

## Mannheim Peritonitis Index in Predicting the Morbidity and Mortality in Patients with Peritonitis due to Hollow Viscus Perforation

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### Abstract

**Objectives of the study:** To evaluate the prognostic value of MPI scoring system in patients with peritonitis due to hollow viscus perforation.

**Materials & Methods:** This study is a clinical, prospective, observational and open study conducted at Rajiv Gandhi Government General Hospital, Madras Medical College, Chennai, during the period from April 2014 to September 2014. The data regarding patient particulars, diagnosis, investigations, and surgical procedures is collected in a specially designed case recording form and transferred to a master chart subjected to statistical methods like mean, standard deviation, proportion, percentage calculation and wherever necessary chi square test for proportion are used.

**Results:** In this study of 100 cases of secondary and tertiary peritonitis were selected. The mean age of patients was 44.89 (SD 16.2) years ranging from 16 to 79 yrs. Majority (50%) of patients had MPI less than 21. 52.5% of patients with MPI score less than 21 developed complications. 45% of patients had complications with MPI score 21 to 27. Complications include minor (wound infection) and major (Respiratory, Renal, Circulatory, Post operative leak) categories. There was no mortality in patients with MPI less than 21, whereas those patients with MPI score more than 29 had the highest mortality rate of 76.9%. Patient with MPI score from 21 to 29 had mortality rate of 23.1%. The outcome of the study is statistically significant by chi-square test with p Value <0.0001.

**Conclusion:** MPI scoring system is simple score to apply; the determination of risk is available during operation and the surgeon can know about the possible outcome and the appropriate management can be decided. The Mannheim Peritonitis Index (MPI) is a useful and simple index which can be effectively used in prediction of outcome of patients presenting with Peritonitis due to Hollow viscus perforation. Key words: Peritonitis, age, duration, Mannheim's peritonitis index.

**Keywords:** MPI Scoring System etc.

### Introduction

With the advances that are being made in many areas of medicine, the surgeon must be familiar with infectious diseases of the peritoneal cavity which has increased in severity and complexity. In addition to the surgical management of secondary peritonitis from gastro intestinal perforation, the practicing surgeon may be called in to manage patient with cirrhosis with infected ascitic fluid as well as patient undergoing peritoneal dialysis with infected dialysis fluid. In addition, there is increasing recognition of a group of patients with persistent intra-abdominal sepsis or tertiary peritonitis in whom infection is associated with multi system organ failure and general depression of immune system. Peritonitis continues to be one of the major infectious

problems confronting the surgeons. Despite the many advances in anti-microbial agents and supportive care, the mortality rate of diffuse suppurative peritonitis remains unacceptably high.

Its causes vary from the one requiring immediate surgical intervention to that requiring conservative management. Its accurate diagnosis and management is a challenge to every surgeon. The complex nature of infections in surgical patients, the multifaceted aspects of treatment, and the increasing complexity of ICU support make evaluation of new diagnostic and therapeutic advances in this field very difficult. Scoring systems those provide objective details of the patient's conditions at specific stages in the disease process aid in understanding these problems. This is important in determining the course, the disease is taking in a particular patient and whether the line of management taken is appropriate or need to be changed.

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The management of peritonitis patients has taken a new turn with the understanding of patho-physiological basis of the disease, the concept of sepsis syndrome and multi-organ failure. The current trend is to recognize these at the earliest and institute aggressive therapy. When the patient has already gone into multi-organ failure, the outlook appears dismal even with intensive critical care. It is here that conservative line of management, as well as newer modalities of treatment such as programmed re-laparotomy and immuno modulation is being tried. Although these newer modalities may be useful, they are expensive. Hence, proper clinical monitoring with optimum number of investigations remain the corner stone of emergency surgery and also for the better use of above methods.

The study is done in 100 patients presenting with peritonitis due to hollow viscus perforation to Emergency OPD, at Rajiv Gandhi Government General Hospital, Chennai, from April 2014 to September 2014.

My study is a clinical, prospective, observational and open study conducted during the period of April 2014 to September 2014.

**Method of collection of data**

The study is done after obtaining a detailed history, complete general physical examination and systemic examination. The patients are subjected to relevant investigations like x-ray erect abdomen, CXR, USG and routine investigations like Hb, TC, urea, creatinine, serum electrolytes.

