

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Efficacy Of Modified Possum Scoring In Predicting Mortality And Morbidity In Perforated Peritonitis.

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ABSTRACT

Even though surgical peritonitis being one of the most common problems faced by surgeons in emergency, still the post operative period of perforated peritonitis is unpredictable most of the times and it carries considerable morbidity and mortality. It therefore becomes necessary for a scoring system that predicts the post-operative period. There have been many scoring systems developed, including the ASA (American Society of Anesthesiologists) for general risk prediction, APACHE III (Acute Physiology and Chronic Health Evaluation III) for intensive care, and the Goldman Index for cardiac-related problems after surgery. In our study, We propose to use the Modified POSSUM Scoring to predict the morbidity and mortality in Perforated Peritonitis patients presenting to MVJ Medical College and Research Hospital, Hoskote from DECEMBER 2020 – NOVEMBER 2022 (24 Months) All cases of established peritonitis admitted in Department of General Surgery of MVJMC & RH. A total of 50 patients admitted who underwent Emergency Laparotomy for perforated peritonitis at MVJ Medical College and Research Hospital. Patients presenting with Peritonitis were evaluated with detailed history and clinical examination and pre-operative physiological variables was collected and intra-operative variables were assessed and the expected outcome was measured by using Possum equation. Patient was followed up for 4 week after the surgery. Outcome and complications were recorded. Statistical Analysis done by expected and observed outcome (chi square test). In our study, 50 patients were studied and Male outnumbered females. The most common site of perforation in gastrointestinal tract was gastric perforation followed by duodenum, ileum and appendix. Crude mortality rate of 10%. Crude morbidity rate of 60% and most of the patients presented with multiple complications. Maximum number of patients presented late >24 hours and almost 50% mortality in the group where patient presented late (>48hrs). Physiological variables such as cardiovascular system, blood pressure, hemoglobin, blood urea, serum potassium and operative variables such as operative complexity, multiple procedure, presence of malignancy, mode of surgery were significant. Additional factor perforation to operation time was included in our study and found to be significant. Predicted risk of mortality and morbidity was calculated and compared with the observed mortality and morbidity. An observed to expected ratio (O: E) for mortality was 1.020 (there was no significant difference between the predicted and observed values)(p =0.980) and for morbidity was 1.005(there was no significant difference between the predicted and observed values)(p =0.934). For mortality and morbidity, positive predictive value was 80% and 97%, negative predictive value was 95% and 93%, sensitivity was 80% and 97%, specificity was 95% and 93% respectively. Possum score is better at predicting mortality and morbidity, but it over predicts morbidity in lower risk groups. Possum scoring system is better since it includes both physiological and operative parameters and can be used as a significant tool for predicting outcomes in perforated peritonitis. Factors such as cardiovascular system, blood pressure, hemoglobin, blood urea, serum potassium, operative complexity, multiple procedure, presence of malignancy, mode of surgery were significant to predict postoperative outcomes independently. Depending on the scoring system, patient's attenders can be counselled preoperatively and prior correction of risk factors can be done. Strict vigilance and prompt adjustment of the verified parameters can improve the patient's overall health and decrease morbidity and mortality. Widespread awareness and education about perforated peritonitis, early referrals, early diagnosis, and prompt treatment must be implemented to shorten the duration of perforation to operation time.

Keywords: Perforated peritonitis; Possum score;

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<https://doi.org/10.33887/rjpbcs/2023.14.5.25>

INTRODUCTION

Surgical peritonitis remains one of the most common problems faced by surgeon”. It still remains as a major cause of morbidity and mortality (mortality from 10%-40%) [1]. The surgeons treating it know the dreadful and fatal complication; the problems can be minor wound infection to Systemic inflammatory response syndrome (SIRS) or septic shock. Even if patients reach the hospital at the earliest, still the post operative period is unpredictable most of the times [2]. It therefore becomes necessary for a scoring system that predicts the post-operative period. In our study, We propose to use the Modified POSSUM Scoring (Physiological and operative scoring system in eNumeration of morbidity and mortality) to predicting the morbidity and mortality in Perforated Peritonitis. POSSUM Score includes 12 Physiological and 6 operative variables in eNumeration of morbidity and mortality [3].

