Original Article

Efficacy of Possum Scoring System in Predicting Mortality and Morbidity in Patients of Peritonitis Undergoing Laparotomy

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Abstract

Background: As peritonitis is a life threatening condition a uniform scoring system is a must to judge the efficacy of the in hospital care. It aids in selecting patients at high risk who require intensive management and also to provide a reliable objective classification of severity and operative risk. With 12 clinical and basic biochemical parameters and 6 operative parameters as the basis, POSSUM is the scoring system, which has the proven ability to assess morbidity and mortality risk, especially in the settings where only basic investigations are available.

Materials & Method: Eighty-nine consecutive cases diagnosed to be peritonitis that underwent laparotomy in a single unit at a tertiary care center were enrolled. Parameters for calculating POSSUM score were retrieved and O:E Ratio for Mortality and Morbidity calculated using linear and exponential analysis.

Results: Using Linear Analysis Mean Morbidity Risk calculated by POSSUM was 67.82%. Expected and Observed Morbidity was 60.35 and 43, with O:E Ratio 0.7. (χ^2-test – not significant) showing POSSUM morbidity equation is a good predictor of morbidity in cases of peritonitis. Mean Mortality Risk as calculated by POSSUM was 23.47%. Expected and Observed Mortality was 21 and 6, with O:E Ratio 0.24. (χ^2-test – significant) showing POSSUM Mortality equation over predicts Mortality in cases of peritonitis especially in low risk patients. Using Exponential analysis POSSUM Morbidity equation could predict morbidity accurately for risk strata 60 -100 where O:E Ratio 2.70 (χ^2-test – not significant), but χ^2-test showed significant difference for risk strata 40-100 and 50-100 showing that POSSUM Morbidity equation over predicts morbidity especially in low risk group (<60%). Using exponential analysis POSSUM Mortality equation could better predict mortality with O: E Ratio 0.60. (χ^2-test – not significant)

Conclusion: POSSUM SCORING SYSTEM is a reasonably good predictor of morbidity using linear analysis whereas using exponential analysis it over predicts morbidity especially in low risk group (<60). POSSUM SCORE over predicts mortality using linear analysis, while the results are significantly better when exponential analysis is used.

Keywords: POSSUM Score, Peritonitis, Morbidity, Mortality

INTRODUCTION

Peritonitis resulting from bowel perforation is a frequently encountered surgical problem in the tropics. A review of literature indicates a very high mortality and morbidity associated with this condition inspite of the advances in treatment.[1]

During the last century advances in antimicrobial therapy, operative techniques, and early diagnosis and intensive care environments have produced a profound decrease in mortality from intraabdominal infection.

Outcome of all surgical procedure performed, not only depends on the performance of the surgeon, but it is the clinical status of the patient at the time of surgery, which largely determines the outcome. Current illness, nature and extent of surgical intervention, and co- morbid conditions associated with the patient influences the final outcome. Therefore, it is being felt since long to develop a system, which can predict outcome of the surgery performed. The ability to compare results of surgeries and their outcome has become increasingly important in recent years. Interest is focused on the development of scoring systems that standardize patient data to allow meaningful comparisons.[2]

There are many scoring systems that predict the risk of mortality with varying degrees of accuracy. However, morbidity is almost universally ignored. Some scores are ideal for assessing the risk of mortality and to a lesser extent morbidity in particular groups of surgical patients, such as those with cardiovascular and gastrointestinal diseases or for assessing the risk of developing particular complications. Others are of use in particular surgical settings, such as patients requiring intensive care. Probably the two most widely accepted scoring systems are APACHE II and ASA Scoring system.

In 1991, Copeland GP et al[3] while working in Broadgreen hospital, Liverpool, UK, devised, Physiological and Operative Severity Score for the enUmeration of Mortality and Morbidity (POSSUM). The POSSUM system is a two-part scoring system that includes a physiological assessment and a measure of operative severity. It was found to be quick, easy to use, and could be applied for both elective and emergency work and accurately predict outcome. The physiological part of the score includes 12 variables, eachdivided into 4 grades with an exponentially increasing score (1, 2, 4, and 8). The physiological variables are those apparent at the time of surgery and include clinical symptoms and signs, results of simple biochemical and haematological investigations, and electrocardiographic changes. The minimum score,therefore, is 12, with a maximum score of 88. The 12 physiological variables that were included in the scoring system were Age, Cardiac status, Respiratory status, Blood pressure, Pulse rate, Glasgow coma score, Haemoglobin level, White cell count, Blood Urea, Serum Sodium, Serum Potassium and ECG findings.