All investigations and surgical procedures were carried out with proper informed written consent as appropriately. The data regarding patient particulars, diagnosis, investigations, and surgical procedures is collected in a specially designed case recording form and transferred to a master chart subjected to statistical methods like mean, standard deviation, proportion, percentage calculation and wherever necessary chi square test for proportion are used.

**Inclusion criteria**

Patients with clinical suspicion and investigatory support for the diagnosis of peritonitis due to hollow viscus perforation who are later confirmed by intra op findings.

Various aetiologies causing such features include

1. Acid peptic disease,
2. Tuberculosis,
3. Typhoid,
4. Appendicitis,
5. Gangrenous cholecystitis,
6. Malignancy

**Exclusion criteria**

Patients with

1. Hollow viscus perforation due to trauma

2. Associated injuries to other organs
3. Associated vascular, neurogenic injuries
4. Any other significant illness which is likely to affect the outcome more than the disease in study.

**Method of study**

The detail history and proper clinical findings were entered in a proforma case sheet.

Patient was subjected to methodical physical examination to assess his general condition. Local examination of abdomen was done and relevant findings were recorded. Rectal examination was done in all cases, per vaginal examination was also done in female patients.

The required and routine investigations were done to establish the diagnosis. Patients were asked to present themselves for follow up after a specific interval or at recurrence of symptoms.

MPI scoring system was done in all patients and patients were classified those with score less than 21, 21 to 29, and more than 29.

Risk Factors	Weighting if present
1. Age > 50 years	5
2. Female Sex	5
3. Organ Failure	7
4. Malignancy	4
5. Preoperative duration of peritonitis > 24 hr.	4
6. Origin of sepsis not colonic	6
7. Diffuse generalized peritonitis	6
8. Exudate	
Clear	0
Cloudy, Purulent	6
Faecal	12

Definitions or organ failure

Kidney	Creatinine level $\geq 177 \mu \text{ mol/l}$ Urea level $\geq 167 \text{ m mol/l}$ Oliguria $< 20 \text{ ml / h}$ .
Lung	$\text{PO}_2 < 50 \text{ mm Hg}$ $\text{PCO}_2 > 50 \text{ mm Hg}$
Shock (definition according to Shoemaker)	Hypodynamic or Hyperdynamic
Intestinal obstruction (only if profound)	Paralysis $\geq 24 \text{ h}$ or complete mechanical ileus.

$\text{PO}_2$ , Partial pressure of  $\text{O}_2$ ,  $\text{Pco}_2$ , Partial pressure of  $\text{CO}_2$

Preoperatively all patients received supportive treatment for correction of hypotension and electrolyte abnormalities.

During laparotomy, intra-abdominal examination of all organs was made in addition to specific pathology.

Primary closure of hollow viscous perforation, Bowel resection anastomosis, Diversion ostomies was done in cases as appropriate with thorough peritoneal lavage and abdominal drains were kept in all patients.

Post operative period was monitored; intake output charts and vital charts were maintained.

Drains were removed after 48 hours with output less than 30ml.

Sutures were removed on the 7<sup>th</sup> post operative day.

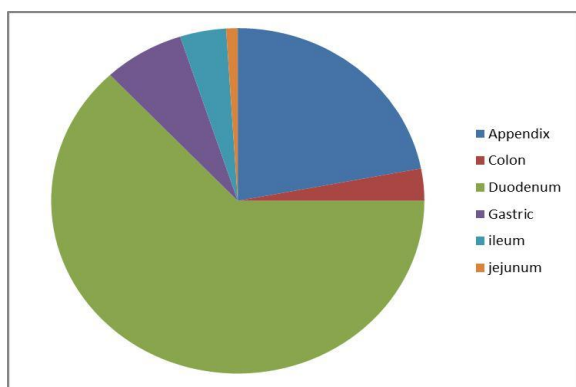
The patients were followed up for a variable period of time.

**Observation and results**

**Table 1** Site of perforation

S.no	Site of Perforation	Frequency	Percent	Valid Percent	Cumulative Percent
1	Duodenum	63	63	63	63
2	Appendix	22	22	22	85
3	Gastric	7	7	7	92
4	ileum	4	4	4	96
5	Colon	3	3	3	99
6	jejunum	1	1	1	100
	Total	100	100	100	

In the study population of 100 subjects, duodenal perforation was seen in 63% of patients, followed by appendicular (22%), gastric (7%) , ileal(4%), Colon(3%) and jejunal(1%) perforation.

