

Original Research Article

ASSESSMENT OF SURGICAL OUTCOME IN EMERGENCY GASTROINTESTINAL SURGERIES USING P-POSSUM SCORE

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ABSTRACT

Background: The aim is to assess the validity of P-POSSUM scoring system in predicting anticipated morbidity & mortality rate.

Materials and Methods: This prospective study was done on 80 cases of acute abdomen which underwent emergency GI surgery in MGM Hospital, Warangal from April 2024 to March 2025.

Results: In the present study, majority of the cases were those of acute appendicitis. Physiological variables having significant association with mortality were pulse rate, systolic blood pressure, blood urea level, serum sodium level, serum potassium level and TLC. Septicaemia was found to be the commonest cause of mortality while wound infection was found to be the commonest cause of morbidity. O:E ratio for mortality was found to be 0.71 while for morbidity it was 0.60. Sensitivity of P-POSSUM score in predicting mortality was found to be 100% with a positive predictive value of 71.43%. Specificity of P-POSSUM score in predicting mortality was found to be 97.3% with a negative predictive value of 100%. P-POSSUM score for mortality was found to over predict mortality in low risk groups while it could accurately predict in high risk groups. P-POSSUM score for morbidity was found to over predict morbidity in low risk groups while it could accurately predict in high risk groups. No significant difference was found between observed and expected mortality and morbidity using P-POSSUM score with Yates' $P=0.23$ and Yates' $P=0.09$ respectively.

Conclusion: To conclude, P-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 emergency GI surgeries.

Keywords: P-POSSUM, Mortality, Appendicitis, Morbidity, Serum Potassium

INTRODUCTION

The basic aim of any surgical procedure is reduction in morbidity and mortality rates. By comparing the influence on adverse outcome; assessment of the efficiency of that particular procedure and the quality of care provided can be done. 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 the hospital stay.^[4] The determination of outcome of surgery helps to plan and implement more effective treatment regimen.

POSSUM & P-POSSUM are accepted methods of risk scoring.^[5,6] P-POSSUM has predicted morbidity and mortality accurately in various settings and indirectly assesses the quality of health care provided.^[7] It is often used as a tool to assess and audit the performance of individuals and institutions.^[7-9] It is often called surgeon based scoring system. It has already found use in general surgery,^[7,10] vascular, colorectal, oesophageal, laparoscopic and hepatic resections.^[8]

All these studies mainly involve patients from developed countries. Few studies have been taken up in developing countries regarding risk adjusted audits of general surgical patients.^[10]

Keeping in mind the different category of patients who seek surgical care at our hospital, [delayed presentation, malnutrition and limited resources] it was felt that P-POSSUM scoring could be used to assess the health care provided, its outcome and to compare with other studies. Hence this prospective study was taken up in a teaching hospital at a district level catering mainly to the rural population. In this clinical study, P-POSSUM score was used to assess surgical outcome, either as morbidity or mortality in patients undergoing emergency gastrointestinal surgeries.

Aims and Objectives

Aims:

1. To assess the validity of P-POSSUM scoring system in predicting anticipated morbidity & mortality rate.
2. To compare with the actual morbidity & mortality rate in general surgical patients admitted for emergency GI surgical procedures.

Objectives: For attaining the above aims, a prospective study was conducted over 12 months period from April 2024 to March 2025 on 80 patients who underwent emergency GI surgeries with the objective of assessing the surgical outcome using P-POSSUM score.

MATERIALS AND METHODS

Assessment of Surgical Outcome in Emergency Gastrointestinal Surgeries Using P-Poosum Score” is a prospective cross sectional study which consists of 80 patients operated on emergency basis admitted in MGM Hospital, Warangal. The study was conducted from April 2024- March 2025. A series of 80 cases was compiled for this study during this period, after obtaining clearance from ethical committee. Analytical data obtained was compared and discussed with the data available in the literature.

Inclusion criteria

1. Patients undergoing emergency GI surgeries.
2. Patients above the age of 18 years.
3. Both males and females
4. Patients willing for participation in the study

Exclusion criteria

1. Patients below the age of 18 years
2. Patients undergoing elective GI surgeries.
3. Immunocompromised patients
4. Patients lost to follow-up
5. Patients not willing for the study
6. Patients with Diabetes mellitus

Method of Collection of Data: All patients admitted under general surgery & scheduled to undergo emergency GI surgeries during the period of April 2024 to March 2025 were studied. The total numbers of cases studied were 80, which included all forms of emergency acute abdomen such as acute

appendicitis, hollow viscus perforation, acute intestinal obstruction and blunt injury abdomen.

All patients underwent thorough clinical examination and a detailed history including similar complaints in the past or any previous surgeries was taken. All patients were simultaneously evaluated for any systemic disease. Patients presenting with shock or hypotension were adequately resuscitated prior to surgery.

Routine investigations like Hb, TLC, BT, CT, Urine analysis and blood grouping and cross matching were done. All cases underwent ECG, Random Blood Sugar, blood urea and serum creatinine, HIV/ HbsAg investigations. Chest X-ray and USG abdomen & pelvis, erect x-ray abdomen was done in all cases. 80 cases were operated on emergency basis. One to two hours prior to surgery, shaving of the abdomen, genitalia was done.