The operative severity part of the score includes 6 variables, each divided into 4 grades with an exponentially increasing score (1, 2, 4, and 8). These are Type of operation, Number of surgical procedures performed, Total blood loss during surgery, Peritoneal soiling, Presence of malignancy and Urgency of surgery**.** The number of operations indicates the chronology of the procedure(s) within 30 days.

The aim of the present study was to assess the accuracy of the POSSUM SCORING SYSTEM to predict mortality and morbidity in patients of peritonitis undergoing laparotomy.

MATERIALS & METHOD

It is a prospective study, carried out in Pad. Dr. D. Y. Patil Hospital, Kolhapur in which all cases diagnosed as peritonitis that underwent laparotomy in a single unit over a period of two years (May 2007 to April 2009) were included.

The cases were included in the study on the basis of following:

Inclusion Criteria

- All patients with signs and symptoms of peritonitis undergoing laparotomy

Exclusion Criteria

- Patients with significant immunosuppression (DM, steroid use, post transplant, retro positive)
- Patient with altered mental status (head injury, toxic encephalopathy)
- Patients with paraplegia
- Patients managed conservatively i.e. not undergoing surgery (acute pancreatitis, acute cholecystitis, appendicular lump)

After the patient was admitted to the hospital a detailed history of the patient was taken and the signs and symptoms were recorded. Laboratory investigations including total count and differential counts, blood sugar levels, renal function parameters (urea and creatinine), serum electrolytes were performed. Electrocardiogram (E.C.G.) and X-Ray chest (PA view) was taken to detect any underlying cardiac or respiratory problem. Radiological examination was conducted in all cases to detect pneumoperitoneum, a plain X-ray of the abdomen in the erect posture was taken to detect the presence of gas under the dome of the diaphragm.

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. Postoperative fluid and electrolyte balance was maintained by input and output charts and adequacy of replacement was judged mainly on the basis of clinical features.

Broad spectrum antibiotics started pre-operatively were continued and changed to suitable antibiotics after the sensitivity of the organisms was known.

All patients were scored before operation [using Table 1 Physiological Score] and at discharge [using Table 2 Operative Severity Score]. The Physiological Score reflect the indices at the time of surgery rather that at the time of admission.

RESULTS

Out of total 89 patients who were studied, 65 (73%) were male patients and 24 (27%) were female patients. Male: Female ratio - 2.7:1. The highest incidence of secondary peritonitis (25.8%) was observed in the age group 21 to 30 years, followed by 51 to 60 years (19.1%). Among these

Table 1: Physiological score (scored at surgery)

S. no.	Variables	Score			
		1	2	4	8
1	Age (years)	< 60	61-70	>71	
2	Cardiac history/signs	No failure	Diuretic, digoxin antianginal or hypertensive therapy	Peripheral edema warfarin therapy	Raised JVP
	Chest radiograph	Normal	-	Borderline Cardiomegaly	Cardiomegaly
3	Respiratory history	No dyspnoea	Dyspnoea on exertion	Limiting Dyspnoea	Dyspnoea at rest (rate>30/min)
	Chest radiograph	Normal	Mild COAD	Moderate COAD	Fibrosis or consolidation
4	Blood pressure (systolic)	110-130	131-170 100-109	>171 90-99	- <89
5	Pulse (beats/min)	50-80	81-100	101-120	>120
6	G.C.S.	15	12-14	9-11	<9
7	Haemoglobin (g/100 ml)	13-16	11.5-12.9 16.1-17.0	10.0-11.4 17.1-18.0	< 10.0 >18.0
8	White cell cout (x 10-12/L)	4-10	10.1-20.0 3.1-3.9	>20.1 <3.0	-
9	Urea (meq/l)	<7.5	7.6-10.0	10.1-15.0	>15.1
10	Sodium (meq/l)	>136	131-135	126-130	<126
11	Potassium (meq/l)	3.5-5.0	3.2-.34 5.1-5.3	2.9-3.1 5.4-5.9	<2.9 >5.9
12	Electrocardiogram	Normal	-	Atrial fibrillation rate: 60-90	Any other abnormal rhythm or >5 ectopics/ min. Qwaves or ST- T wave changes