Physiological Variables

	SCORES			
	1	2	4	8
Age (in years)	≤ 60	61 – 70	≥ 71	-
Cardiac signs	No failure	Diuretic, digoxin, antianginal or hypertensive therapy	Peripheral edema; warfarin therapy Borderline cardiomegaly	Raised jugular venous pressure Cardiomegaly
Chest radiograph				
Respiratory history	No dyspnea	Dyspnea on exertion Mild COAD	Limiting dyspnea (one flight) Moderate COAD	Dyspnea at rest (rate ≥ 30/min) Fibrosis or consolidation
Chest radiograph				
Blood pressure systolic (mmHg)	110 – 130	131 – 170 100 – 109	≥ 171 90 – 99	≤ 89
Pulse (beats/min)	50 – 80	81 – 100	101 – 120	≥ 121
Glasgow coma score	15	12 – 14	9 – 11	≤ 8
Hemoglobin (gm/100ml)	13 – 16	11.5 – 12.9 16.1 – 17.0	10.0 – 11.4 17.1 – 18.0	≤ 9.9 ≥ 18.1
White cell count (x 10 ¹² / l)	4 – 10	10.1 – 20.0	≥ 20.1	-
Urea (mmol/L)	≤ 7.5	7.6 – 10.0	10.1 – 15.0	≥ 15.1
Sodium (mmol/L)	≥ 136	131 – 135	126 – 130	≤ 125
Potassium (mmol/L)	3.5 – 5.0	3.2 – 3.4 5.1 – 5.3	2.9 – 3.1 5.4 – 5.9	≤ 2.8 ≥ 6.0
Electrocardiogram	Normal	-	Atrial fibrillation Rate (60-90/min)	Any other abnormal rhythm or ≥ 5 ectopic/min, Q waves or ST/T wave changes

Operative Variables

	Score			
	1	2	4	8
Operative severity*	Minor	Moderate	Major	Major +
Multiple procedures	1	-	2	> 2
Total blood loss (ml)	≤ 100	101 – 500	501 – 999	≥ 1000
Peritoneal soiling	None	Minimal (serous fluid)	Local pus	Bowel content, pus or blood
Presence of malignancy	None	Primary only	Nodal metastases	Distant metastases
Mode of surgery	Elective	-	Emergency resuscitation of >2 hours possible # Operation < 24 hours after admission	Emergency (immediate surgery < 2 hours needed)

POSSUM equation for morbidity:

$$\ln R/1 - R = - 5.91 + (0.16 \times \text{physiological score}) + (0.19 \times \text{operative severity score})$$

POSSUM equation for mortality:

$$\ln R/1 - R = -7.04 + (0.13 \times \text{physiological score}) + (0.16 \times \text{operative severity score})$$

Where R is predicted risk.

Aims And Objectives

- To assess the efficacy of modified POSSUM score in perforated peritonitis.
- To assess the efficacy of POSSUM scoring system in identifying risk factors for adverse outcome.
- To assess the efficacy of additional factor; Time at presentation from onset of symptoms in predicting the post operative outcome in patients with perforated peritonitis

METHODS

Type of study: Prospective

Duration of study: 2 years (December 2020- November 2022)

The study was conducted in the Department of Surgery, MVJ Medical College and Research Hospital, Hoskote from December 2020- November 2022 (24 months). It was approved by the institute ethics committee. The study was a prospective observational of a single group of patients undergoing Emergency laparotomy for hollow viscus perforation. All patients of established peritonitis following Hollow viscus perforation were included in the study. Patients with primary peritonitis, peritonitis secondary to gynecological cause and peritonitis secondary to trauma were excluded from the study. The sample size was estimated using the sample size formula. A convenient sampling technique was followed. Informed consent was obtained from patients. Patients presenting with Peritonitis was evaluated with detailed history and clinical examination. Pre-operative physiological variables were collected. All patients underwent Emergency laparotomy and operative variables were collected intraoperative. The expected outcome was measured by using Possum equation. Patient was followed up for 4 week after the surgery. Outcome and complications noted in patients were recorded.

