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STUDY OF EPIDEMIOLOGY OF PERFORATIVE PERITONITIS IN A TERTIARY CARE HOSPITAL AND THE ROLE OF POSSUM SCORING IN PREDICTING OUTCOMES.

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Abstract:

An observational study was conducted in a tertiary care hospital to assess the efficacy of the Physiological and Operative Severity Score for the enumeration of Mortality and Morbidity (POSSUM) scoring system to predict mortality, morbidity in patients undergoing laparotomy for perforative peritonitis from January 2016 to December 2017. 50 patients meeting the inclusion criteria were included in the study and the results were evaluated using chi-square test, P-value. Several scoring systems (eg, APACHE II, SIRS, multiple organ dysfunction syndrome [MODS], Mannheim peritonitis index) have been developed to assess the clinical prognosis of patients with peritonitis. Most of these scores rely on certain host criteria, systemic signs of sepsis, and complications related to organ failure. Although valuable for comparing patient cohorts and institutions, these scores have limited value in the specific day-to-day clinical decision-making process for any given patient.

In our study, age group, sex ratio, presenting complaints, finding on examination, radiological finding, co-morbidities, peritoneal soiling, site of perforation, procedure performed, complications, co-relation between site of complication and perforation, morbidity and mortality rates were taken into consideration and the efficacy of POSSUM was evaluated and was compared with the predicted morbidity and mortality rates.

We concluded that POSSUM scoring is effective in predicting the risk of morbidity & mortality in patients undergoing laparotomy for perforative peritonitis.

Keywords: Perforative peritonitis. POSSUM, evaluation

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 in spite of the advances in treatment. 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 intra abdominal 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.

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

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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.

In 1991, Copeland GP et al 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, each divided 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 aim of the present study is to assess the efficacy of the POSSUM SCORING SYSTEM to predict mortality and morbidity in patients of peritonitis undergoing laparotomy.

MATERIALS AND METHODS:-

This is an observational study conducted in a tertiary care hospital from January 2016 to December 2017. 50 patients were included in the study and the results were evaluated using chi-square test, P-value. All patients with signs and symptoms of peritonitis undergoing laparotomy; patients with established peritonitis following hollow viscus perforation; patients with intra-peritoneal abscess due to hollow viscus perforation were included in the study. Patients with age 12 years and below; patients with primary peritonitis due to alcoholic cirrhosis, nephrotic syndrome, cardiac failure or systemic lupus erythematosus; patients with significant immunosuppression (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) were excluded from the study.

Methods:

All patients in whom diagnosis of perforative peritonitis was made based on clinical signs and symptoms and radiological investigations and undergoing laparotomy were included in the study. Detailed clinical history and examination findings were recorded in a predesigned proforma. Radiological confirmation as done with x-ray abdomen (erect) and chest were recorded. Occasional patient with unclear diagnosis on x-ray (and stable vitals) were subjected to ultrasonography/ CECT, the findings of which were recorded. All routine biochemical blood investigations were recorded. All patients were managed as per standard hospital protocols. On admission 2 wide bore i.v cannulas were put and adequate fluid resuscitation started. Appropriate i.v antibiotics (usually 3rd generation cephalosporins +/- aminoglycoside) were given. Strict input / output monitoring was done. CVP monitoring was done as indicated. Continuous Ryle's tube aspiration was done. After initial resuscitation all patients were posted for exploratory laparotomy.

POSSUM score was calculated following resuscitation; immediately pre-operatively. Operative findings for all patients were recorded, noting the site of perforation and operative procedure performed (primary closure/ resection-anastomoses/ stoma),

peritoneal soiling, presence of any malignancy and amount of blood loss. Post-operatively, the patients were followed up till discharge (after ensuring return of bowel function and absence/ resolutions of complications)/ 30days (whichever is longer) and complications recorded including death; secondary peritonitis; wound infection; wound dehiscence; pneumonia; septicaemia ; respiratory failure; anastomotic leak; deep vein thrombosis and pulmonary embolism; urinary tract infection. Data collected was analysed using chi-square test and P-value for statistical significance in the difference of outcomes observed and predicted. If P-value was > 0.05, it indicated no statistically significant difference between the observed and predicted outcomes thereby meaning that the scoring system was effective in predicting the outcomes and vis-a-versa.