Table 2: Operative severity score (scored at discharge)

S. no.	Variables	Score			
		1	2	4	8
1	Operative severity	Minor	Moderate	Major	Major+
2	Multiple procedures	1	-	2	> 2
3	Total blood loss (ml)	<100	101-500	501-999	>1000
4	Peritoneal soiling	None	Minor (serous fluid)	Local pus	Free bowel content pus or blood
5	Presence of malignancy	None	Primary only	Nodal metastasis	Distant metastasis
6	Mode of surgery	Elective	-	Emergency resuscitation of >2 hr possible: Operation <24 hr after admission	Emergency (immediate surgery)

89 patients who underwent surgery, 83 survived (93.25%) and 6 patients (6.75%) died after operation (Table 3).

Total number of patients developing complications was 43 (48.31%). Most frequent complication was surgical site wound infection, which was present in 25 patients (28.08%). 12 patients developed wound dehiscence. 12 patients developed pneumonia, 6 patients suffered from septicaemia and 5 patients required, ventilator support for respiratory failure. Urinary tract infection (UTI) and anastomotic leak was present in 5 and 2 patients respectively. One patient developed pulmonary embolism (Table 4).

For all patients (n-89) mean morbidity risk calculated by POSSUM was 67.82%. Expected and observed morbidity was 60.35 and 43. Total 32 patients were having morbidity risk in risk group 61-80, with mean risk of 69.78% corresponding to expected morbidity in 22.32 patients

Table 3: Incidence of peritonitis in different age groups

Age group	Number of patients	Percentage
0-10	3	3.4
11-20	8	9.0
21-30	23	25.8
31-40	12	13.5
41-50	10	11.2
51-60	17	19.1
61-70	13	14.6
71-80	3	3.4

but 17 patients observed morbidity, O:E Ratio 0.76 (χ^2-test – not significant). Total 26 patients were present in risk group 81-100% having mean risk morbidity 89.16%. Expected and observed morbidity in this group was 23.18 and 20 respectively with O:E Ratio 0.86 (χ^2-test – not significant) Total 21 and 10 patients were present in a morbidity risk group of 41-60% and 21-40% respectively,

corresponding to expected morbidity 11.24 and 3.59. Here 5 patents and 1 patient actually developed complication in each group O: E Ratio 0.44 and 0.28 respectively (χ^2-test – significant). In nutshell - POSSUM morbidity equation is a good predictor of morbidity O: E Ratio 0.7 (χ^2-test – not significant) (Table 5).

For patients of peritonitis mean mortality risk as calculated by POSSUM was 23.47%. 51 patients were having mortality risk in between 1 to 20%, with mean risk of 12.68% corresponding to expected mortality in 6.47, but no patient observed mortality. 7 and 3 patients were present in a mortality risk group of 41-60% and 61-80% corresponding to expected mortality in 3.28 and 1.89 respectively. 1 and 3 patients died in each group respectively. 27 patients were present in 21-40% risk group having mean risk of 28.35%. Expected and observed mortality in this group was 7.65 and 0 respectively. Chi square was found to have no significant difference between observed and predicted values implying POSSUM Score as a good indicator of mortality when linear method of analysis is used (Table 6).

Using exponential analysis POSSUM Morbidity equation could predict morbidity accurately for risk strata 60 -100 where chi square test applied showed values 2.70 and was not significant, but showed significant difference for risk strata 40-100 and 50-100 showing that POSSUM Morbidity equation over predicts morbidity especially in low risk group (<60%) (Table 7).

Using exponential analysis POSSUM Mortality equation mortality could better predict mortality with O:E Ratio 0.60. Chi square test applied showed no significant difference for risk strata 30 -100, 40-100, 50-100, 60-100, 70-100, 80-100 and 90-100 (Table 8).