In cases undergoing Appendectomy, incision was closed in layers and abdominal drain was placed as per the operating surgeon's discretion. Abdominal drain was removed once drainage was below 20cc. Antibiotics were continued till the removal of sutures. Post operatively deep breathing exercises, chest physiotherapy and movement of limbs in bed was advised as soon as patient recovered from anaesthesia. Early limited ambulation was done once patient was able to bear pain.

Post operatively, cases were monitored for development of complications which were documented as morbidity. Mortality, if occurred, was documented and the cause was noted. IV fluids were continued till passage of flatus, thereafter patient received liquid diet and later soft diet. Skin sutures were removed on 8th day or 10th day and patient discharged on same day or next day. At discharge patients were advised to review every weekly upto 4 weeks.

At the time of review the patients were asked for any symptoms and operative site examined for any complications. These cases were then analyzed and results were compared with existing literature. Chi square test was used to deduce whether or not the variables advocated in P-POSSUM score had significant association with morbidity and mortality.

RESULTS

The Present study was conducted over 80 cases of acute abdomen requiring emergency GI surgery admitted in the Department of General Surgery, MGM Hospital, Warangal between April 2024 to March 2025. Following observations and results were obtained from the study.

Incidence

In the present study it was observed that maximum numbers of cases undergoing emergency GI surgeries were those of acute appendicitis, accounting about 43 cases (53.8%). Next commonest were those of hollow viscus perforation, 23 cases (28.7%), followed by acute intestinal

obstruction & blunt injury abdomen with incidence of 10 cases (12.5%), 04 cases (05%) respectively.

Table 1: Incidence of type of acute abdomen.

Diagnosis	No of cases n=80	Percentage
Acute appendicitis	43	53.8
Hollow viscus perforation	23	28.7
Acute intestinal obstruction	10	12.5
Blunt injury abdomen	04	05
Total	80	100

Incidence of Mortality & Morbidity: Of the 80 cases undergoing emergency GI surgery, mortality was noted in 6.25% of the cases & morbidity was noted in 21.2% of the cases. Of the 5 cases in which mortality was observed, 1 case (20%) underwent emergency appendectomy for acute appendicitis, 1 case (20%) underwent exploratory laparotomy for hollow viscus perforation & 3 cases (60%)

underwent emergency exploratory laparotomy for acute intestinal obstruction. Of the 17 cases in which morbidity was observed, 4 cases (24%) were diagnosed as acute appendicitis, 9 cases (52%) as hollow viscus perforation, 2 cases (12%) as acute intestinal obstruction and 2 cases (12%) as blunt injury abdomen. Incidence of mortality & morbidity is represented in [Table 3].

Table 2: Incidence of mortality & morbidity.

Diagnosis	No of Cases N=80	Mortality N=05	Morbidity N=17
Acute Appendicitis	43	01(20%)	04(24%)
Hollow Viscus Perforation	23	01(20%)	09(52%)
Acute Intestinal Obstruction	10	03(60%)	02(12%)
Blunt Injury Abdomen	04	00(0%)	02(12%)
Total	80	05(6%)	17(21%)

Cause of mortality: Cause of death was septicaemia in 4 cases (80%) out of the 5 cases in

which mortality was noted. Cause of death in 1 case (20%) was Aspiration pneumonitis.

Table 3: Cause of mortality

Cause of mortality	No of cases n=05	Percentage
Septic shock	04	80
Aspiration pneumonitis	01	20
Total	05	100

Post operative complications: The main complication noted postoperatively in majority of the cases was superficial wound dehiscence & infection. 12 out of the 17 cases with morbidity had superficial wound dehiscence along with infection. 01 case developed burst abdomen. 01 case had only wound infection as diagnosed by discharge of purulent exudate and culture sensitivity report.

01 case had chest infection, diagnosed by the presence of pleural effusion & consolidation on chest radiograph. 01 case developed hypotension and respiratory failure requiring SIMV. 01 case had impaired renal function as diagnosed by elevation of blood urea from pre operative level.

Table 4: Incidence of post operative complications noted in the present study

Post operative complication	No of cases N=17
Wound infection	14
Wound dehiscence	13
Chest infection	01
Impaired renal function	01
Hypotension	01
Respiratory failure	01
Total	17

Association of SBP with mortality and morbidity: In the present study, 49 cases (60%) had SBP in the range of 110-130 mm Hg, 19 cases (24%) in the range of 131-170 and 100-109 mm Hg, 6 cases (8%) in the range of 90-99 mm Hg and 6 cases (8%) presented with SBP <89 mm Hg. Of the 5 cases in which mortality was noted, 4 cases (80%) had SBP <89 mm Hg and 1 case (20%) had SBP in the range of 90-99 mm Hg on initial presentation. Significant association was noted

between mortality and SBP at initial presentation with $P < 0.00001$. Morbidity was noted in 17 cases of which 7 cases (41%) had SBP in the range of 110-130 mm Hg and 4 cases (24%) in the range of 131-170 and 100-109 mm Hg, 5 cases (29%) in the range of 90-99 mm Hg and 01 case (6%) had <89 mm Hg on initial presentation. No significant association was found between initial BP and occurrence of post operative complications with $P = 0.07$.