Statistical analysis

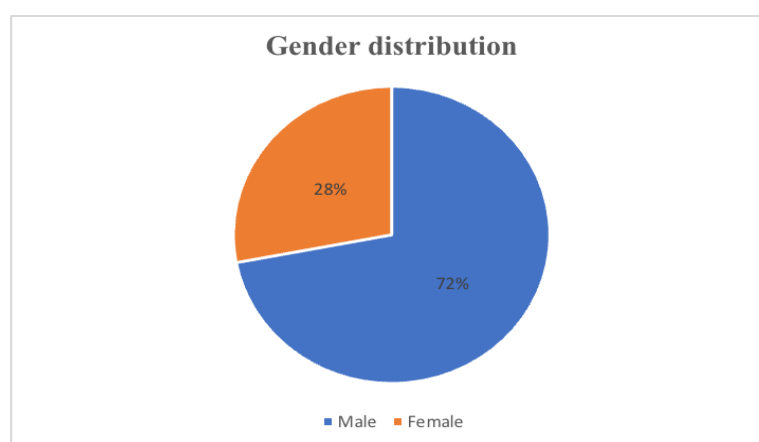
The data was collected in individual patient proforma and was entered systematically in a Microsoft Excel sheet (Redmond, WA, USA). Statistical analysis determined using Statistical Package for the Social Sciences (SPSS) 19.0 software (IBM Corp., Armonk, NY, USA). The data on categorical variables, such as gender, and clinical characteristics were expressed as frequency and percentages. The normal distribution of data was tested using Kolmogorov-Smirnov (K-S) test. The expected mortality rate was obtained using linear regression analysis and the O:E ratio (observed: expected ratio) was calculated. Chi square test applied to obtain the p value to note any significant difference between the predicted rate and the actual outcome. Rate of increment in complication for each risk factor was calculated based on the hypothesis and "t" test will applied to validate the hypothesis.

Ethical approval: Ethical Approval was obtained from Institute Ethical Committee.

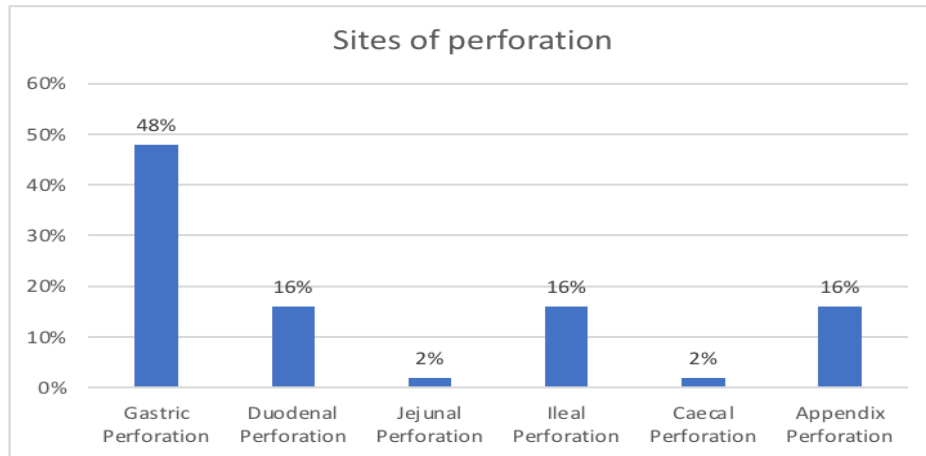
RESULTS

In our study there were a total of 50 patients , among them 36 were males and 14 were females.

