Mortality Rate and Morbidity Rates

Predicted Risk	Mortality				Morbidity			
	N	Observed frq.	Expected frq.	O: E Ratio	N	Observed frq.	Expected frq.	O: E Ratio
1-10	255	0	0	0	0	0	0	0
11-20	12	0	0	0	134	30	44	0.6
21-30	6	0	5	0	27	22	23	0.9
31-40	5	0	4	0	27	20	22	0.9
41-50	5	0	3	0	15	11	13	0.8
51-60	0	0	0	0	7	5	6	0.8
61-70	0	0	0	0	9	7	7	1
71-80	4	4	4	1	9	6	7	0.8
81-90	11	11	8	1.3	28	25	27	0.9
91-199	15	15	8	1.8	44	37	27	1.37
1-100	300	25	32	0.78	300	163	176	0.92
Significance	Yates x2=1.526, Yates p=0.56				Yates x2=7.8, Yates p=0.76			

difference between the predicted and observed values (Yates'x2=1.526, P=0.56). For morbidity, an observed to the expected ratio (O: E) of 0.92 was obtained and there was no significant difference between the predicted and observed values (Yates'x2=7.8, P=0.76). A comparison of observed and P-POSSUM predicted mortality and morbidity rates were done using linear analysis. An observed to the expected ratio (O: E) of 0.78 was obtained and there was no significant difference between the predicted and observed values (Yates'x2=1.526, P=0.56). For morbidity, an observed to the expected ratio (O: E) of 0.92 was obtained and there was no significant difference between the predicted and observed values (Yates'x2=7.8, P=0.76). The primary goal of any surgical procedure is to minimize morbidity and mortality rates, necessitating tailored treatment regimens for individual patients[15]. Perioperative in-patient mortality and morbidity rates are critical for assessing the quality of surgical institutions, making accurate preoperative assessments essential for reducing complications[16]. Predicting postoperative outcomes using various risk scores is significant, as a patient's physiological status reflects their ability to handle surgical stress[17]. The P-POSSUM scoring system is particularly noteworthy for its correlation with observed mortality rates., however, it is crucial to validate it against the local population's health conditions, especially in developing countries like India, where malnutrition and delayed medical care can adversely affect outcomes[18]. In our prospective study of 300 patients undergoing gastrointestinal surgery, we evaluated the correlation between the P-POSSUM score and expected morbidity and mortality outcomes at a tertiary care center. Most patients were aged 61-70 years (55.33%), with a notable male predominance (67.33%). Health parameters indicated that 79.4% had a normal pulse rate and 64.5% maintained blood pressure within 110-130mmHg, while 24% showed abnormal electrocardiograms and 53.5% had normal white blood cell counts (4-10 mm^3). Hemoglobin levels for 58% of patients were predominantly in the 13-16g/dL range, with 67% having urea levels below 7.5mmol/dL and 68% exhibiting sodium levels above 136mmol/L. Notably, 97% underwent minor surgical procedures, 75% experienced blood loss between 100-500mL and 76.5% required emergency surgery within 24 hours of presentation, with 89% not having any malignancies. Our findings showed that morbidity occurred in 56% of cases, affecting 168 patients, while the mortality rate was 8.33%, or 25 patients. These results align with previous studies, including **Mahaseth**[19], which reported morbidity rates of 65% and **Jhobta**[20] with rates of 50%. The observed mortality rate matches **Sutton**[21], who found an 8.4% rate. Linear analysis of the P-POSSUM morbidity score indicated an observed morbidity of 163 versus an expected 176, yielding an observed to expected (O:E) ratio of 0.92, suggesting reasonable predictive capability for morbidity in this cohort, compared to O:E ratios of 0.60 and 0.76 reported by **Hota**[22] and **Anbarasu**[23]. Although variations exist, these findings indicate that the P-POSSUM score remains a valuable predictive tool for assessing surgical risk. **Copeland**[24] audited 344 patients undergoing reconstructive vascular surgery, reporting estimated mortality rates of 10.2% for Unit A (observed 9.4%) and 20.2% for Unit B (observed 20.2%). ROC curves showed no significant differences, confirming the POSSUM system's superiority over crude mortality rates. Similarly, **Sagar**[25] analyzed 438 post-colorectal resection patients, finding crude mortality rates of 5.6-6.9% and morbidity rates from 13.6-30.6%, with O:E ratios of 0.87 for mortality and 0.90 for morbidity, validating the POSSUM score's reliability. **Mohan Lal Echara**[26] studied 100 patients undergoing emergency laparotomy, finding an observed mortality rate of 12.0%, compared to the POSSUM's prediction of 40% and P-POSSUM's estimate of 27%, underscoring the importance of scoring systems in surgical outcome predictions. Our analysis yielded an O:E ratio of 0.78 for mortality, consistent with other studies reporting ratios between 0.66 and 0.90, reinforcing the P-POSSUM score's reliability. Overall, our study emphasizes the P-POSSUM scoring system's applicability in predicting morbidity and mortality in gastrointestinal surgeries, highlighting the need for ongoing validation of risk assessment tools in clinical practice.

CONCLUSION

The P-POSSUM score (Portsmouth Physiologic and Operative Severity Score for the Enumeration of Mortality and Morbidity) is a vital tool for

gastrointestinal surgeries, validating its effectiveness in assessing care adequacy to mitigate postoperative complications. It is also useful for surgical audits, enhancing care quality and patient outcomes. Overall, the findings demonstrate that P-POSSUM accurately predicts adverse postoperative outcomes in gastrointestinal surgeries and warrants further evaluation.

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