Table 5: Association of SBP with mortality and morbidity

SBP (mm Hg)	N0. Of cases n=80	Mortality n=05	Significance	Morbidity n=17	Significance
110-130	49 (60%)	00	X2=26.16 P=<0.00001	07 (41%)	X2=6.96 P=0.07
131-170	19 (24%)	00		04(24%)	
100-109				05(29%)	
>171	06 (8%)	01 (80%)		01(06%)	
90-99					
<89	06 (8%)	04(20%)			

In the present study, 10 cases (12%) had pulse rate in the range of 50-80 bpm, 30 cases (38%) in the range of 81-100 bpm, 34 cases (42%) in the range of 101-120 bpm and 6 cases (8%) with >120 bpm on initial presentation. Of the 5 cases in which mortality was noted, 3 cases (60%) had pulse rate in the range of 101-120 bpm and 2 cases (40%) had pulse rate >120bpm on initial presentation. Significant association was noted between mortality

and pulse rate at presentation with P=0.04. 17 cases developed post operative complications of which 12 cases (70%) were in the range of 101-120 bpm, 3 cases (18%) in the range of 81-100 bpm and 2 cases (12%) had pulse rate >120 bpm on presentation. No significant association was noted between pulse rate at presentation and development of post operative complications with P=0.09.

Table 6: Association of pulse rate with mortality and morbidity

Pulse Rate (bpm)	N0 of cases n=80	Mortality n=05	Significance	Morbidity n=17	Significance
50-80	10(12%)	00	X2=8.11 P=0.04	00	X2=6.39 P=0.09
81-100	30(38%)	00		03(18%)	
40-49				12 (70%)	
101-120	34(42%)	03(60%)		02 (12%)	
>120	06(8%)	02(40%)			
<39					

Association of Hb% with mortality and morbidity: In the present study, 16 cases (20%) had Hb in the range of 13-16 g/dl, 22 (27%) in the range of 11.5 -12.9 g/dl & 16.1-17 g/dl, 19 cases (24%) in the range of 10-11.4 g/dl and 23 cases (29%) had Hb ≤ 9.9 g/dl on presentation. Of the 5 cases of mortality, Hb was in the range of 10-11.4 g/dl in 3 cases (60%), 11.5-12.9 in 1 case (20%) and ≤ 9.9 g/dl in 1 case (20%). No significant association was

noted between mortality and Hb at presentation with P=0.3. Post operative complications were noted in 17 cases of which 8 cases (47%) had Hb ≤ 9.9 g/dl, 6 cases (35%) in the range of 11.5-12.9 g/dl, 2 cases (12%) in the range of 10-11.4g/dl, 1 case (6%) in the range of 13-16 g/dl. No significant association was noted between morbidity and Hb at initial presentation with P=0.23.

Table 7: Association of Hb with mortality and morbidity

Hb(g/dl)	No of cases n=80	Mortality n=05	Significance	Morbidity n=17	Significance
13-16	16 (20%)	00	X2=3.61 P=0.30	01(47%)	X2=4.29 P=0.23
11.5-12.9	22 (27%)	01(60%)		06(35%)	
16.1-17				02(12%)	
10-11.4	19 (24%)	03(20%)		08(06%)	
17.1-18					
≤9.9	23(29%)	01(20%)			
≥18.1					

Association of total leucocyte count with mortality and morbidity: In the present study, out of 80 cases, 55 cases (69%) had TLC in the range of 10.1-20 and $3.1-4 \times 10^3/\text{mm}^3$, 17 cases (21%) in the range of $4.1-10 \times 10^3/\text{mm}^3$, 8 cases (10%) with < 3.1 or $\geq 20.1 \times 10^3/\text{mm}^3$. Mortality was noted in 5 cases of which 4 cases (80%) had TLC either < 3.1 or $\geq 20.1 \times 10^3/\text{mm}^3$. 1 case (20%) had TLC in the range of $10.1-20 \times 10^3/\text{mm}^3$. The association between TLC

at presentation and mortality was found to be highly significant with P=0.000071. 17 cases developed post operative complications of which 13 cases (76%) had TLC either in the range of $3.1-4 \times 10^3/\text{mm}^3$ or $10.1-20 \times 10^3/\text{mm}^3$. 3 cases (18%) had TLC in the range of $4.1-10 \times 10^3/\text{mm}^3$. 1 case (6%) had TLC $< 3.1 \times 10^3/\text{mm}^3$. No significant association was noted between TLC at presentation and morbidity with P=0.79.

Table 8: Association of TLC with mortality and morbidity

TLC	No of cases	Mortality	Significance	Morbidity	Significance
4.1-10	17(21%)	00	X2=19.09 P=0.000071	03(18%)	X2=0.46 P=0.79
3.1-4	55(69%)	01(20%)		13(76%)	
10.1-20				01(06%)	
<3.1	08(10%)	04(80%)			
≥20.1					

Association of urea with mortality and morbidity: In the present study, out of 80 cases, 68 cases (85%) had urea < 45 mg/dl, 8 cases (10%) in the range of 46-60 mg/dl and 4 cases (05%) in the range of 61-90 mg/dl. Of the 5 cases in which mortality was noted, 2 cases (40%) had urea < 45 mg/dl and 3 cases (60%) had urea in the range of 46-60 mg/dl on presentation. Significant association

was noted between mortality and the value of urea at the time of presentation with $P=0.005$. 17 cases developed post operative complications of which 13 (76%) of them had urea <45 mg/dl, 2 cases (12%) in the range of 46-60 mg/dl, 2 cases (12%) in the range of 61-90 mg/dl. No significant association was noted between morbidity and blood urea levels at the time of presentation with $P=0.54$.