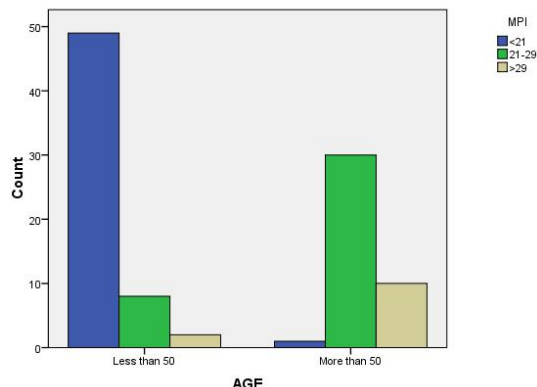


**Chart 1:** Site of perforation

**Table 2** Age and MPI cross tabulation

				MPI			
				<21	21-29	>29	Total
AGE	Not more than 50	Count	49	8	2	59	
	% within		83.10%	13.60%	3.40%	100.00%	
	AGE	% within	98.00%	21.10%	16.70%	59.00%	
	MPI	% of Total	49.00%	8.00%	2.00%	59.00%	
	More than 50	Count	1	30	10	41	
	% within		2.40%	73.20%	24.40%	100.00%	
	AGE	% within	2.00%	78.90%	83.30%	41.00%	
	MPI	% of Total	1.00%	30.00%	10.00%	41.00%	
Total	Count		50	38	12	100	
	% within		50.00%	38.00%	12.00%	100.00%	
	AGE	% within	100.00%	100.00%	100.00%	100.00%	
	MPI	% of Total	50.00%	38.00%	12.00%	100.00%	

In the total study population, among patients younger than 50 years of age 83% had MPI < 21 13.6% had MPI 21-29 and 3.4% had MPI >29 and among patients older than 50 years of age 2.4% had MPI <21 73.2% had MPI 21-29 and 24.4% had MPI >29.



**Chart 2:** Age and MPI Bar chart

**Table 3** Age (yrs) Statistics

N value	100
Mean	44.89
Median	43.5
Range	63
Minimum	16
Maximum	79
Std Deviation	16.201

**Table 4** Sex and MPI Cross tabulation

				MPI			
				<21	21-29	>29	Total
Sex	Male	Count	50				11
	% within		51.00%	37.80%			100.00%
	SEX	% within	100.00%	97.40%	91.70%	98.00%	
	MPI	% of Total	50.00%	37.00%	11.00%	98.00%	
	Female	Count	0	1	1	2	
	% within		0.00%	50.00%	50.00%	100.00%	
	SEX	% within	0.00%	2.60%	8.30%	2.00%	
	MPI	% of Total	0.00%	1.00%	1.00%	2.00%	
Total	Count		50	38	12	100	
	% within		50.00%	38.00%	12.00%	100.00%	
	SEX	% within	100.00%	100.00%	100.00%	100.00%	
	MPI	% of Total	50.00%	38.00%	12.00%	100.00%	

Among the males in the study population, 51% had MPI<21, 37.8% MPI 21-29 and 11.2% >29% and among the females 50% had MPI 21-29 and 50% had MPI >29.

