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"Evaluation Of P-Possum Scoring System In Patients With Acute Abdomen "

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ABSTRACT

Introduction :

Acute abdomen presents as the most challenging symptom in the clinical scenarios across all specialities. The challenges faced are not only in diagnosis but also in the treatment and further prevention of similar episodes. This study was undertaken to assess the validity of P-POSSUM Scoring System as a tool for predicting mortality and morbidity in patients admitted with acute abdomen in our institution.

Aims :

- To evaluate the accuracy of predictions of mortality and morbidity by the P-POSSUM scoring system in patient with acute abdomen
- To study the effects of the parameters like Intra Peritoneal Drain insertion (prior to definitive surgery) and Drain irrigation on morbidity and mortality.

Materials and methods :

This was a prospective observational study conducted between 1st June 2019 and 31st May 2020 on 210 patients. Using the outcome (dead/alive and complicated / uncomplicated) as a dependent and linear regression equation derived by P-POSSUM variables; predicted and observed rates of morbidity and mortality were obtained and compared using appropriate statistical tests. Then final conclusions were drawn.

KEY WORDS : ACUTE ABDOMEN , P-POSSUM SCORING SYSTEM, INTRA-PERITONEAL DRAIN

I. INTRODUCTION

The term acute abdomen refers to signs and symptoms of abdominal pain and tenderness, a clinical presentation that often requires emergency surgical consultation.[(1)]Peritonitis, the peritoneal inflammation, is one of the frequent causes of acute abdomen and peritonitis secondary to any bowel or other visceral pathology, e.g. hollow viscus perforation is a common indication for exploratory laparotomies performed in all hospitals.

Over the last few decades there is significant decrease in the average mortality rate in post laparotomy cases or any post-operative patients. It has come down to 11.1% from 19.4% according to some studies.[(2)]This might be due to better awareness amongst the public regarding seeking early medical care, recent advances in surgical skills like various peri-operative quality initiatives including early diagnosis and interventions, intensive postoperative care with specialists led approaches. But the mortality due to emergency laparotomies is still high when compared to elective surgeries.[(2)]

Doctors are expected to provide the patients and their relatives, caregivers and attenders, the prognosis of the disease, treatment protocol, potential risks involved and the possible outcomes of the available treatment modalities. Several scoring systems are thus used by the doctors and medical institutions to arrive at theconclusions regarding possible morbidity and outcome. But the search for ideal scoring system with less fallacies is still on. The scoring system should be capable of analysing accurately the risk factors associated with morbidity and mortality reducing the subjective errors amongst various healthcare providers. In 1991 Dr. Copeland, Department of Surgery, Broad green hospital, Liverpool, United Kingdom, developed the Physiological and Operative Severity Score for the enumeration of Mortality and Morbidity(POSSUM) as a method to predict patient's outcome. This score has 12 physiological and 6 operative factors. Depending on severity of abnormality of the factor each of them is assigned a score 1,2,4 or 8 points. The points for each physiological factors are added to give physiological score(PS). Similarly, the total operative score (OS) is obtained by the summation of points of the variables of the OS.[(3,16)]Portsmouth-POSSUM (P-POSSUM) is a modification of the POSSUM system, which uses same

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variables and grading system, but a different equation to provide better results.[11,16]In India, P-POSSUM is being studied with different population subjects and under different surgical practices.

In our study we assessed the validity of P-POSSUM as a tool for predicting mortality and morbidity in patients admitted with acute abdomen and underwent laparotomy in our institution. We added two more variables, first being insertion of intra-peritoneal drain before definitive surgery and second being the irrigation of the intra- peritoneal drain post-operatively in order to evaluate their effects on morbidity and mortality of the patient.

II. AIMS :

- To evaluate the accuracy of predictions of mortality and morbidity by the P-POSSUM scoring system in patient with acute abdomen
- To study the effects of the parameters like Intra Peritoneal Drain insertion and Drain irrigation on morbidity and mortality in post-operative period.

III. MATERIALS AND METHODS :

This was a prospective observational studycarried out on 210 patients admitted in Department of General Surgery, Sanjay Gandhi Memorial Hospital associated with Shyam Shah Medical College, Rewa , Madhya Pradesh. Study duration was between 1st June 2019 and 31st May 2020.