Table 9: Association of blood urea with mortality and morbidity

UREA (mg/dl)	No of cases n=80	Mortality n=05	Significance	Morbidity n=17	Significance
<45	68(85%)	02(40%)	$X^2=10.49$ $P=0.005$	13(76%)	$X^2=1.20$ $P=0.54$
46-60	08(10%)	03(60%)		02(12%)	
61-90	04(05%)	00		02(12%)	
>90	00	00		00	

Association of serum sodium with mortality and morbidity: In the present study, out of 80 cases, 33 cases (41%) had sodium ≥ 136 mmol/L, 27 cases (34%) in the range of 131-135 mmol/L, 12 cases (15%) in the range of 126-130 mmol/L and 8 cases (10%) with ≤ 125 mmol/L. Mortality was noted in 5 cases of which 3 cases (60%) had sodium levels ≤ 125 mmol/L and 2 cases (40%) with levels in the range of 126-130 mmol/L. Significant association was noted between low serum sodium levels at

presentation and occurrence of mortality with $P=0.002$. Post operative complications were noted in 17 cases of which 9 cases (54%) had sodium levels in the range of 131-135 mmol/L, 3 cases (17%) with ≥ 136 mmol/L, 3 cases (17%) with ≤ 125 mmol/L and 2 cases (12%) in the range of 126-130 mmol/L. No significant association was found between morbidity and serum sodium levels at presentation with $P=0.22$.

Table 10: Association of serum sodium with mortality and morbidity

SODIUM	No of cases n=80	Mortality n=05	Significance	Morbidity n=17	Significance
≥ 136	33(41%)	00	$X^2=14.62$ $P=0.002$	03(17%)	$X^2=4.32$ $P=0.22$
131-135	27(34%)	00		09(54%)	
126-130	12(15%)	02(40%)		02(12%)	
≤ 125	08(10%)	03(60%)		03(17%)	

Association of serum potassium with mortality & morbidity: In the present study, of 80 cases, 55 cases (69%) had potassium levels in the range of 3.5-5.5 mmol/L, 5 cases (06%) in the range of 3.2-3.4 mmol/L, 5 cases (06%) in the range of 5.1-5.3 mmol/L, 10 cases (13%) in the range of 2.9-3.1 mmol/L, and 5 cases (06%) with ≤ 2.8 mmol/L. All the 5 cases (100%) in which mortality was noted had serum potassium levels ≤ 2.8 mmol/L at presentation. Association of low serum potassium

levels with mortality was found to be highly significant with $P < 0.00001$. 17 cases were found to have post operative complications of which 9 cases (53%) had potassium levels in the range of 3.5-5 mmol/L, 4 cases (23%) in the range of 3.2-3.4 mmol/L, 2 cases (12%) in the range of 2.9-3.1 mmol/L and 2 cases (12%) with ≤ 2.8 mmol/L at presentation. No significant association was noted between serum potassium levels at presentation and morbidity with $P=0.63$.

Table 11: Association of potassium with mortality and morbidity

POTASSIUM (mmol/L)	No of cases n=80	Mortality n=05	Significance	Morbidity n=17	Significance
3.5-5	53(69%)	00	$X^2=32.3$ $P < 0.00001$	09(53%)	$X^2=1.71$ $P=0.63$
3.2-3.4	10(13%)	00		04(23%)	
5.1-5.3	10(13%)	00		02(12%)	
2.9-3.1	10(13%)	00		02(12%)	
5.4-5.9	07(05%)	05(100%)		02(12%)	

Association of ECG with mortality & morbidity: In the present study, out of 80 cases, 75 cases (94%) had ECG within normal limits on presentation and 5 cases (06%) had T wave abnormalities. 4 (80%) out of 5 cases in which mortality was observed had a normal ECG. 1 case (20%) had T wave inversion. No significant association was noted between ECG

at presentation and occurrence of mortality with $P=0.24$. 17 cases developed post operative complications of which 13 cases (77%) had normal ECG on presentation and 4 cases (23%) had T wave abnormalities. Significant association was found between abnormal ECG and occurrence of morbidity with $P=0.02$.

Table 12: Association of ECG with morbidity and mortality

ECG	No of cases n=80	Mortality n=05	Significance	Morbidity n=17	Significance
WNL	75(94%)	04(80%)	X2=1.35 P=0.24	13(77%)	X2=0.24
ABNORMAL	05(06%)	01(20%)		04(23%)	P=0.02

Operative Scoring

Operative Severity:In the present study, of 80 cases, 37 cases (46%) underwent emergency appendectomy which is categorised as a surgery with moderate severity as per P-POSSUM and 43 cases (54%) underwent surgery of major severity which was emergency exploratory laparotomy in all the cases. Of the 5 cases in which mortality was noted, 1 case (20%) underwent emergency

appendectomy and 4 cases (80%) underwent emergency exploratory laparotomy. No significant association was noted between mortality and operative severity with P=0.25. 17 cases had post operative complications of which 13 cases (77%) underwent emergency exploratory laparotomy and 4 cases (23%) underwent emergency appendectomy. No significant association was noted between morbidity and operative severity with P= 0.08.