OBSERVATION

In our study we found –

Table 1: Age Distribution

AGE GROUP	NO. OF PATIENTS
13-15	3 (6%)
16-30	13 (26%)
31-45	20 (40%)
46-60	7 (14%)
61-75	(12%)

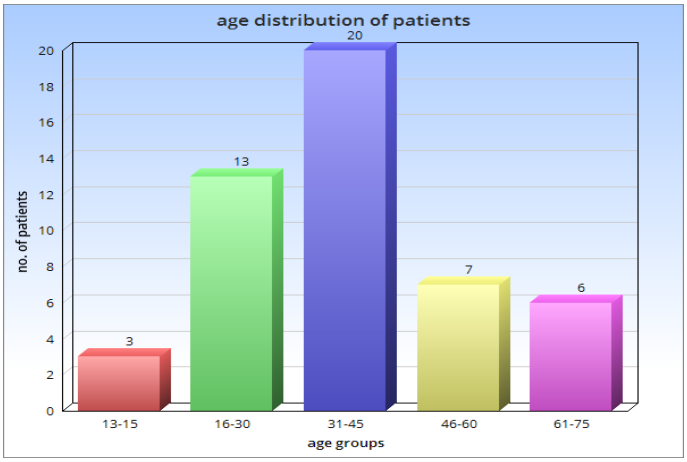
Majority of patients (40%) were in the age group of 31-45yrs.

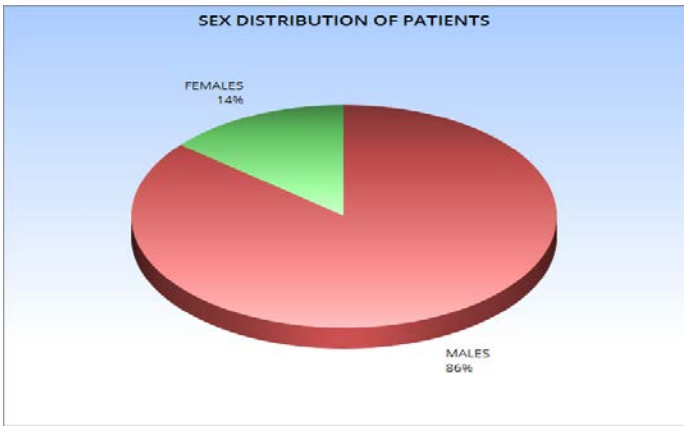
66% patients were in the age group of 16-45 yrs.

Table 2: Sex Distribution

SEX DISTRIBUTION	NO. OF PATIENTS
MALE	43 (86%)
FEMALE	7 (14%)

Male: Female ratio = **6.14 : 1**





PATIENT SYMPTOMATOLOGY:

Table 3: Presenting Symptoms

SYMPTOMS	NO. OF PATIENTS
PAIN IN ABDOMEN	50 (100%)
NAUSEA- VOMITING	30 (60%)
OBSTIPATION- CONSTIPATION	47 (94%)