Data collection: All the patients admitted with acute abdomen in the Department of General Surgery through Out-Patient Department (OPD), casualty and transferred from other departments and who fulfilled the inclusion criteria (age >18yrs, non traumatic acute abdomen) were included for the study. They were interviewed by the principal investigator. The patient's detailed information including registration details, brief history about the presenting complaints was taken while simultaneously resuscitating the patient.After pre-operative resuscitation and stabilisation, the nature of the management was informed. The patients were then taken for exploratory laparotomy. Peri- operative details required for the P-POSSUM scoring system were documented. Scores were allotted as per physiological and operative parameters in the study and final expected morbidity rate and mortality rate were calculated and interpreted.

Fig 1 : The Physiological Scoring (as per P-POSSUM Guidelines) are as follows:

Parameters	Scores			
	1	2	4	8
Age (in years)	≤60	61-70	≥ 71	-
Cardiac signs	No failure	Diuretic, digoxin, antianginal or hypertension therapy	Peripheral edema , warfarin therapy	Raised jugular venous pressure
Chest radiography	-	-	Borderline cardiomegaly	Cardiomegaly
Respiratory history	No dyspnea	Dyspnea on exertion	Limiting dyspnea (one flight)	Dyspnea at rest (rate ≥ 30/min)
Chest radiography		Mild COAD	Moderate COAD	Fibrosis and consolidation
Blood pressure - systolic (mmHg)	110-130	131-170 100-109	≥ 171 90-99	≤ 89
Pulse Rate (beats/min)	50-80	81-100	101-120	≥ 121
Glasgow coma score	15	12-14	9-11	≤ 8
Haemoglobin (g/100ml)	13-16	11.5 - 12.9 16.1- 17.0	10.0 - 11.4 17.1 - 18	≤9.9 ≥ 18.1
White cell count ($x10^{12}$/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.

*(COAD - Chronic Obstructive Airway Disease)

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Fig 2 : The Operative Scoring (as per P-POSSUM Guidelines) are as follows:

Parameters	Score			
	1	2	4	8
Operative severity	Minor	Moderate	Major	Major +
No. Of procedures	1	-	2	>2
Total intra-op blood loss(ml)	≤ 100	101-500	501-999	≥1000
Peritoneal soiling	None	Minimal (serous fluid)	Local pus	Free Bowel content, blood or pus
Presence of malignancy	None	Primarily only	Nodal metastasis	Distant metastasis
Mode of surgery	Elective	-	Emergency resuscitation >2hrs* Operation 24 hours after admission	Emergency (immediate surgery <2hrs hours needed)

*Resuscitation is possible even if this period is not utilised

Fig 3 : Few examples of operations included under Operative Severity Score :

minor	moderate	major	Major plus
Excision biopsy of fibroadenoma	appendicectomy	Any laparotomy	Any aortic procedure
Eversion of sac in hydrocele	cholecystectomy	Peripheral bowel resection	abdomino-perineal resection
varicocelectomy	mastectomy	Vascular procedures	Pancreatic or liver resection
Inguinal hernia repair	prostectomy	Major amputations	Oesophago-gastrectomy

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The Physiologicaland the Operative score thus obtained were used in the below mentioned P-POSSUM equations proposed by Portsmouth University:

1. P-P

(3,6,13)

OSSUM equation for morbidity : Ln [R1/1- R1] = - 5.91 + (0.16 x physiological score) + (0.19 x operative score)Where R1 - predicted morbidity risk

(3,6,13)

2. P-POSSUM equation for mortality : Ln [R2/1 -R2] = -9.065 + (0.1692 x physiological score) + (0.155 x operative score)Where R2 = predicted mortality risk.