Table 13: Association of operative severity with morbidity and mortality

Operative severity	No of cases n=80	Mortality n=05	Significance	Morbidity n=17	Significance
MODERATE	37(46%)	01(20%)	X2=1.30 P=0.25	04(77%)	X2=2.9
MAJOR	43(54%)	04(80%)		13(23%)	P=0.08

Association of multiple procedures with mortality & morbidity: In the present study, of 80 cases, single procedure was performed in 79 cases (99%) and re exploration was performed in 1 case (1%).

Mortality was noted in 4 cases (80%) of 79 cases in which single procedure was performed and 1 case (20%) in which re exploration was mandated.

Significant association was noted between increasing number of procedures and occurrence of mortality with P= 0.007.

17 out of 79 cases (100%) in which single procedure was performed developed post operative complications. No significant association was noted between number of procedures and morbidity with P= 0.64.

Table 14: Association of multiple procedures with mortality and morbidity

Multiple procedures	No of cases n=80	Mortality n=05	Significance	Morbidity n=17	Significance
SINGLE	79(99%)	4(80%)	X2=7.2 P=0.007	17(100%)	X2=0.2
TWO	1(1%)	1(20%)		00	P=0.64

Association of peritoneal soiling with mortality & morbidity:In the present study, of 80 cases, no peritoneal soiling was noted in 35 cases (44%), local pus in 2 cases (2%), free bowel content, pus and haemoperitoneum in 43 cases (54%).

All the 5 cases (100%) in which mortality was observed had peritoneal soiling with free bowel content and / or pus. No significant association was

found between peritoneal soiling and occurrence of mortality with P=0.12.

17 cases had post operative complications of which 15 cases (88%) had peritoneal soiling with bowel content and/ or pus or haemoperitoneum, 1 case (6%) with local pus and 1 case (6%) without peritoneal soiling. Significant association was noted between presence of peritoneal soiling and occurrence of morbidity with P= 0.012.

Table 15: Association of peritoneal soiling with mortality and morbidity

Peritoneal soiling	No of cases n=80	Mortality n=05	Significance	Morbidity n=17	Significance
None	35	00 (0%)	X2=4.09 P=0.12	01 (88%)	X2=8.72 P=0.012
Local pus	02	00 (0%)		01 (06%)	
Free bowel content, pus, blood	43	05(100%)		15 (06%)	

Association of amount of blood loss with mortality & morbidity:In the present study, of 80 cases, 54 cases (67%) had blood loss ≤ 100 ml, 23 cases (29%) in the range of 101-500 ml, 1 case (01%) in the range of 501-999 ml and 2 cases (03%) with ≥ 1000 ml blood loss intra operatively. All the 5 cases (100%) in which mortality was noted had intra operative blood loss in the range of 101-500 ml. Significant association was noted between increased

intraoperative blood loss and mortality with P=0.012. Post operative complications were noted in 17 cases of which 7 cases (41%) had intra operative blood loss ≤ 100 ml, 8 cases (47%) in the range of 101-500 ml, 1 case (06%) in the range of 501-999 and 1 case (06%) with ≥1000ml. No significant association was noted between intra operative blood loss and morbidity with P=0.17.

Table 16: Association of intraoperative blood loss with morbidity and mortality

Amount of blood loss(ml)	No of cases n=80	Mortality n=05	Significance	Morbidity n=17	Significance
≤100	54(67%)	00	X2=10.81	07(41%)	X2=4.9
101-500	23(29%)	05(100%)		08(47%)	

501-999	01(01%)	00	P=0.012	01(06%)	P=0.17
≥1000	02(03%)	00		01(06%)	

Association of mode of surgery with mortality & morbidity: In the present study, all 80 cases underwent emergency surgery within 24 hours. Of them, 70 cases (88%) could be resuscitated for > 2 hours but were operated as soon as possible within 24 hours and 10 cases (12%) were haemodynamically unstable even on resuscitation and surgery was mandated within 2 hours. Of the 5 cases in which mortality was noted, 2 cases (40%) were those in which resuscitation was possible for > 2 hours and 3 cases (60%) were those which had to

be operated within 2 hours of presentation. Significant association was noted between mode of surgery and occurrence of mortality with higher rate of mortality noted in cases where surgery was mandated within 2 hours with P=0.004. 17 cases had post operative complications of which 12 cases (71%) could be operated after 2 hours but within 24 hours and 5 cases (29%) underwent surgery within 2 hours. No significant association was noted between mode of surgery and morbidity with P=0.07.

Table 17: Association of mode of surgery with mortality and morbidity

Mode of surgery	No of cases n=80	Mortality n=05	Significance	Morbidity n=17	Significance
>2hrs- <24hrs	70(88%)	02(40%)	X ² =8.19	12(71%)	X ² =3.06
<2hrs	10(12%)	03(30%)	P=0.004	05(29%)	P=0.07

DISCUSSION

The basic tenet in the health care is to provide quality health care with reduction in adverse outcome. By comparing adverse outcome rates, assessment of adequacy of care provided can be done and evolve new strategies for better outcome. However comparison using crude mortality rate can be misleading as it does not account for the patients' condition and the disease process. To overcome this shortcoming, POSSUM a risk adjusted scoring system was proposed.^[5] Later P-POSSUM, a modification of POSSUM, was proposed, as it correlates better with the observed mortality rate.^[11] But PPOSSUM has to be correlated to the general condition of the local population for it to be effective.^[9] This is important for patients in developing countries like India where the general health of the population is variable and presentation frequently delayed.^[1,9]

In the present study P-POSSUM scoring was applied in 80 cases admitted in MGM Hospital, Warangal over 12 months with acute abdomen undergoing emergency GI surgery and the observed mortality rate was compared with expected mortality rate.