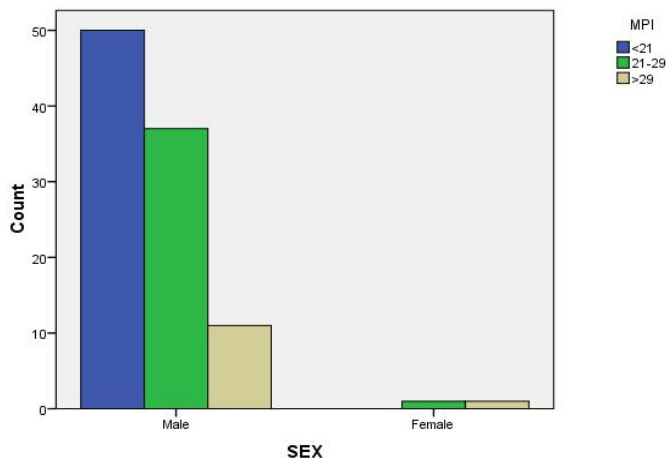


Chart 3: Sex and MPI Bar Chart

Table 4 Duration of peritonitis and MPI score

		MPI				
			<21	21-29	>29	Total
Duration of peritonitis	Not more than 24 hrs	Count	4	4	0	8
		% within duration of peritonitis	50.00%	50.00%	0.00%	100.00%
		% within MPI	8.00%	10.50%	0.00%	8.00%
		% of Total	4.00%	4.00%	0.00%	8.00%
	More than 24 hrs	Count	46	34	12	92
		% within duration of peritonitis	50.00%	37.00%	13.00%	100.00%
		% within MPI	92.00%	89.50%	100.00%	92.00%
		% of Total	46.00%	34.00%	12.00%	92.00%
Total		Count	50	38	12	100
		% within duration of peritonitis	50.00%	38.00%	12.00%	100.00%
		% within MPI	100.00%	100.00%	100.00%	100.00%
		% of Total	50.00%	38.00%	12.00%	100.00%

Peritonitis duration < 24 hours, 50% had MPI <20 and 50% had MPI 21-29 and those with duration >24 hours, 50% had MPI <20, 37% had MPI 21-29 and 13% had MPI >29

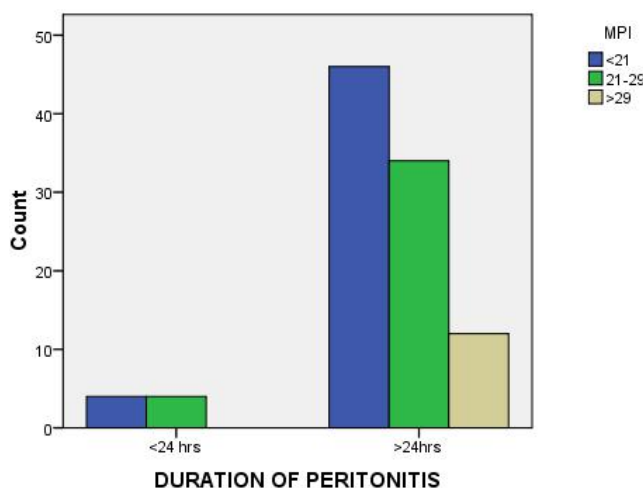
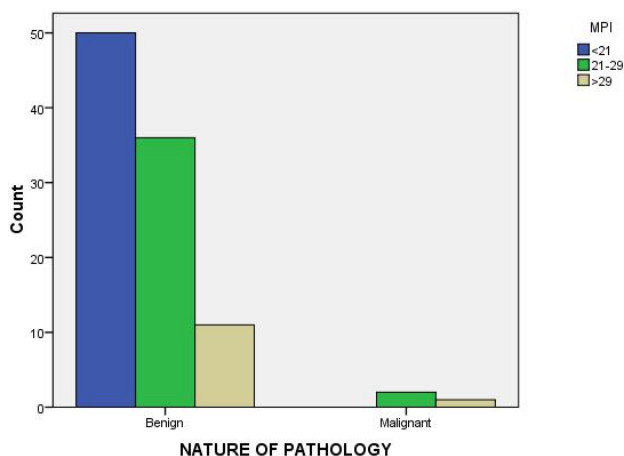


Chart 4: Duration of peritonitis and MPI Bar Chart

**Table 5: Nature of pathology and MPI Cross tabulation**

			Mpi			
			<21	21-29	>29	Total
Nature of	Benign	Count	50	36	11	97
Pathology		% within nature of pathology	51.50%	37.10%	11.30%	100.00%
		% within MPI	100.00%	94.70%	91.70%	97.00%
		% of total count	50.00%	36.00%	11.00%	97.00%
	Malignant	Count	0	2	1	3
		% within nature of pathology	0.00%	66.70%	33.30%	100.00%
		% within MPI	0.00%	5.30%	8.30%	3.00%
		% of total count	0.00%	2.00%	1.00%	3.00%
Total		Count	50	38	12	100
		% within nature of pathology	50.00%	38.00%	12.00%	100.00%
		% within MPI	100.00%	100.00%	100.00%	100.00%
		% of total	50.00%	38.00%	12.00%	100.00%

Among those with benign pathology 51.5% had MPI <21 and 37.1% had MPI 21-29 and 11.3% had MPI >29 and malignant pathology none had MPI <21 and 66.7% had MPI 21-29 and 33.3% had MPI >29