Definition of complications (In postoperative period) as

(25)

per criteria defined by P-POSSUM Scoring System :

- Chest infection: Production of purulent sputum with positive bacteriological cultures, with or without chest radiograph changes or pyrexia, or consolidation seen on chest radiograph.
- Wound infection: Cellulitis of skin around surgical wound or the discharge of purulent exudates.
- Pyrexia of unknown origin: Any temperature above 37.0°C for more than 24 h after the original pyrexia following surgery (if present), for which no obvious cause could be found.
- Wound dehiscence/ gaping: Superficial or deep wound breakdown.
- Deep venous thrombosis and pulmonary embolus: When suspected, confirmed radiologically by USG doppler, venography or diagnosed at postmortem.
- Impaired renal function: Defined as increase in blood urea >5mmol/L when compared to preoperative levels.
- Anastomotic leak: Bowel content being discharged through the drain, wound or abnormal orifice.
- Septicaemia : Positive blood culture

All recorded observations were analysed. Using the outcome (dead/alive and complicated / uncomplicated) as a dependent and linear regression equation derived by P-POSSUM variables; predicted and observed rates of morbidity and mortality were obtained. The predicted and observed rates were compared. O: E (observed to expected) ratio was calculated. Statistical significance was determined.

IV. OBSERVATIONS AND RESULTS :

Out of 210 patients, death occurred in 34 patients (mortality rate of 16.2%). Total of 42 (20%) patients were females and 168 (80%) individuals were males.Most common indication for emergency exploratory laparotomy was gastric perforation with 74 cases (35.2%).176 (84% of total cases) patients who survived, complications (morbidity) was seen in 78 (44.3%) of the patients. The chest infection (27 cases; 20.6%) and renal failure (21 Cases; 16%) were the most common complications in the post-op period. In our study preoperative risk factors such as pulse rate(p=<0.0001), systolic blood pressure(p=<0.0001), GCS (p=<0.0001), respiratory system dysfunction (p=0.039), ECG changes (p=<0.0001), haemoglobin (p=0.008), serum potassium(p=0.05), blood urea (p=<0.0001) were statistically significant. Intra- operative factors such as total blood loss(p=<0.0001), peritoneal soiling (p=0.009) were statistically significant factors of mortality (*$p \leq 0.05$ = significant). All these risk factors except for serum potassium and peritoneal soiling also had statistically significance for morbidity. CVS signs (p=0.001) and No. Of surgeries (p=0.001) also had significant for morbidity. Out of 210 patients operated, 36 (17.1%) patient's intra-peritoneal drain (IPD) were irrigated with warm saline intermittently. Mortality occurred with 12 (33.4%) such patients and 24 (66.7) patients recovered.(Chi square = 9.41; p value = 0.002). IPD irrigation with normal saline had p value of 0.002 and 0.001 for mortality and morbidity respectively thus it was found to be a statistically significant factor influencing the early recovery of the patient. But pre-operative intra-abdominal drain insertion was found to be statistically insignificant with p values of 0.362 and 0.661 for mortality and morbidity respectively. The mean P-POSSUM score in our study was 45.00. The mean P- POSSUM score amongst patients who survived was 42.5 and patients who died was 57.9. Comparison of observed and P-POSSUM predicted rates was done. An observed to expected ratio (O:E) for mortality was 0.91 and observed to expected ratio (O:E) for morbidity was 0.87. A ratio of 1.00 would indicate good performance; greater than 1.00 indicates under-prediction when compared to the expected and less than 1.00 indicates over-prediction when compared to the expected value.

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TABLE 1 : RISK FACTORS ANALYSIS

Sl no.	Risk factors	Mortality		Morbidity	
		T test	p value *	T test	p value *
1	Age scoring	2.802	0.246	3.506	0.173
2	Pulse Rate	26.768	<0.0001	25.888	<0.0001
3	CVS SIGNS	2.883	0.41	16.733	0.001
4	RS SIGNS	8.341	0.039	24.201	<0.0001
5	ECG	38.711	<0.0001	33.004	<0.0001
6	GCS	46.505	<0.0001	36.925	<0.0001
7	SBP	40.117	<0.0001	26.356	<0.0001
8	Hb	11.769	0.008	7.76	0.05
9	WBC	0.558	0.455	1.66	0.198
10	S. Sodium	4.184	0.242	2.831	0.418
11	S. Potassium	7.804	0.05	2.8	0.424
12	B. Urea	24.642	<0.0001	11.502	0.009
13	Operative severity	0.989	0.32	3.027	0.082
14	Mode of surgery	0.268	0.604	0.372	0.542
15	Total blood loss	19.568	<0.0001	13.841	0.003
16	Peritoneal soiling	11.646	0.009	7.234	0.065
17	No. Of surgeries	1.338	0.247	10.452	0.001
18	Malignancies	1.193	0.275	2.306	0.129
19	IPD Insertion	0.831	0.362	0.193	0.661
20	Drain irrigation	9.41	0.002	10.691	0.001