The discussions are mainly on analysis and observations made regarding the 12 physiological variables and 6 operative variables and their association with outcome in the form of mortality or morbidity.

Physiological Variables Age: In the present study, mean age was found to be 38.25 ± 14.8 years. Of 80 cases, mortality was noted in 5 cases (7%) in age group < 60 years. No significant association was noted between age group and occurrence of mortality as indicated by a P value of 0.457. This finding is similar to that observed in the study conducted by Vallabha T & Pangi M (P=0.265).^[11]

Respiratory History: In the present study, of 80 cases, mortality was noted in 1 case (20%) of 5 cases and in 4 cases (5.3%) of 75 cases with and

without significant respiratory history respectively. No significant association was noted between presence of respiratory history and occurrence of mortality as indicated by a P value of 0.24. This finding is similar to that noted in a study conducted by Vallabha T & Pangi M (0.108).^[11] Morbidity was noted in 2 (40%) of 5 cases and 15 (20%) of 75 cases with and without significant respiratory history respectively. No significant association was noted between presence or absence of respiratory history and morbidity as indicated by a P value of 0.42. This finding is similar to that noted in a study conducted by Wani NA et al (P>0.5).^[12]

Systolic Blood Pressure: In the present study, of 80 cases, of 80 cases, mortality was noted in 1 out of 6 cases (16.7 %) with SBP in the range of 90-99 mm Hg and in 4 out of 6 cases (66.7%) with SBP ≤89 mm Hg. Highly significant association was noted between lower SBP at presentation and occurrence of mortality as indicated by a P value of <0.00001. This finding is in contrast with that noted in a study done by Vallabha T & Pangi M (P=0.153).^[11] Morbidity was noted in 7 out of 49 cases (14.28%) with SBP in the range of 110-130mm Hg, 4 out of 19 cases (21%) in the range of 100-109 mmHg, 5 out of 6 cases (83%) in the range of 90-99 mm Hg and 1 out of 6 cases (16.7%) with ≤ 89 mm Hg. No significant association was noted between SBP at presentation and occurrence of post operative complications. This finding is similar to that noted in a study done by Wani NA et al (P>0.5).^[12]

Pulse Rate: In the present study, of 80 cases, mortality was noted in 3 out of 34 cases (8.8%) presenting with pulse rate of 101-120 bpm and in 2 out of 6 cases (33%) with pulse rate of >120bpm on admission. Significant association was noted between pulse rate at admission and occurrence of mortality with P=0.04. This finding is in contrast to that noted in a study done by Vallabha T & Pangi M in which no significant association was noted between pulse rate and mortality with

P=0.13.^[11] Morbidity was noted in 3 out of 30 cases (10%) with pulse rate of 81-100 bpm, 12 out of 34 cases (35%) with 101-120 bpm and 2 out of 6 cases (33%) with >120 bpm at the time of initial presentation. No significant association was noted between pulse rate at presentation and occurrence of morbidity with P=0.09. This is in contrast to that noted in a study done by Wani et al., in which significant association was noted between pulse rate and morbidity with P<0.001.^[12]

Haemoglobin: In the present study, of 80 cases, mortality was observed in 1 out of 22 cases (4.5%) presenting with Hb 11.5 – 12.9 g/dl, 3 out of 19 cases (15.8%) with 10-11.4 g/dl and 1 out of 23 cases (4.3%) with ≤9.9 g/dl at the time of admission. No significant association was noted between the value of Hb at presentation and occurrence of mortality with P=0.30. This finding is similar to that noted in a study done by Vallabha T & Pang M in which no significant association was noted between Hb at presentation and occurrence of mortality with P=0.33.^[11] Morbidity was seen in 1 out of 16 cases (6.2%) with Hb 13-16 g/dl, 6 out of 22 cases (27.2%) with 11.5-12.9 g/dl, 2 out of 19 cases (10.5%) with 10-11.4 g/dl and 8 out of 23 cases (34.8%) with ≤ 9.9 g/dl at the time of presentation.