**Chart 5: Nature of pathology and MPI score bar chart**

**Table 7 Nature of exudate and MPI Cross tabulation**

			MPI			
			<21	21-29	>29	Total
Nature of	Cloudy,	Count	50	37	9	96
Exudate	Purulent	% within				
		Nature of Exudate	52.10%	38.50%	9.40%	100.00%
		% within MPI	100.00%	97.40%	75.00%	96.00%
		% of Total	50.00%	37.00%	9.00%	96.00%
	Faeculent	Count	0	1	3	4
		% within Nature of Exudate	0.00%	25.00%	75.00%	100.00%
		% within MPI	0.00%	2.60%	25.00%	4.00%
		% of Total	0.00%	1.00%	3.00%	4.00%
Total		Count	50	38	12	100
		% within nature of Exudate	50.00%	38.00%	12.00%	100.00%
		% within MPI	100.00%	100.00%	100.00%	100.00%
		% of Total	50.00%	38.00%	12.00%	100.00%

Among those with cloudy, purulent exudates 52.1% had MPI <21, 38.5% had MPI 21-29 and 9.4% had MPI >29 and those with faeculent exudates none had MPI <21, 25% had MPI 21-29 and 75% had MPI >29.

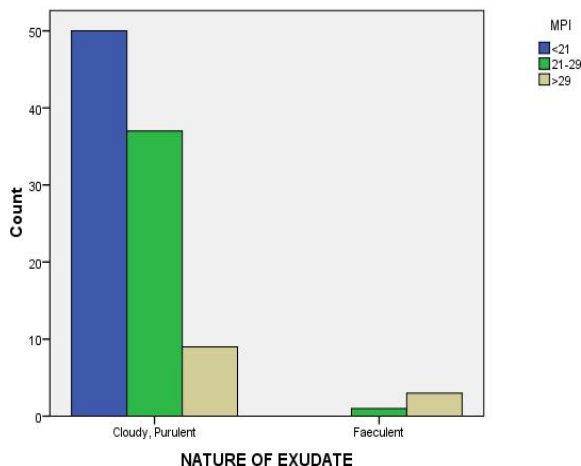


Chart 7: Nature of exudate and MPI Bar chart

Table 8 Final outcome and MPI Cross tabulation

		MPI				
			<21	21-29	>29	Total
Final Outcome	Death	Count	0	3	10	13
		% within FINAL Outcome	0.00%	23.10%	76.90%	100.00%
		% within MPI	0.00%	7.90%	83.30%	13.00%
		% of Total	0.00%	3.00%	10.00%	13.00%
Complication	No	Count	21	18	1	40
		% within final outcome	52.50%	45.00%	2.50%	100.00%
		% within MPI	42.00%	47.40%	8.30%	40.00%
		% of Total count	21.00%	18.00%	1.00%	40.00%
Total	No Complication	Count	29	17	1	47
		% within final outcome	61.70%	36.20%	2.10%	100.00%
		% within MPI	58.00%	44.70%	8.30%	47.00%
		% of Total	29.00%	17.00%	1.00%	47.00%
Total	Total	Count	50	38	12	100
		% within final outcome	50.00%	38.00%	12.00%	100.00%
		% within MPI	100.00%	100.00%	100.00%	100.00%
		% of Total	50.00%	38.00%	12.00%	100.00%

Pearson Chi-Square value - 61.64. p value – 0.0001

Among the total population, 40% had complications, 47% had no complications and 13% had expired. Amongst those who expired there was no patient with MPI <21 23.1% had MPI 21-29 and 76.9% had MPI > 29. Amongst those who had complications 52.5 % had MPI <21, 45% had MPI 21-29, 2.5% had MPI >29. Amongst those without complications 61.7% had MPI <21, 36.2% had MPI 21-29, and 2.1% had MPI >29.