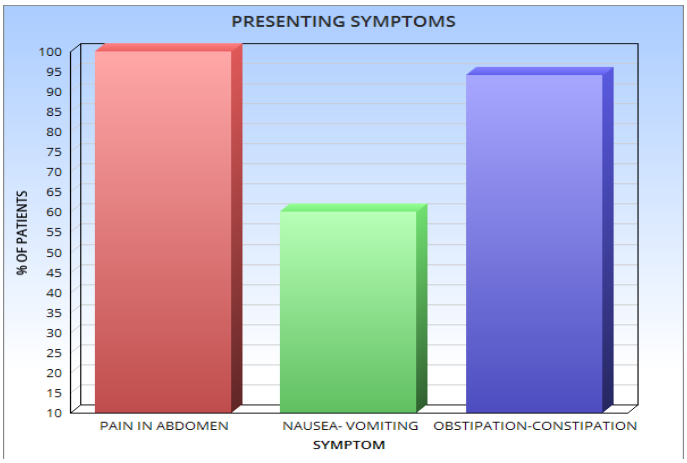
Table 4: Clinical Signs

SIGNS	NO. OF PATIENTS
ABDOMINAL TENDERNESS	50 (100%)
GUARDING	34 (68%)
RIGIDITY	5 (10%)
ABDOMINAL DISTENSION	17 (34%)
FEVER	16 (32%)
TACHYCARDIA	20 (40%)
COLD EXTREMITY	5 (10%)
OLIGURIA	8 (16%)

Abdominal pain and tenderness was the consistent finding in 100% of patients.

Table 5: Radiological Findings

RADIOLOGICAL FEATURES	NO. OF PATIENTS
GASS UNDER DIAPHRAGM ON X-RAY	39 (78%)
GASS UNDER DIAPHRAGM AFTER RT INSERTION	6 (12%)
NO GAS UNDER DIAPHRAGM	5 (10%)



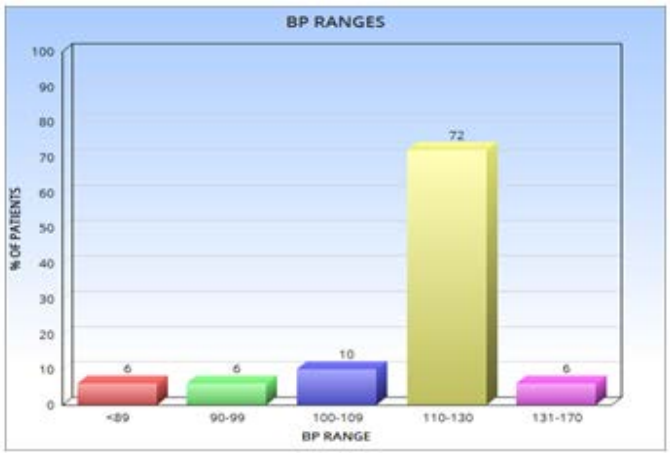
POSSUM PARAMETERS:

CARDIO-VASCULAR and RESPIRATORY STATUS

16% of patients were hypertensives.

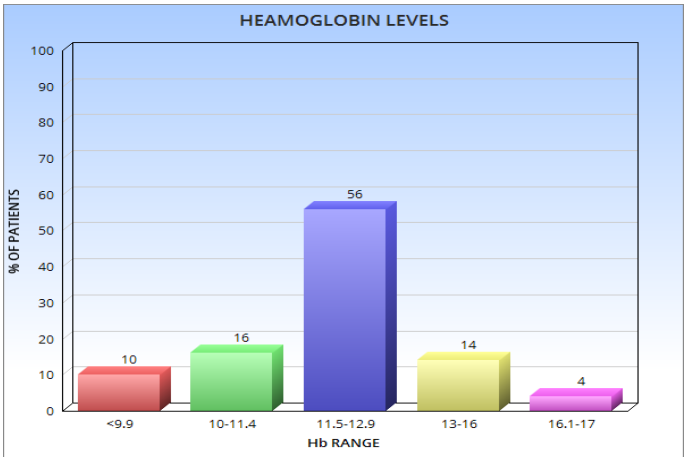
16% of patients had dyspnea.