Total Leucocyte Count: In the present study, out of 80 cases, mortality was seen in 1 out of 55 cases (1.8%) with TLC 10.1- 20 x10³ /mm³ and in 4 out of 8 cases (50%) with ≥20.1 x10³ /mm³. Highly significant association was noted between elevated TLC at the time of presentation and occurrence of mortality with P=0.000071. This finding is similar to that noted in a study done by Vallabha T & Pang M in which significant association was noted between elevated TLC at presentation and occurrence of mortality with P=0.01.^[11] Morbidity was noted in 3 out of 17 cases (17.6%) with TLC 4.1-10 x10³ /mm³, 13 out of 55 cases (23.6%) with 10.1-20 x10³ /mm³ and 1 out of 8 cases (12.5%) with ≥20.1 x10³ /mm³ on initial presentation. No significant association was noted between TLC and morbidity with P=0.79. This finding is in contrast with a study conducted by Wani NA et al where significant association was noted between elevated TLC at presentation and occurrence of morbidity with P<0.001.^[12]

UREA: In the present study, out of 80 cases, mortality was seen in 2 out of 68 cases (2.9%) with urea <45 mg/dl and in 3 out of 8 cases (37.5%) in the range of 46-60 mg/dl. Significant association was noted between elevated urea level at presentation and occurrence of mortality with P=0.005. This finding is similar to that noted in a study conducted by Vallabha T & Pang M in which significant association was noted between elevated blood urea levels at presentation with P=0.004.^[11] Morbidity was seen in 13 out of 68 cases (19.1%) with urea < 45mg/dl, 2 out of 8 cases (25%) in the range of 46-60 mg/dl, 2 out of 4 cases (50%) in the range of 61-90 mg/dl. No significant association was noted between urea level at

presentation and morbidity with P=0.54. This finding is in contrast with a study conducted by Wani NA et al where significant association was noted between blood urea levels and morbidity with P<0.001.^[12]

SODIUM: In the present study, of 80 cases, mortality was noted in 2 out of 12 cases (16.7%) with sodium levels in the range of 126-130 mmol/L and 3 out of 8 cases (37.5%) with ≤125 mmol/L. Significant association was noted between low serum sodium levels at presentation and occurrence of mortality with P=0.002. This finding is similar to that seen in a study done by Vallabha T & Pang M with a P value of 0.03.^[20] Morbidity was seen in 3 out of 33 cases (9%) with sodium levels ≥136 mmol/L, 9 out of 27 cases (33.3%) in the range of 131-135 mmol/L, 2 out of 12 cases (16.7%) in the range of 126-130 mmol/L and 3 out of 8 cases (37.5%) with ≤ 125 mmol/L. No significant association was noted between serum sodium levels and morbidity. This is in contrast with a study conducted by Wani NA et al (P<0.001).^[12]

Potassium: In the present study, of 80 cases, mortality was seen in 5 out of 7 cases (71.4%) with potassium levels ≤2.8 mmol/L at the time of presentation. Highly significant association was noted between low serum potassium levels at presentation and occurrence of mortality with P<0.00001. This finding is in contrast with a study conducted by Vallabha T & Pang M in which no significant association was noted between serum potassium levels at presentation and mortality with P=0.08.^[20] Morbidity was noted in 9 out of 53 cases (17%) with potassium levels in the range of 3.5 – 5.5 mmol/L, 4 out of 10 cases (40%) in the range of 3.2-3.4 mmol/L, 2 out of 10 cases (20%) in the range of 2.9-3.1 mmol/L and 2 out of 7 cases (28%) with ≤2.8 mmol/L at presentation. No significant association was noted between serum potassium levels at presentation and morbidity with P=0.79. This finding is in contrast to that noted in a study done by Wani NA et al in which significant association was noted between serum potassium levels at presentation and morbidity with P<0.001.^[12]

ECG: In the present study, of 80 cases, mortality was noted in 4 out of 75 cases (5.3%) with normal ECG and 1 out of cases (20%) with an abnormal ECG. No significant association was noted between ECG and occurrence of mortality with P=0.24. Morbidity was noted in 13 out of 75 cases (17.3%) with normal ECG and in 4 out of 5 cases (80%) with abnormal ECG. Significant association was noted between abnormal ECG and morbidity with P=0.02. This finding is in contrast to that noted in a study done by Wani NA et al., in which no significant association was noted between ECG and morbidity with P>0.5.^[12]

Operative variables

Operative severity: In the present study of 80 cases, mortality was observed in 1 out of 37 cases (2.7%), who underwent emergency GI surgery of

moderate severity and 4 out of 43 cases (9.3%), who underwent emergency GI surgery of major severity. No significant association was noted between operative severity and mortality with $P=0.25$. This finding is in contrast to that noted in a study conducted by Wani et al., in which significant association was noted between operative severity and morbidity with $P<0.001$.^[12]

Multiple Procedures: In the present study, of 80 cases, mortality was noted in 4 out of 79 cases (5%) undergoing single procedure and in 1 out of single case (100%) which underwent 2 procedures within a time period of 1 week. Significant association was noted between number of procedures and mortality with $P=0.007$. This finding is in contrast to that noted in a study done by Raut et al. in which no significant association was noted between multiple procedures and mortality with $P=0.465$.^[13]

Peritoneal Soiling: In the present study, of 80 cases, mortality was noted in 5 out of 43 cases (12%) with peritoneal soiling with free bowel content, pus or haemoperitoneum. No significant association was noted between peritoneal soiling and mortality with $P=0.12$. This finding is similar to that noted in a study conducted by Vallabha T & Pangi M in which no significant association was noted between peritoneal soiling and mortality with $P=0.29$.^[11]

Amount of Blood Loss: In the present study, of 80 cases, mortality was noted in 5 out of 23 cases (21.7%) with intra operative blood loss in the range of 101-500ml. Significant association was noted between amount of blood loss intra operatively and mortality with $P=0.012$. This finding is similar to that seen in a study done by Vallabha T & Pangi M,^[20] ($P=0.03$).