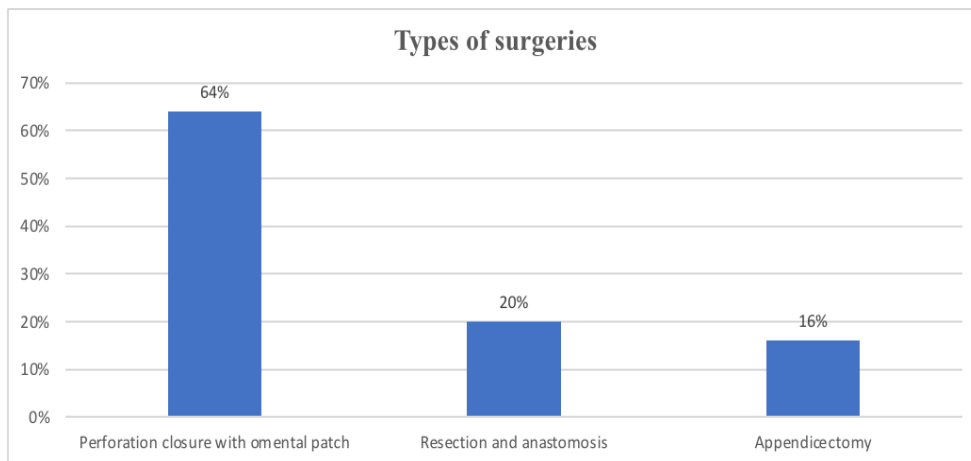
Table 1: Demography



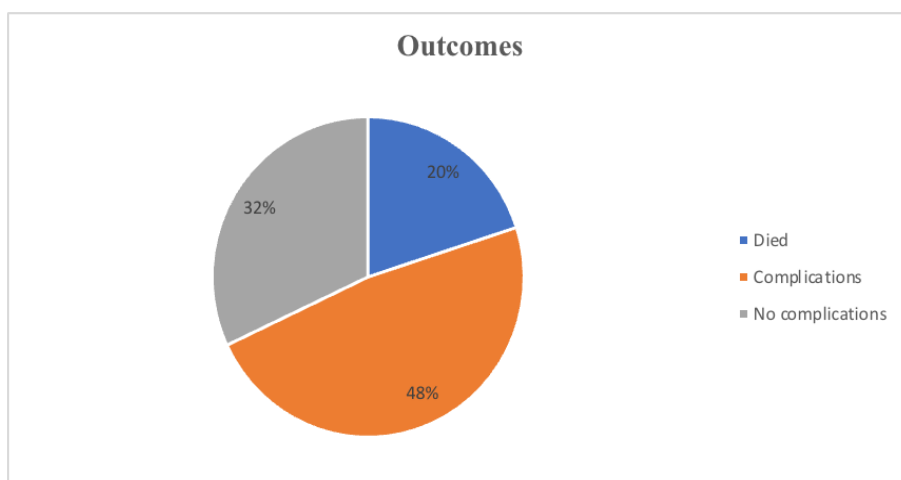
Most common site of perforation was gastric pre-pyloric perforation(48%) which include one patient of gastric malignancy presented as perforation. Other sites of perforation studied in our study were duodenal (16%), ileum (16%) , appendix (16%), jejunum (2%) and caecum (2%).



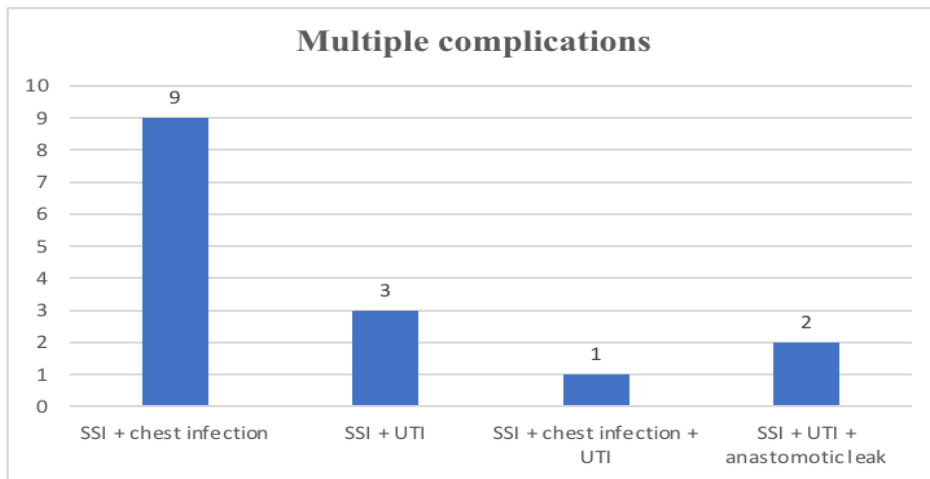
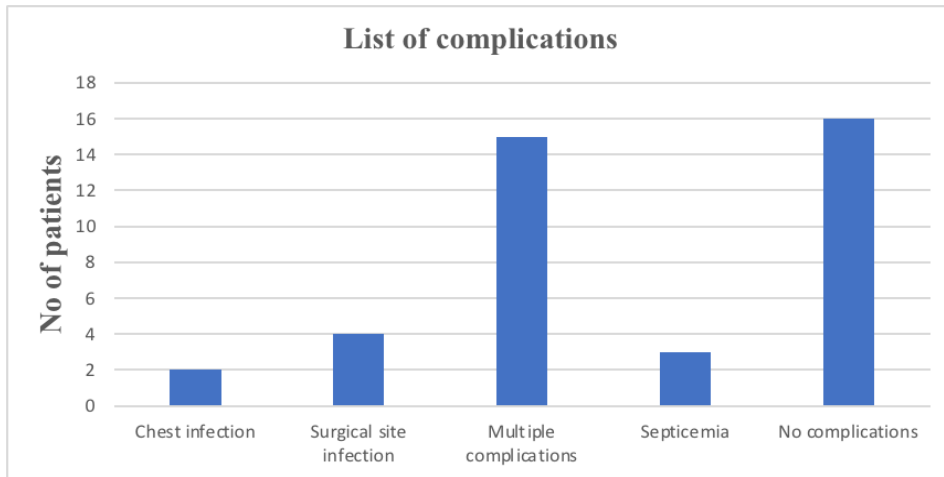
All cases were operated emergency which includes perforation closure with omental patch(64%), resection-anastomosis(20%) and appendectomy(16%).