DISCUSSION

In today's era, where the patient's safety and proper management of patient is of foremost important, it is

Table 4: Frequency distribution of observed complications

S. no.	Complications	Number of patients
1	Wound Infection	25
2	Wound Dehiscence	12
3	Pneumonia	12
4	Septicaemia	6
5	Respiratory failure	5
6	UTI	5
7	Anastomotic leak	2
8	Pulmonary embolism	1

Table 5: Comparison of expected and observed morbidity using POSSUM morbidity equation. (Linear analysis)

Range of risk (%)	No. of patients	Mean risk (%)	Expected morbidity	Observed morbidity	O:E ratio	χ^2-value
21-40	10	35.92	3.59	1	0.28	6.71 Significant
41-60	21	53.56	11.24	5	0.44	7.79 Significant
61-80	32	69.78	22.32	17	0.76	1.66 Not Significant
81-100	26	89.16	23.18	20	0.86	0.51 Not Significant
1-100	89	67.82	60.35	43	0.71	1.90 Not Significant

χ^2-tabulated value=3.84, Degrees of freedom=1

Table 6: Comparison of expected and observed mortality using POSSUM mortality equation. (Linear analysis)

Range of risk (%)	No. of patients	Mean risk (%)	Expected mortality	Observed mortality	O:E ratio	χ2-value
1-20	51	12.68	6.47	0	0.00	Not Applicable
21-40	27	28.35	7.65	0	0.00	Not Applicable
41-60	7	46.87	3.28	1	0.31	5.20 Significant
61-80	3	62.87	1.89	3	1.59	0.41 Not Significant
81-100	2	90.1	1.80	2	1.11	0.02 Not Significant
1-100	89	23.47	21	6	0.28	7.4 Significant

χ^2-tabulated value=3.84, Degrees of freedom=1

Table 7: Comparison of expected and observed morbidity using POSSUM morbidity equation. (Exponential analysis)

Range of risk (%)	No. of patient	Mean risk (%)	Expected morbidity	Observed morbidity	O:E ratio	χ^2-value
0-39	7	34.13	2.39	0	0.00	Not Applicable
10-39	7	34.13	2.39	0	0.00	Not Applicable
20-39	7	34.13	2.39	0	0.00	Not Applicable
30-39	5	37.1	1.85	0	0.00	Not Applicable
40-100	82	70.69	58	43	0.74	5.23 Significant
50-100	75	73.13	55	41	0.75	4.78 Significant
60-100	60	77.87	47	37	0.79	2.70 Not Significant
70-100	39	84.70	33	27	0.82	1.33 Not Significant
80-100	28	88.53	25	21	0.84	0.76 Not Significant
90-100	12	94.27	11	10	0.91	0.10 Not Significant

χ^2-tabulated value=3.84, Degrees of freedom=1

necessary to assess the expected outcome of the procedure performed. Recognizing patients who are at high risk to develop complications and have high risk of mortality would prompt us to take necessary action and help us in the better management of patient. An ideal scoring system should be applicable to a wide range of general surgical procedures, both elective and emergency and should allow prediction of both mortality and morbidity. In the past, various scoring systems, such as ASA and APACHE II have been used to predict both morbidity and mortality in surgical patients. These existing scoring systems are either too simple or too complex and do not completely meet the expectation as being readily applicable to all patients. POSSUM has been proved to be a one of the best scoring system which could predict the morbidity and mortality risk with reasonable accuracy. It has been validated by many authors around the globe and has been used successfully as a tool for surgical audit. It has been used by many authors in various surgical specialties with success, though it was found to slightly over predict morbidity and mortality.

In present study, out of the total 5832 patients admitted in Unit II of Department of Surgery (May 2007-April 2009), 124 cases were diagnosed as acute abdomen with clinical diagnosis of peritonitis. Amongst these 35 patients clinically diagnosed as acute abdomen were managed conservatively and excluded from the study, remaining 89 patients diagnosed as peritonitis who underwent laparotomy, were included in the study (Table 9).