Mode of Surgery: In the present study, of 80 cases, mortality was noted in 2 out of 70 cases (2.8%) in which resuscitation was possible for > 2 hours and in 3 out of 10 cases (30%) in which surgery was mandated within 2 hours. Significant association was noted between mode of surgery and mortality with $P=0.012$. This finding is in contrast to that noted in a study done by Raut et al. in which no significant association was noted between mode of surgery and mortality with $P=0.373$.^[13]

Comparison of Observed and Expected Mortality in Various Studies: In the present study, mortality was noted in 5 out of 80 cases (6.25%) which is in close resemblance to the average mortality in various studies.

Mortality was noted in 1 case which underwent emergency laparotomy for hollow viscus perforation accounting for 20% of mortality. Similar finding was noted in a study done by Kitara DL et al in which hollow viscus perforation was the cause of mortality in 27.3% of the cases. Of the 5 cases in which mortality was noted, 1 case had P-POSSUM score in the range of 80-90% and 4 cases in the range of 90-100%. O:E ratio in all the 5 cases was 1.0 indicating that no difference was noted between observed and expected mortality in high risk groups

as predicted by P-POSSUM. This indicates that P-POSSUM accurately predicts mortality in high risk groups. Mahesh et al also reported that P-POSSUM predicts death accurately in general surgical patients. Similar finding was noted in a study done by Raut et al.^[13]

In the present study, of 80 cases, morbidity was noted in 17 cases (21.25%). Similar result was noted in a study done by Sarah MAY et al,^[14] where morbidity was noted in 28.8% cases. Morbidity was noted in 35.3% of cases in a study done by Kumar P et al., and in 44% of the cases in a study done by Akbar NA et al.^[15]

Comparative analysis of occurrence of wound infection in various studies

Commonest cause of morbidity was found to be wound infection as noted in 14 out of 17 cases (17.5%). Wound infection as the commonest cause of morbidity was also noted in studies done by Akbar NA et al.^[15] (10%), Vishwani et al,^[16] (28%), Sarah MAY et al,^[14] (9.2%) and Raut et al (35.7%).^[13]

Comparative analysis of occurrence of chest infection in various studies

Superficial wound dehiscence was the next commonest cause of morbidity as noted in 12 out of 17 cases (15%). Similar finding was noted in a study done by Vishwani et al (13.4%).^[16] In a study done by Raut et al,^[13] superficial wound dehiscence was noted to be the cause of morbidity in 7.6% cases. Superficial wound dehiscence was noted in 19.2% cases in a study done by Kumar P et al. Comparative analysis of occurrence of chest infection in various studies

Chest infection was the cause of morbidity in 1 out of 17 cases (1.25%). Similar finding was noted in a study done by Wani NA et al,^[21] with chest infection being the cause of morbidity in 1.2% cases. Chest infection was the cause of morbidity in 16.5%, 13.4% and 21.3% cases in the study done by Kumar S et al,^[17] Vishwani et al,^[16] and Raut et al,^[13] respectively. The cause for lower incidence of chest infection in the present study could be attributed to the fact that chest physiotherapy and incentive spirometry were initiated as early as possible in the post operative period.

Comparative analysis of occurrence of impaired renal function in various studies

Impaired renal function was noted in 1 out of 17 cases (1.25%). Impaired renal function was the cause of morbidity in 7.6%, 1.7% cases as in the study done by Raut et al and Sarah MAY et al respectively.^[13,14]

Comparative analysis of occurrence of hypotension in various studies

Hypotension was noted in 1 out of 17 cases (1.25%). In a study done by Raut et al, hypotension was noted in 17.7% cases.^[13]

Comparative analysis of occurrence of respiratory failure in various studies

Respiratory failure was seen in 1 out of 17 cases (1.25%). In a study done by Vishwani et al,^[16] and

Raut et al,^[13] respiratory failure was noted in 5.6% and 3.9% of the cases respectively.

Comparative analysis of occurrence of burst abdomen in various studies

Burst abdomen (deep wound dehiscence) was noted in 1 out of 17 cases (1.25%). In a study done by Raut et al,^[13] deep wound dehiscence was noted in 5.8% cases. No cases of DVT/ PE were noted in the present study. This finding could be attributed to the fact that early mobilization was instituted whenever feasible. In cases which could not be ambulated, passive limb exercises were advocated. Using P-POSSUM score, morbidity was expected to be seen in 28 cases. But morbidity was observed in 17 cases. Observed to expected (O:E) morbidity ratio in the present study was found to be 0.60. O:E ratio using POSSUM score for morbidity was found to be 0.43 in a study conducted by Sarah MAY et al.^[14]

In the present study, P-POSSUM was found to over predict morbidity in low risk groups.

Morbidity was predicted in 6 cases in the range of 10-20%, 2 cases in the range of 20-30% and 2 cases in the range of 30-40%. But no morbidity was observed in the cases with P-POSSUM morbidity score ranging from 10-40%. Similar finding was noted in a study done by Vishwani et al using POSSUM score for prediction of morbidity (exponential analysis).^[16] P-POSSUM score for morbidity could accurately predict morbidity in cases with higher score.

CONCLUSION

To conclude, P-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 emergency GI surgeries.

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