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PREDICTION OF OUTCOME USING THE MANNHEIM PERITONITIS INDEX IN CASES OF PERITONITIS

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ABSTRACT: BACKGROUND: Peritonitis still presents an extremely common & dreaded problem in emergency surgery. Despite aggressive surgical techniques, the prognosis of peritonitis and intra-abdominal sepsis is very poor, especially when multiple organ failure develops. Therefore early objective & reliable classification of the severity of peritonitis and intra-abdominal sepsis is needed not only to predict prognosis & to select patients for these aggressive surgical techniques but also to evaluate & compare the results of different treatment regimens. So, in this prospective study of 60 cases of peritonitis, the reliability of the Mannheim peritonitis index is assessed & its predictive power evaluated. **MATERIALS & METHODS:** This prospective study was carried out in the department of surgery, GMCH, Udaipur from June 2014 to June 2015 after taking the permission from institutional ethics committee. Patients from both sexes of various age groups having peritonitis of varied aetiology & who had undergone laparotomy were taken. A detailed history, thorough clinical examination & necessary investigations were performed in each case according to planned proforma. After resuscitation laparotomy was done & operative findings were noted carefully and a proper note on the progress of each patient was maintained and any complications encountered were noted. So, early classification of patients presenting with peritonitis by means of objective scoring system was done to select patients for aggressive surgery & overall morbidity & mortality were analyzed. **RESULTS:** Total 60 patients of peritonitis were examined and common causes were peptic (61.6%), typhoid (21.6%) and appendicular (8.3 %). Most common age group was found to be 21 to 50 years and male to female ratio was 4:1. Peritonitis was more common in patients involved in hard work and chronic Bedi smokers (61.6%). About 46% of patients who presented for treatment within 48 hours of onset of illness mortality was 0% compared to 25% in those who presented after 8 hours. Overall mortality rate was 13.3%. It was highest in the 2nd decade (25%) followed by the 5th, 6th, 7th decade (16.6% each) of life. Mortality steadily increased with increased in Mannheim peritonitis index score. For patients with a score less than 21 the mortality rate was 0%, for score 21-29 it was 14.2 % and for score greater than 29 the mortality rate was found to be 50%. Patients with a score less than 26 the mean mortality rate was 2.3% and for score greater than 26, it is 38.8%. For a threshold index score of 26, the sensitivity was 87.5% and specificity was 78.8% in predicting death. **CONCLUSION:** This study reaffirms the value of the Mannheim Peritonitis index in identifying high risk patients with peritonitis.

KEYWORDS: Peritonitis, Mannheim peritonitis Index, Peritonitis scoring system.

INTRODUCTION: Peritonitis is defined as inflammation of the peritoneal cavity, caused by a number of etiologic agents including bacteria, fungi, viruses, chemical irritants, and foreign

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bodies. The sequence of both local and systemic events than occurs following the peritoneal insult represents a relatively constant response to a variety of injurious agents. However, the clinical aspects, specifically, the management of peritonitis is influenced significantly by the aetiology of the infective process (Hiyama et al 1997).¹

Peritonitis, of whatever origin, still presents an extremely common and dreaded problem in emergency surgery. The incidence in the underdeveloped world is not very low and the delay in presentation due to various socio-economic reasons enormously affects the outcome. In all age-groups it carries a high morbidity and mortality, but particularity in middle & advanced years. Various diagnostic measures helped the clinician to institute treatment without delay but many a time, the diagnosis is not so easy.

Conventional methods of management include pre-operative resuscitation, operative treatment, followed by a period of nasogastric suction, intravenous therapy to maintain adequate hydration and to correct the electrolyte imbalance until the period of paralytic ileus has resolved, the use of systemic antibiotics, and in the more severe cases showing evidence of circulatory collapse the judicious use of blood transfusion and vasopressors.

The respected aphorism that states that the diagnosis of peritonitis is made by clinical evaluation remains true today. Abdominal pain is almost universally the predominant symptom, which is constant, burning and aggravated by movement in fully established peritonitis. Others are anorexia, nausea, vomiting, thirst and oliguria. Systemic signs included fever, diaphoresis, tachycardia etc., while focal signs are tenderness, rebound tenderness, guarding and rigidity. Bowel sounds are usually markedly diminished or absent and abdominal distension is often present.

In general, routine laboratory and radiographic studies often add little specific information in the evaluation of peritonitis. Leukocytosis, with a predominance of immature neutrophil is almost uniformly present. Plain x-ray abdomen in supine may reveal obliteration of the peritoneal fat lines and the psoas shadow indicating the presence of edema. Free intraperitoneal air, indicative of a perforated viscus, may be found on upright abdominal, left lateral decubitus, or upright chest x-ray. Diagnostic peritoneal aspiration from one or more quadrants of the abdomen may be helpful in aetiological diagnosis.