The overall Male:Female ratio reported by different researchers varied considerably. Study done by Afridi SP et al[4] in 2008 showed Male: Female Ratio 2.1:1 while study by Kitara DL et al[5] in 2006 showed Male:Female Ratio 2:1,which are similar to the present study showing Male:Female Ratio 2.7:1, but are quite low as compared to study by Jhobta RS et al[6] which shows Male:Female ratio 5.25: 1. The varying rates may be because of smaller subset of patient enrolled to the study (Table 10).

The incidence of peritonitis was statistically different across, different age groups ($p<0.001$), being maximum in the age group 21-30 which was 25.8%. It was similar to study by Ramchandra ML et al[7] which showed an incidence of 32% and study by Jhobta RS et al[6] which showed and incidence of 28%.

Second highest incidence of peritonitis was 19.5% observed in age group 31-40, similar to that observed by Ramachandra ML et al[7], showing incidence of 26% and study by Jhobta RS et al[6] showing incidence of 21%. The vulnerability of younger age to duodenal perforation which constitutes most cases in the study can be accounted for high incidence in age group 20-40 in study (Table 11).

The spectrum of peritonitis in developed western countries like USA, Japan, and China is different from that seen in developing eastern countries like India, Pakistan, and Nepal. In study by Malangoni MA et al[8], from Ohio, USA in published in September 2006, most common cause of intraabdominal infection in America was Appendicitis, second most common being Colonic perforation, gastroduodenal perforations showing significantly reduced number due to widespread adoption of medical therapies for peptic ulcer disease. Jejuno- ileal perforations due to infective pathology are rare, most of small bowel perforations in west were traumatic in origin. In present

Table 8: Comparison of expected and observed mortality using POSSUM mortality equation. (Exponential analysis)

Range of risk (%)	No. of patients	Mean risk (%)	Expected mortality	Observed mortality	O:E ratio	χ^2-value
0-29	68	15.83	10.7	0	0.0	N.A.
10-29	54	18.01	9.7	0	0.0	N.A.
20-29	18	25.01	4.5	0	0.0	N.A.
30-100	21	48.2	10	6	0.60	2.67 Not Significant
40-100	12	58.1	7	6	0.86	0.17 Not Significant
50-100	8	65.9	5	6	0.83	0.17 Not Significant
60-100	5	73.8	4	5	0.80	0.20 Not Significant
70-100	2	90.1	2	2	1.00	0.00 Not Significant
80-100	2	90.1	2	2	1.00	0.00 Not Significant
90-100	1	94.3	1	1	1.00	0.00 Not Significant

χ^2-tabulated value=3.84, Degrees of freedom=1

Table 9: Comparison of Male: Female ratio in various studies

Study	Year	Place of study	M:F ratio
Afridi SP *etal*[52]	2008	Karachi, Pakistan	2.1 : 1
Jhobta RS *etal*[55]	2006	Chandigarh, India	5.25 : 1
Kitara DL *etal*[53]	2006	Kampala, Uganda	2 : 1
Present study	2009	Kolhapur, India	2.7 : 1

Table 10: Comparison of incidence of peritonitis in various studies

Age group	Percentage of cases of peritonitis		
	Present study	Ramchandra ML et al[56]	Jhobta RS et al[55]
0-10	3.4	0	5.0
11-20	9.0	8.0	14.0
21-30	25.8	32.0	28.0
31-40	19.5	26.0	21.0
41-50	11.2	16.0	16.0
51-60	13.1	13.0	6.0
61-70	14.6	3.0	8.0
71-80	3.4	4.0	2.0

Table 11: Comparison between diagnosed cases of peritonitis

Study	Total	D.U.	G.P.	A.P.	S.B.P.	C.P.	Others
Jhobta RS et al[55]	504	289 (57)	42 (8)	59 (12)	92 (18)	19 (4)	50 (1)
Afridi SP et al[52]	300	131 (43.6)	4 (1.3)	15 (5)	122 (40.9)	24 (8)	4 (1.3)
Quereshi et al[58]	126	31 (21.6)		12 (9.5)	37 (29.4)	3 (2.4)	46 (37.1)
Nishida et al[59]	229	92 (40.2)		0	71 (31)	66 (28.8)	-
Chen et al[63]	98	57 (58.1)		13 (13.2)	6 (6.1)	14 (14.3)	-
Dorairajan et al[60]	250	80 (32)		38 (15.2)	103 (41.2)	5 (2)	-
This study	89	28 (31.4)	4 (4.5)	15 (16.9)	14 (15.7)	2 (1.8)	26