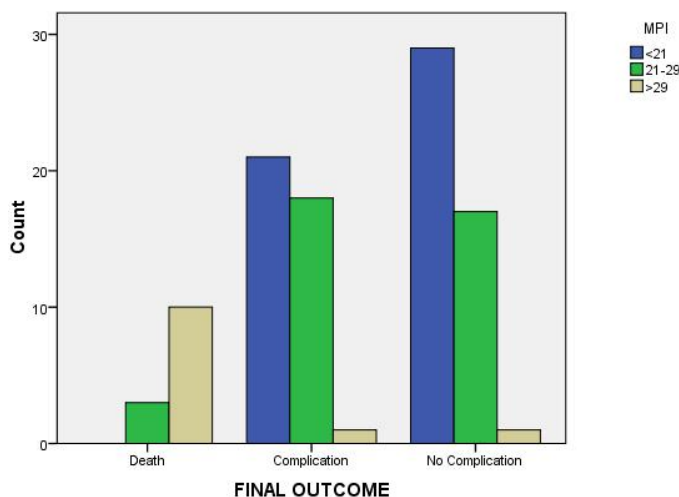


Chart 8: Final outcome and MPI Bar chart

## Discussion

Peritonitis remains a hot spot for the surgeons despite advancements in surgical technique and intensive care treatment. Various factors like age, sex, duration, site of perforation, extent of peritonitis and delay in surgical intervention are associated with morbidity and mortality. A successful outcome depends upon early surgical intervention, source control and exclusive intraoperative peritoneal lavage. Also various methods and scoring systems are used to identify the risks and morbidity and mortality in those patients.

In the present study, hundred cases of peritonitis those attended RGGGH emergency department from April 2014 to September 2014 were included with age ranging from 16 to 79 years. The mean age of the patients was 44.89 (SD 16.2) years. There was male preponderance (98%) in this study and the most common etiology of peritonitis was duodenal perforation seen in 63% of patients, followed by appendicular perforation (22%), gastric (7%), ileal (4%), Colon (3%) and jejunal perforation (1%).

Most patients presented with history of abdominal pain, abdominal distension and fever with varying duration, most (92%) presenting after 24 hours of onset of symptoms. MPI scoring system done in all patients depending on preoperative and intra-operative findings and patients were categorized into three categories those <21, 21 to 29, >29. Majority (50%) of patients had MPI less than 21. 52.5% of patients with MPI score less than 21 developed complications. 45% of the patients had complications with MPI score 21-27. Complications include minor (wound infection) and major (Respiratory, Renal, Circulatory, Post operative leak) categories. There was no mortality in patients with MPI less than 21, whereas those patients with MPI score more than 29 had the highest mortality rate of 76.9%. Patient with MPI score with from 21 to 29 had mortality rate of 23.1%. The outcome of the study is statistically significant by chi-square test with p Value <0.0001. This study is compared to available literature and other studies.

Qureshi AM, Zafar A, Saeed K, Quddus A. et.al. One hundred and twenty-six patients who presented to the department with secondary peritonitis were included in the study. Mortality rate for MPI score > or = 26 was 28.1% while for scores less than 26 it was 4.3%. For MPI scores pound 20 mortality rate was 1.9%, for scores 21-29 it was 21.9% and for score 30 or more it was 28.1%. Chi-square showed significant association between mortality and increasing MPI score ( $p < 0.01$ ). Odd ratios calculated were significant for age > 50 years, malignancy, organ failure, pre-operative duration of peritonitis > 24 hours and cloudy, purulent exudate.

A S Ermolov, V E Bagdat'ev, E V Chudotvortseva, A V Rozhnov. A retrospective analysis of 100 case histories of patients with diffuse peritonitis was made in order to evaluate the prognostic significance of the Mannheim Peritonitis Index (MPI). The patients were divided into 3 groups according to the amount of scores: in the first group (12-20 scores) there were no lethal issues, in the second group (21-29 scores) 42% of the patients died,

100% lethality was noted in the third group when MPI was 30 scores or more.

## Conclusion

- Peritonitis remains a hot spot for the surgeons despite advancements in surgical technique and intensive care treatment. Various factors like age, sex, duration, site of perforation, extent of peritonitis and delay in surgical intervention are associated with morbidity and mortality.
- Duodenal perforation is the most common etiology of peritonitis followed by appendicular perforation, gastric, ileal, Colon and jejunal perforation in this study.
- Males are commonly affected compared to females in this study.
- Emergency laparotomy and primary repair of the hollow viscus perforation is more effective in patients with secondary and tertiary peritonitis.
- In the management of patients with generalized peritonitis, scoring the patients into various risk groups can be beneficial.
- MPI scoring system is easy score to apply, the determination of risk is available during operation and surgeon can know about the possible outcome and the appropriate management can be decided.
- MPI is more effective in predicting the mortality in peritonitis due to hollow viscous perforation.

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