The role of ultrasonography, CT and MIR in peritonitis is limited to those patients presenting with abdominal pain who have no immediate, compelling indication for abdominal exploration.

In case of doubt, early surgical intervention is to be preferred to a "Wait and See" policy.

Despite aggressive surgical techniques such as radical debridement, lavage systems, open management and planned re-operation, the prognosis of peritonitis and intra-abdominal sepsis is still poor, especially when multiple organ failure develops (Bosscha et al, 1997).² Therefore, early objective and reliable classification of severity of peritonitis and intra-abdominal sepsis is needed not only to predict prognosis and to select patients for these aggressive surgical techniques but also to evaluate and compare the results of different treatment regimens.

The benefit of such classification is difficult to evaluate because of the problems in performing randomized studies in patients with this heterogeneous disease. Well-defined objective patient criteria and grading of risk factors are essential for scientific comparison of groups (Billing et al, 1994).³

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Several scoring systems have been developed in the past two decades. The Mannheim peritonitis index is based on data from 1253 patients with peritonitis treated between 1963 and 1979 and was developed by discriminant of 17 possible risk factors (Wacha et al, 1987).⁴ Eight of these were of prognostic relevance and were entered into the current index, with a weighting according to the predictive power. The information is collected during the first laparotomy, enabling immediate classification.

Risk Factor	Weighting if present
Age>50	5
Female sex	5
Organ Failure*	7
Malignancy	4
Preoperative duration of peritonitis> 24 hrs	4
Origin of sepsis not colonic	4
Diffuse generalized peritonitis	6
Exudate – Clear	0
Cloudy, Purulent	6
Faecal	12
Total score	

The Mannheim Peritonitis Index (Billing et al, 1994)³

* Definitions of Organ Failure:

Kidney	Creatinine level	> 177 µmol/L > 2.31 mg/dl_
	Urea level	> 167 mmol/L > 467.78 mg/dl_
	Oliguria	<20 ml/h
Lung	PO ₂	<50 mm Hg
	PCO ₂	>50 mm Hg
Shock	Hypodynamic or Hyperdynamic	
Intestinal Obstruction (Only if profound)	Paralysis > 24 hrs or Complete mechanical ileus	

So, in this prospective study of 60 cases of peritonitis, the reliability of the Mannheim peritonitis index is assessed and its predictive power evaluated.

MATERIALS & METHOD: This prospective study was carried out in the department of surgery, GMCH, Udaipur from June 2014 to June 2015 after taking the permission from institutional ethics committee. Patients from both sexes of various age groups having peritonitis of varied aetiology

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& who had undergone laparotomy were taken. A detailed history, thorough clinical examination & necessary investigations were performed in each case according to planned proforma. All patients were investigated for-

- Hematological - Hb, TLC, DLC, BT, CT.
- Biochemical - B. Sugar, S. Urea and creatinine.
- Urinalysis - Albumin, Sugar and microscopy.

X-ray chest and flat plate abdomen in standing as well as in supine was done for evidence of pneumoperitoneum or other relevant findings.

Diagnostic peritoneal aspiration was done by four quadrant method and the fluid was sent for culture and sensitivity and microscopic examination. Preoperative blood gas analysis was done to measure PO₂ & PCO₂. Special investigations like Widal test, Mantoux test and serum electrolytes were also done whenever indicated. HPE of the tissue from perforation site was done by department of pathology, Geetanjali Medical College, Udaipur.

Immediate treatment was started with intravenous fluids, continuous nasogastric decompression and combination antibiotics usually in the form of ceftriaxone, Gentamycin and metronidazole were given. Foley's catheter was put to assess the urine output per hour. Patients were prepared for emergency operation as early as possible after managing the vital parameters and adequate preoperative hydration.

Laparotomy was done through a standard midline or right paramedian incision. After opening the peritoneum, a careful note of operative findings were made specially origin of sepsis, localized or diffuse generalized peritoneal fluid and pus was sucked out. After closure of the perforation a thorough peritoneal lavage with normal saline and betadine solution was done. Abdomen was closed after putting abdominal drain through a separate incision. Blood transfusion was done whenever needed. A proper note on the progress of each patient was maintained and any complication encountered was noted and managed accordingly.

So, early classification of patients presenting with peritonitis and intra-abdominal sepsis by means of objective scoring system was done to select patients for aggressive surgery and overall morbidity and mortality were analyzed.