D.U. - Duodenal Perforation, G.P. - Gastric perforation, A.P. - Appendicular perforation, S.B.P. - Small bowel perforation, C.P. - Colonic perforation () percentage

study the most common cause of peritonitis was Gastro-duodenal perforation n = 32 (36%), which was similar to study by Dorairajan et al[9], Afridi SP et al[4], Quereshi et al[10], Jhobta RS et al[6], Nishida et al[11], Chen et al[12] being 32%, 44.9%, 21.6% and 65%,40.2%, 71.3% respectively.

Second most common cause being appendicular perforation 16.9% (n = 15) which is similar to studies by Dorairajan et al[9], Jhobta RS et al[6], Afridi SP et al[4], Quereshi et al[10], Chen et al[12] with incidence of 15.2%, 12%, 5%, 9.5%, 13.2% respectively.

Third most common cause observed in the study was acute intestinal obstruction, (15.7%) most commonly due to post operative adhesions or internal herniation. Next common cause of peritonitis in the study was small bowel perforation 15.7% mostly due to infective pathology (typhoid, tubercular, amoebic) as compared to traumatic perforations in east.

Among the rare causes of peritonitis are colonic perforations 1.8% which is comparable to other studies in developing countries like Dorairajan et al[9], Jhobta RS et al[6], Afridi SP et al[4], Quereshi et al[10] being 2%, 4%, 8%, 2.4% respectively as compared to 28.8% and 14.3% seen in study from, Nishida et al[11] and Chen et al[12] from Japan and China respectively.

The observed mortality in the present study was 6.75 % (n = 6) in the patients which is in close resemblance to the average mortality in various studies (9.2%–10.6%), as shown in Table 12.

The low mortality rates may be attributed to low symptom - operation interval because of early attendance of patient to emergency department and to the fact that maximum number of patients were of upper gastro intestinal perforation with relatively low mortality rates (Table 13).

The present study shows morbidity of 48.3% (n = 43), which is comparable to 50% as shown by Jhobta RS et al[6]. Surgical site wound infection was the most frequent complication present in 28% patients (n- 25) which is equivocal to study by Jhobta RS et al[6], Ramchandra ML et al[7], Afridi SP et al[4] with rates of 25%, 32%, 42% respectively. Wound dehiscence was seen in 12 patients (13%), study by Jhobta RS et al[6] and Afridi SP et al[4] showing rates of 9% and 26% respectively.

Table 12: Comparision of observed mortality in other studies

Study	Observed mortality
Afridi SP et al[52] (2008)	10.6%
Jhobta RS et al[55] (2006)	10%
Dorairajan et al[60] (1995)	9.2%
Present study (2009)	6.75%

Pneumonia developed in 12 patients (13%) whereas study by Afridi SP et al[4] and Jhobta RS et al[6] showed pneumonia in 20% and 28% respectively. Septicaemia was seen in 7% (n=6) as compared to 18% and 20% shown in study by Jhobta RS et al[6] and Afridi SP et al[4]. Total 5 patients required ventilator support for respiratory failure. One patient developed life threatening pulmonary embolism. Urinary tract infection was present in 5 patients while anastomotic leak was present in 2 patients (2%) as compared to 2%, 6% and 7% shown by study by Afridi SP et al[4], Ramchandra ML et al[7] and Jhobta RS et al[6] respectively. Amit Nair et al[13] concluded in his study of 70 patients who underwent emergency small bowel anastomosis, that risk factors for leakage of emergency small bowel anastomosis include hypoalbuminemia, hyponatremia at presentation and intraoperative hypotension (Table 14).

Overall on application of linear regression analysis, POSSUM Morbidity equation in present study had O:E Ratio of 0.71:1. This was comparable to study by Mohil RS et al[14] with O:E Ratio of 0.68 and Khan AW et al[15], showing O:E Ratio of 0.66:1. The orginal study by Copeland GP et al[16] for cases of gastrointestinal surgery showed O:E Ratio of 1.03:1 (Table 15).