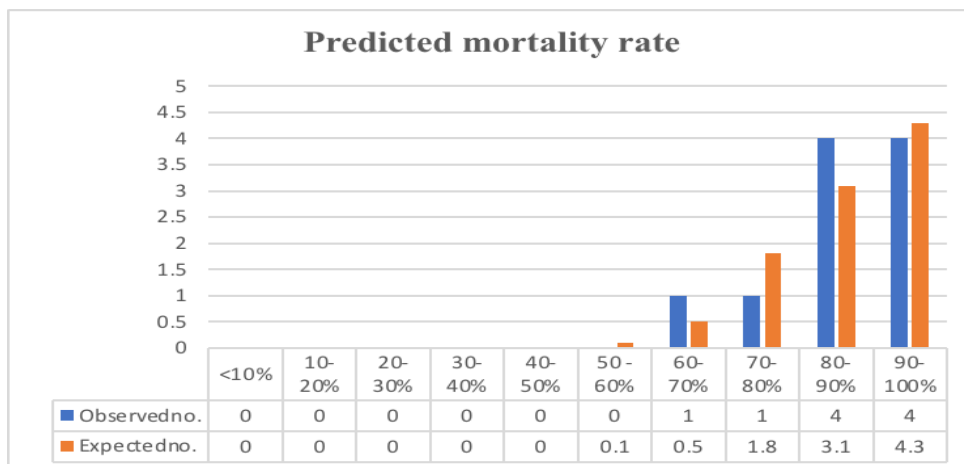
Out of 50 patients in our study , 10 patients died resulting in crude mortality rate of 20% and 24 patient developed complication in postoperative period , resulting in crude morbidity rate of 60%. The remaining 16 patients showed no evidence of any complication.

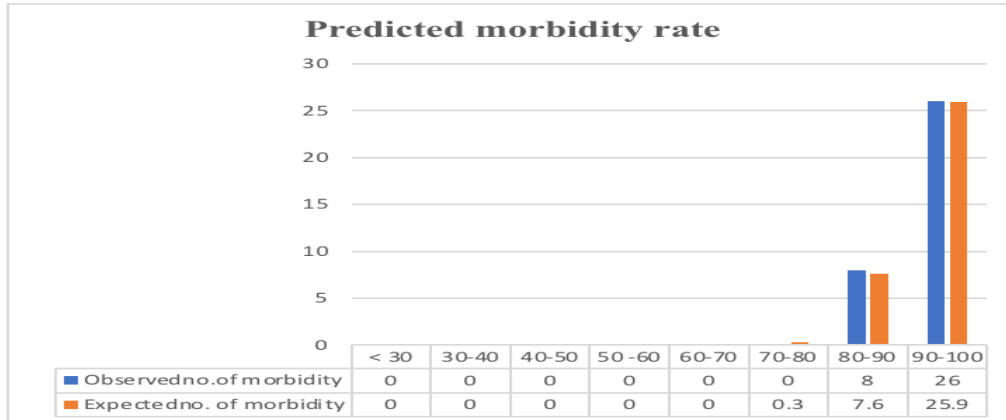


Complications noted in our study were multiple complications (30%), Surgical site infection(8%), septicemia(6%) and chest infection(4%). Among patients with multiple complications, maximum number of patients presented with surgical site infection along with chest infection.