BLOOD PRESSURE RANGE

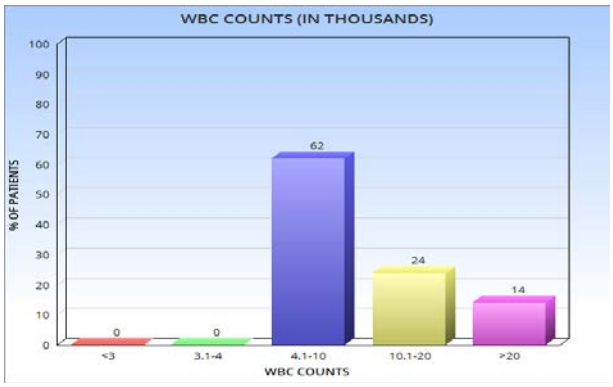


Majority of the patients (72%) had BP stabilised in the range of 110-130mm of Hg (after adequate fluid resuscitation).

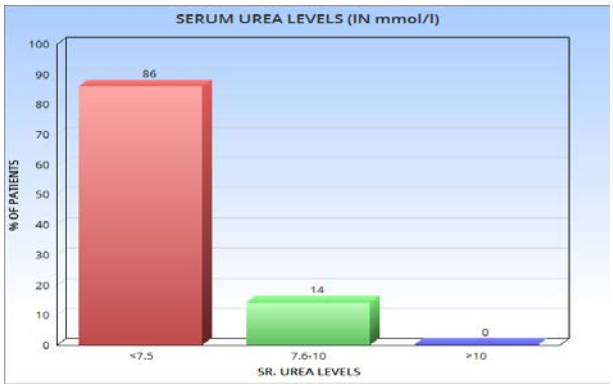
HEAMOGLOBIN LEVELS*:*



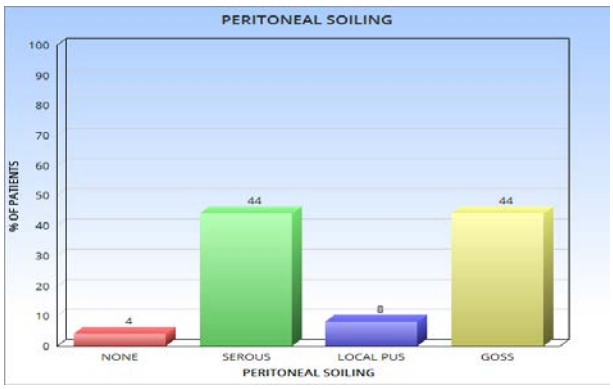
WBC COUNTS



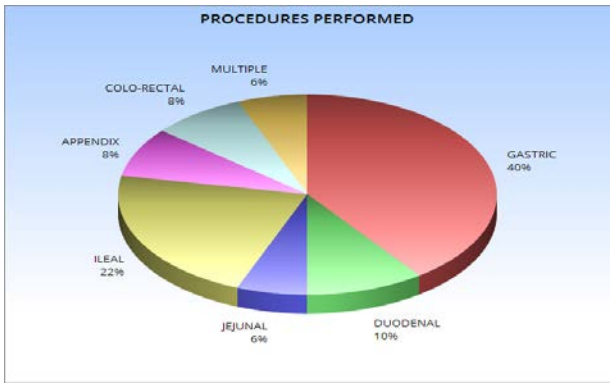
SERUM UREA LEVELS



PERITONEAL SOILING

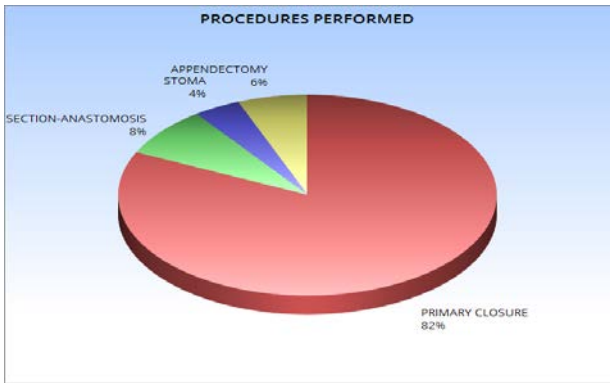


SITES OF PERFORATION:



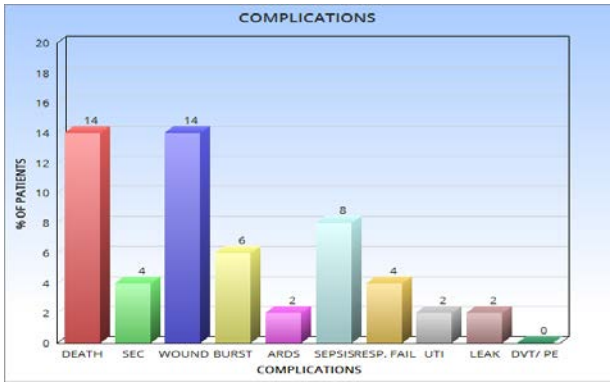
Gastric perforations were the most common finding (40%) followed by ileal (22%).

PROCEDURES PERFORMED:



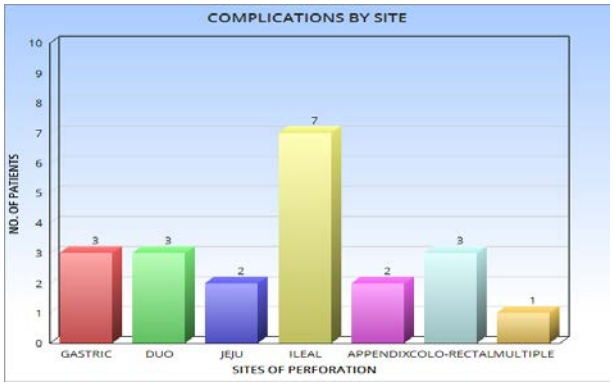
Majority (82%) of the patients were managed by primary closure, 8% required resection and anastomosis.

COMPLICATIONS:



Wound infections were the most common complication (14%) followed by sepsis (8%). Crude mortality rate was 14%.

COMPLICATIONS BY SITE:



Maximum complications were found in patients with colo-rectal perforation (75%) followed by jejunal (66.66%) and ileal (63.63%).

Table 6: Comparison between observed and possum prediced mortality and morbidity:

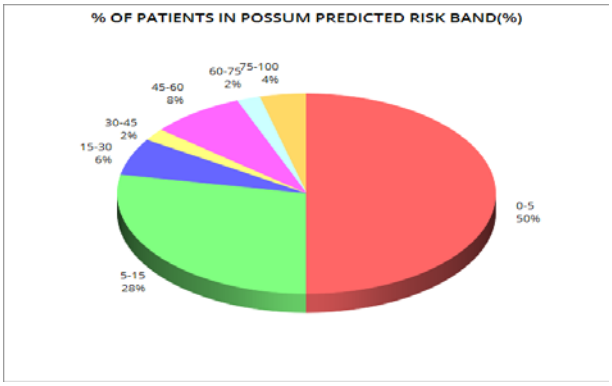
MORTALITY

OBSERVED (O)	POSSUM CALCULATED (E)	O/E	CHI-SQ	P
7 (14%)	6.81	1.02	0.005	0.94 (> 0.05)

MORBIDITY

OBSERVED (O)	POSSUM CALCULATED (E)	O/E	CHI-SQ	P
21 (42%)	13.85	1.51	3.69	0.054(>0.05)

POSSUM PREDICTED RISK BANDS FOR MORTALITY:



50% patients were in the low (0-5) risk band. 36% in the intermediate (5-45) risk band. 14% in the high (45-100%) risk band.