TABLE 2 : COMPARISON OF OBSERVED AND EXPECTED (O:E) MORTALITY RATES.

Predicted mortality rate	No. Of Procedures	Observed No.	Expected no.	O:E
<10	3	1	1	1.0
10- 20	9	0	0	0
20-30	8	0	0	0
30-40	7	0	0	0
40-50	5	0	0	0
50-60	9	0	0	0
60-70	8	0	0	0
70-80	11	2	3	0.6
80-90	20	4	4	1.0
90-100	130	27	29	0.9
Total	210	34	37	0.91

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TABLE 3 : COMPARISON OF OBSERVED AND EXPECTED (O:E) MORBIDITY RATES

Predicted morbidity rate	No. Of cases	Observed No.	Expected No.	O:E
<10	158	40	47	0.85
10- 20	9	4	6	0.67
20-30	2	0	1	0
30-40	4	2	3	0.67
40-50	2	1	2	0.5
50-60	1	1	0	0
60-70	1	0	0	0
70-80	6	5	5	1.0
80-90	4	4	4	1.0
90-100	23	21	22	0.95
Total	210	78	90	0.87

TABLE 4 : COMPARISON OF MEAN P-POSSUM SCORE AND OUTCOME

Group	No. Of patients	Mean total P-POSSUM score
Alive	176	42.5
Died	34	57.9
Total no.	210	45.00

TABLE 5 : INDICATION OF EMERGENCY PROCEDURE

Sl no.	Indication	No. Of Cases	Percentage
1	Gastric perforation peritonitis	74	35.2
2	Ileal perforation peritonitis	37	17.6
3	Appendicular perforation peritonitis	18	8.6
4	Acute intestinal obstruction with dense adhesions	10	4.8
5	Acute intestinal obstruction with sigmoid volvulus	8	3.8
6	Large bowel perforation peritonitis	7	3.4
7	Acute intestinal obstruction with ileal stricture.	7	3.4
8	Jejunal perforation peritonitis	4	1.9
9	Acute intestinal obstruction with Intussusception	4	1.9
10	Acute intestinal obstruction with koch's abdomen with pyoperitoneum and adhesions	4	1.9
11	Other pathology	37	17.5
	Total	210	100

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TABLE 6 : LIST OF COMPLICATIONS

Sl no.	Type	No. Of cases	Percentage
1	Toxemia	13	10
2	Pyrexia of unknown origin	6	4.6
3	Chest infection	27	20.6
4	Renal failure	21	16
5	DVT/ thrombosis	2	1.5
6	Anastomotic leak	4	3
7	Wound infection	51	39
8	Wound gaping	2	1.5
9	Bed sores	3	2.3
10	Fistula formation	2	1.5

V. CONCLUSION :

The P-POSSUM scoring system has close fit prediction in the extremes (extremely low-risk and extremely high-risk groups) of mortality risk groups. P-POSSUM is a good predictor of morbidity in high risk groups but it slightly over-predicts in low risk groups. Thus P-POSSUM appears to be an effective and valid index for prediction of morbidity risk and mortality (surgical outcome) in the Indian population. Also, intra-peritoneal drain irrigation and co-morbidities have significant effects on the surgical outcome of the patient; while the pre-operative insertion of peritoneal drain had no statistical significance.

P-POSSUM Scoring system would thus help in optimising and implementing the resuscitative measures. Adequate care can be given in specific high risk groups with targeted interventions; improving quality of care and reducing the medical expenses. So P-POSSUM can be an effective score for high risk cases by predicting mortality and morbidity, for providing better quality of life.

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