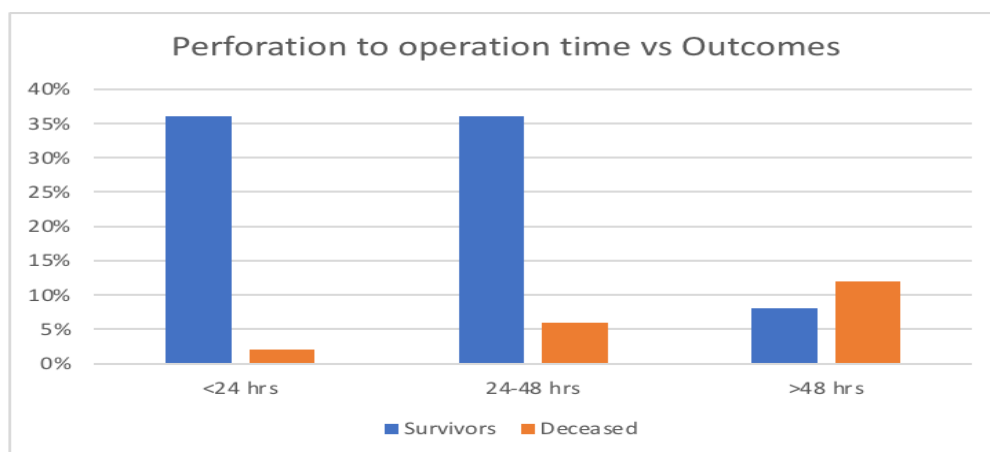


Using logistic equations, the predicted risk of mortality and morbidity was calculated and compared with the observed mortality and morbidity. An observed to expected ratio (O: E) for mortality was 1.020 (no significant difference)(p =0.980). An observed to expected ratio (O: E) for morbidity was 1.005 (no significant difference)(p =0.934). For mortality and morbidity, sensitivity was 80% and 97%, specificity was 95% and 93%, positive predictive value was 80% and 97%, negative predictive value was 95% and 93% respectively.(Derived from logistics equation)





Analysis of POSSUM variables were obtained. Physiological variables such as Cardiovascular system, Blood pressure, Hemoglobin, Urea and serum Potassium were found to be significant to cause adverse outcomes. Operative variables such as Operative complexity, Multiple procedure, Presence of malignancy and Mode of surgery were found to be significant to cause adverse outcomes. Additional factor-perforation to operation time was included in our study and showed more than 50% mortality if patient present late(>48hrs).



DISCUSSION

Over the past few years, surgical audit has become more significant as a tool for evaluating the standard of surgical treatment and as a teaching tool. The use of the crude mortality rate in these days can be deceiving. Due to poverty and ignorance, a particular illness's presentation is delayed in a developing country like India, which causes more complications and higher death rates. There have been many scoring systems developed, including the ASA (American Society of Anesthesiologists) for general risk prediction, APACHE III (Acute Physiology and Chronic Health Evaluation III) for intensive care, and the Goldman Index for cardiac-related problems after surgery [4-7].

The POSSUM score method can be used to identify patients with perforated peritonitis who have a higher risk of mortality or complications. POSSUM was developed by Copeland et al., from a cohort of 1372 patients in 1991 mainly for surgical audits [3]. It is a scoring system based on 12 preoperative physiological factors and six operative factors [3]. Each factor is scored with 4 graded score values; the sum of individual scores was used to predict postoperative outcome.

In our study there were a total of 50 patients studied, among them 36 were males and 14 were females. Similar studies which show male preponderance were Gurjar [10] et al (68.5%), Chatterjee [8] et al (88%), Batra P [11] et al (88%) and Manivannan [12] et al (87%).

Most common indication of surgery was gastric pre-pyloric perforation (48%) which include one patient of gastric malignancy presented as perforation. Other sites of perforation studied in our study were duodenal (16%), ileum (16%), appendix (16%), jejunum (2%) and caecum (2%). Gurjar et al [10] and Murugappan et al [13] obtained similar results which showed 53% patients and 58% presented with gastric pre-pyloric perforation respectively. A study by Batra P [11] et al (80%) and Manikanta [14] et al (66%) shows gastro-duodenal perforation as a most common site of gastrointestinal perforation. However studies by Kumar A [9] et al and Manivannan [12] et al report that Duodenal perforation is most common site of perforation in gastrointestinal tract. All the patients underwent emergency surgery which includes perforation closure with omental patch (64%), resection-anastomosis(20%) and appendectomy(16%)

In our study, death occurred in 10 patients out of 50 patients resulting in crude mortality rate of 20% and out of remaining 40 patients, 24 patients developed complications resulting in crude morbidity rate of 60%. Gurjar et al [10] reported crude mortality rate of 17.40%, Kumar A et al [9] reported mortality rate of 18%, Chatterjee et al [8] reported mortality rate of 18%. However few studies reported lesser mortality rate, Manikanta [14] et al (5.7%), Batra P [11] et al (5.70%), and Manivannan [12] et al (4%) .