Table 7: Observed and predicted mortality and morbidity in different risk bands:

RISK GROUP	NO OF PT (MORTALITY RISK GROUP)	MORTALITY (OBSERVED)	MORTALITY (EXPECTED)	CHI-SQ	P	NO OF PT (MORBIDITY RISK GROUP)	MORBIDITY (OBSERVED)	MORBIDITY (EXPECTED)	CHI-SQ	P
0-5	25	0	0.93	0.93	0.33	0	0	0	0	1
5-15	14	0	0.98	0.98	0.32	1	0	0.1	0.10	0.7
15-30	3	1	0.73	0.09	0.70	23	2	4.9	1.71	0.19
30-45	1	0	0.40	0.40	0.50	10	7	4.2	1.86	0.17
45-60	4	3	1.4	1.82	0.17	3	0	2.0	2.00	0.15
60-75	1	1	0.6	0.26	0.61	4	3	1.72	0.83	0.36
75-100	2	2	1.77	0.02	0.88	9	9	0.93	0.009	0.92

Difference in observed and POSSUM predicted mortality and morbidity in each risk group is statistically insignificant (P-value > 0.05), thereby concluding that, the POSSUM scoring is accurate in predicting the risk of morbidity and mortality in patients undergoing surgery for perforative peritonitis.

DISCUSSION:

In our study performed at a tertiary care hospital over a period of 2 years our observations were as follows-

The incidence of patients presenting with perforative peritonitis was found to be maximum in the age group of 16-45 yrs (40% were between 31-45 yrs). Similar results can be found from several other studies conducted elsewhere. Males were found to be more affected than females (6.14:1). Pain in abdomen was the most consistent presenting complaint in all patients (100%), other important complaints being obstipation-constipation and nausea-vomiting. Tenderness was the most consistent finding on examination (100%), other important findings being guarding and tachycardia. Gas under diaphragm was seen on erect x-ray chest and abdomen in majority of patients (78%) and was the only diagnostic test performed, 20% (stable) patient required additional investigation (Ultrasonography of abdomen and pelvis), while 1 (unstable) patient was diagnosed at laparotomy. In our study, 16% patients were hypertensive and 2% had COAD.12% patients developed dyspnea and 14% patients developed impaired renal function. Equal proportion of patients (44%) had minimal (serous) and gross (bowel content) peritoneal contamination. Peritoneal soiling has been evaluated as an individual risk factor for adverse outcomes in multiple studies. The site of perforation for majority of the cases was gastric perforations (40%) followed by ileal perforations(22%).Variable observations are found in different studies with regards to the most common site of perforation. This may be due to regional variation in prevalence of diseases like enteric fever. Primary closure of perforation was required in majority of patients (82%) while fewer patients required resection-anastomosis/ stomas.

In our study majority (82%) of the patients who had small perforations, were adequately

resuscitated pre-operatively, had good bowel vascularity and healthy ulcer margins, the intra-abdominal infection was deemed controllable by thorough peritoneal lavage and closure was anticipated to be without tension were treated with primary closure. 8% patients with larger perforations or where the ulcer margins were unhealthy or closure was anticipated to be under tension were treated with primary resection and anastomosis. Diverting stomas were made in patients.4% unstable patients underwent primary stomas. Wound infection was the most commonly observed complication (14%).Complication rate was highest in patients with colo-rectal perforation (75 %) followed by jejunal (66.66%) and ileal (63.63%). Crude morbidity rate of in the study was 14% while crude mortality rate was 42%. On evaluating the efficacy of POSSUM scoring, there was no statistically significant difference between observed and POSSUM predicted morbidity and mortality (P-value > 0.05).

POSSUM was found to be a good predictor of morbidity and mortality in our study.

Fewer studies are available which have evaluate the role of POSSUM scoring in patients undergoing surgery for perforative peritonitis. These include-