On application of linear regression analysis POSSUM Mortality equation, showed O:E Ratio of 0.28:1. POSSUM Mortality equation significantly over predicts mortality which was also seen in study by Mohil RS et al[14] with O:E Ratio of 0.39 and Khan AW et al[15] showing rates of 0.20:1, but orginal 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 (Table 16).

On application of exponential analysis to POSSUM Morbidity equation the O:E Ratio improved to 0.74:1, similar

improvement was seen in study by Mohil RS et al[14], showing ratio of 0.91:1, while study by Khan AW et al[15] no improvement in result by use of exponential analysis as compared to linear analysis showing O:E Ratio 0.62:1 (Table 17).

On application of exponential analysis to POSSUM Mortality equation results improved significantly with O:E Ratio 0.60 (chi square test – not significant) which was comparable to study by Mohil RS et al[14] which showed O:E Ratio of 0.62: 1, while study by Khan AW et al[15] showed no significant improvement in result with O: E Ratio 1.15:1 (Table 17).

Table 13: Comparison of complications in various studies

Study	Total	SSI (%)	WD (%)	F F (%)	PA (%)	SA (%)
Afridi SP et al[52]	300	126 (42)	78 (26)	5 (2)	60 (20)	60 (20)
Jhobta RS et al[55]	504	126 (25)	44 (9)	34 (7)	143 (28)	90 (18)
Ramchandra ML et al[56]	50	19 (38)	-	3 (6)	-	-
Present study	89	25 (28)	12 (13)	2 (2)	12 (13)	6 (7)

SSI – Surgical Site Infection, WD – Wound Dehiscence, FF – Faecal Fistula, PA – Pneumonia, SA – Septicemia

Table 14: Comparison of results of linear analysis using POSSUM Morbidity equation in various studies

Study	Surgical Speciality	O:E ratio
Copeland GP et al[26]	Gastrointestinal surgery	1.03 :1
Khan AW et al[70]	Pancreatic surgery	0.66:1
Mohil RS et al[48]	Peritonitis	0.68:1
Present study	Peritonitis	0.71:1

Table 15: Comparison of results of linear analysis using POSSUM Mortality equation in various studies

Study	Surgical speciality	O:E ratio
Copeland GP et al[26]	Gastrointestinal surgery	1.04 :1
Khan AW et al[70]	Pancreatic surgery	0.20:1
Mohil RS et al[48]	Peritonitis	0.39:1
Present study	Peritonitis	0.28:1

Table 16: Comparison of results of exponential analysis using POSSUM morbidity equation in various studies

Study	Surgical speciality	O:E ratio
Khan AW et al[70]	Pancreatic surgery	0.62:1
Mohil RS et al[48]	Peritonitis	0.91:1
Present study	Peritonitis	0.74:1

Table 17: Comparison of results of exponential analysis using POSSUM morbidity equation in various studies

Study	Surgical speciality	O:E ratio
Khan AW et al[70]	Pancreatic surgery	0.15:1
Mohil RS et al[48]	Peritonitis	0.62:1
Present study	Peritonitis	0.60:1

CONCLUSION

Incidence of peritonitis in the bread earning group (20-40 yrs) as seen in the study was alarmingly high (39.3%) and has been significant cause of concern for all. Thus is the need of a systemic approach so as to improve the over all survival and the requirement of a system to compare the performances in different units and to analyse the overall performance of the unit. POSSUM SCORING SYSTEM seems to be the solution for the same as it rationally predicts mortality and morbidity in patients of peritonitis undergoing laparotomy provided proper logistic analysis are used.

POSSUM morbidity equation can reasonably predict morbidity when linear analysis is used and results improve with application of exponential analysis.

POSSUM mortality equation over predicts mortality especially in low risk groups, while the prediction improves significantly when exponential analysis is used.

POSSUM scoring systems can be used to assess the outcome of surgery and would help us in proper management of patients. POSSUM can be used in our set up for better patient's counselling, improving surgical outcome and better management of limited resources and man power.

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