Complications noted in our study were chest infection (4%), Surgical site infection (8%), septicemia(6%), and multiple complications (30%). Kumar A [9] et al obtained a similar result which shows 30% patients developed multiple complications in postoperative period. However wound infection reported to be commonest complication in studies by Gurjar et al [10], Manikanta et al [14], Manivannan et al [12] and Murugappan et al [13].

In our study, Maximum number of patients presented late >24 hrs (66%) which corresponds well with other studies such as Batra P [11] et al (66.20%) and Chatterjee [8] et al (62%).

In our study, analysis of risk factors were done, factors such as cardiovascular system, blood pressure, hemoglobin, blood urea, serum potassium, operative complexity, multiple procedure, presence of malignancy, mode of surgery were found to be significant. Additional factor perforation to operation time was included in our study and found to be significant.

Comparison of observed and POSSUM predicted mortality rates and morbidity rates were done using linear analysis. An observed to expected ratio (O: E) for mortality was 1.020 (there was no significant difference between the predicted and observed values) ($p = 0.980$) and for morbidity was 0.997 (there was no significant difference between the predicted and observed values) ($p = 0.893$). Chatterjee et al [8] noted the similar results of O:E ratio of mortality and morbidity was 1.005 and 1.001 respectively and same results obtained by Kumar A et al [9] O:E ratio of mortality and morbidity to be 1.005 and 1.001 respectively. Vishwani A [15] et al found that POSSUM scoring system is reasonably good predictor of mortality (O:E = 0.6) and morbidity (O:E = 0.7) using exponential and linear analysis respectively. Similar finding was obtained by Prytherach DR [16] et al (O: E = 0.9), Sagar PM [17] et al(O: E = 0.87) and Parihar V [18] et al(O: E = 0.97).

Studies	Male preponderance	Commonest site of perforation	Commonest complications	Mortality rate	O:E ratio for mortality	O:E ratio for morbidity
Present study	72%	Pre-pyloric (gastric) 48%	Multiple infections 30%	20%	1.020	0.997
Chatterjee et al ⁽⁸⁾	88%			18%	1.005	1.001
Kumar A et al ⁽⁹⁾		Duodenal 48%	Multiple infections 30%	18%	1.005	1.001
Gurjar et al ⁽¹⁰⁾	68.5%	Pre-pyloric (gastric) 53%	Wound infection	17.40%		
Batra P et al ⁽¹¹⁾	88%	Gastro-duodenal 80%	Fever	5.70%		
Manivannan et al ⁽¹²⁾	87%	Duodenal 75%	Wound dehiscence	4%		
Murugappan et al ⁽¹³⁾	88.5%	Pre-pyloric (gastric) 58%	Wound infection			
Manikanta et al ⁽¹⁴⁾		Gastro-duodenal 66%	Wound infection	5.7%		
Vishwani A et al ⁽¹⁵⁾					0.6	0.7
Pyrtherach DR et al ⁽¹⁶⁾					0.9	
Sagar PM et al ⁽¹⁷⁾					0.87	
Parihar V et al ⁽¹⁸⁾					0.97	

Limitations Of The Study

A small size is the limitation of the study. Factors such as Glycemic status, Hypoalbuminemia and duration of surgery was not included in the study which also plays a major role in postoperative adverse outcomes.

CONCLUSIONS

Possum scoring system is better since it includes both physiological and operative parameters and can be used as a significant tool for predicting outcomes in perforated peritonitis. Depending on the scoring system, patients attending can be counseled preoperatively and prior correction of risk factors can be done. Strict vigilance and prompt adjustment of the verified parameters can improve the patient's overall health and decrease morbidity and mortality. Widespread awareness and education about perforated peritonitis, early referrals, early diagnosis, and prompt treatment must be implemented to shorten the duration of perforation to operation time.

ACKNOWLEDGEMENTS

I want to acknowledge the efforts taken by the entire team for working hard towards this article.

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