Pooja Batra et al [1] : sensitivity- 100%, specificity-72.29%, NPV- 1, PLR- 3.57, NLR-0. Predictive ability was seen with higher scores. POSSUM is easier, faster and accurate in predicting morbidity and mortality. Prasan Kumar et al [2]: no difference was found in the observed and expected (POSSUM predicted) morbidity andmortalty. Mohil RS [3] : there is a need to validate POSSUM in Indian scenario where problems like delayed presentation and limited resources can affect the outcome even with adequate quality care. May S [4] : no difference was noted in the observed and expected motality rates in the higher risk groups (O : E = 0.66). Kumar P [5] validated POSSUM score in enteric perforation peritonitis and concluded that POSSUM is a good predictor of morbidity (O:E = 0.85) and over predicts mortality (O:E = 0.47). MohdZiaulHaq [6] : POSSUM is a good risk adjusted surgical tool for predicting morbidity and mortality in patients undergoing surgery for perforative peritonitis. Bravo JA [7] : Having 30-day mortality as an end point variable, the expected (or POSSUM calculated) deaths were not significantly different from the observed or actual number of deaths in all the patients undergoing emergency gastro-intestinal surgery. Ambrish et al [8] : no significant difference was observed in the observed and expected morbidity and mortality. Prytherih et al [9]: On analysis we found no statistical difference between observed and expected mortality rate. (O:E = 0.9). Sagar PM et al [10] : On analysis we found no statistical difference between observed and expected mortality rate. (O:E = 0.87) Parihar V [11] : On analysis we found no statistical difference between observed and expected mortality rate. (O:E = 0.97) Koray Das [12] : compared Apache II, POSSUM and SAPS II scoring system and found POSSUM scoring system reliable for prediction of overall hospital stay. Kumar S [13] : POSSUM scoring was found to be a good predictor of morbidity but over-predicted mortality in patients of perforative peritonitis due to enteric fever. Muruganappa et al [13] : POSSUM is an excellent score for predicting mortality. POSSUM and Sepsis scores are excellent (accuracy > 97%) but slightly low PPV and over-predicted morbidity. POSSUM is easier to calculate than sepsis score. Neary WD [14] : POSSUM is an accurate tool for audit in emergency surgery. D Chaubey [15] : POSSUM was accurate in predicting morbidity and mortality. Tekkis PP [16] : POSSUM has generally over-predicted morbidity significantly when linear method of analysis was used, and though over-prediction of morbidity was insignificant with exponential method of analysis, (O:E = 0.98). Mannivannal et al [17] : POSSUM out-performed APACHE-II in predicting morbidity and mortality in perforative peritonitis. Viswani et al [18] : studied the efficacy of POSSUM in predicting mortality and morbidity in patients of peritonitis undergoing laparotomy in 89 patients in single surgical unit and 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. Teleanu G et al [19] : validated POSSUM in 58 patients and concluded that it has prognostic value for patients with abdominal sepsis in colonic peritonitis. K Mado et al [20] : APACHE and POSSUM are equivalent .

Few studies have shown contrary results.

M Ishizuka et al [21] : MPI as the most useful as compared to POSSUM, SOFA, and APACHE II. S Bindo et al [22] : Bindo et al., who described their own PSS system comprising age, severity of peritonitis, ASA, presence of immunodeficiency, and presence of ischemia, reported that ASA was the most useful method. Kirata DL et al [23] : POSSUM predicts mortality better, it predicts morbidity but statistically insignificant. Tetsuo Sumi et al [24]: evaluated the individual variables of the POSSUM score. Factors in the POSSUM Physiological Score (PS) that showed significant differences were age (p ¼ 0.001), respiratory signs (p ¼ 0.004), chest radiographic findings (p ¼ 0.019), urea level (p ¼ 0.001), pulse (p ¼ 0.001), systolic blood pressure (p ¼ 0.002), and total score (p ¼ 0.001). For the OSS, these factors were peritoneal soiling (p ¼ 0.002) and total score (p ¼ 0.001).

There was also a significant difference in total scores for POSSUM, SOFA, and MPI, suggesting that these prognostic methods accurately reflect the prognosis of patients undergoing surgery for colorectal perforation.

CONCLUSION:

There was no statistically significant difference between observed and POSSUM predicted morbidity and mortality (P-value > 0.05).

Thus POSSUM scoring is a good predictor of morbidity and mortality in patients undergoing surgery for perforative peritonitis.

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