RESULTS: The present study was carried out on 60 consecutive patients of peritonitis who were admitted in surgical wards of GMCH, Udaipur. The pertinent observations are as follows:

Table 1: Shows that majority of the patients belonged to the age group 21 to 50 years. The youngest patient was a 12 year old male boy, while oldest was a 72 year old male. There were 78.3% male patients and 21.74% female patients with the male to female ratio being 4:1.

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Table 1. Age and sex incidence

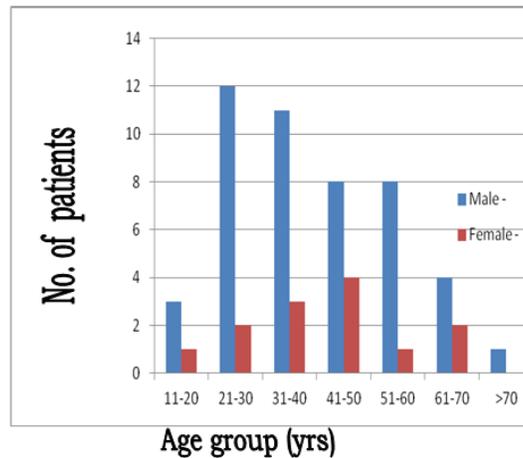


Table 2: Shows those peptic perforations were the most frequent cause of peritonitis (61.6%), follow by enteric perforators (21.6%) and burst appendix (8.3%).

SI. NO.	Cause	No. Of Cases	Stomach	Duodenum	Jejunum	Ileum	Appendix	Colon
1.	Peptic Ulcer	37	1	36	-	-	-	-
2.	Enteric fever	13	-	-	-	13	-	-
3.	Burst Appendix	5	-	-	-	-	5	-
4.	Blunt Trauma	3	1	-	-	1	-	1
5.	Tuberculosis	1	-	-	-	1	-	-
6.	Malignancy	1	1	-	-	-	-	-
	Total	60	3	36	-	15	5	1

Table 2: Causes and Sites of Perforation Peritonitis

Table 3: Shows that majority of the patients (71.6%) presented for treatment within 72 hours of onset of illness.

SI. NO.	Interval	No. of cases	%
1	< 24 hrs	17	28.3
2	25 to 48 hrs	11	18.3
3	49 to 72 hrs	15	25
4	73 to 96 hrs	6	10
5	> 96 hrs	11	18.3
	Total	60	100

Table 3: Interval between Onset of Illness & Hospitalization

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Figure 1: Shows that majority of the patients in the present study were having diffuse generalized peritonitis (91.6%). Among the cases of localized peritonitis 4 belongs to the burst appendix and 1 to the duodenal perforation.

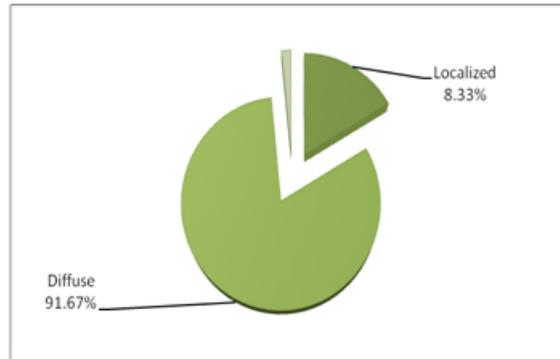


Fig. 1: Incidence of Localized and Diffuse Peritonitis

Figure 2: Shows that most of the patients in the present study were having cloudy/purulent peritoneal exudate (81.6%).

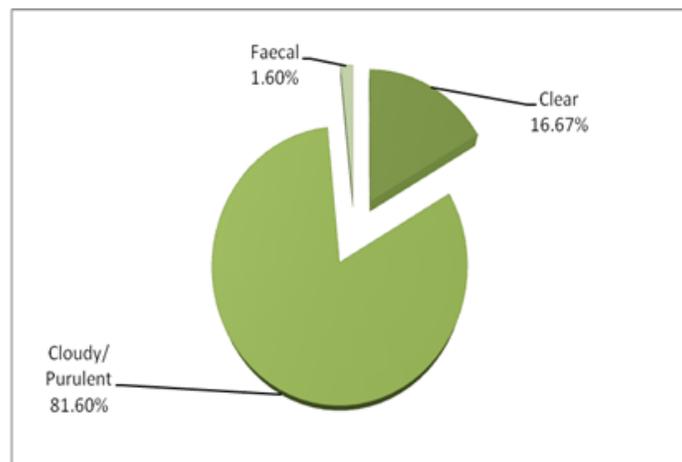


Fig. 2: Character of the peritoneal exudates

Postoperative Complications: The main postoperative complications were sepsis, pneumonitis & shock.

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Figure 3: Shows that in the present study 8 patients had died. Mortality was highest in 2nd decade followed by 5th & 7th decades of life.

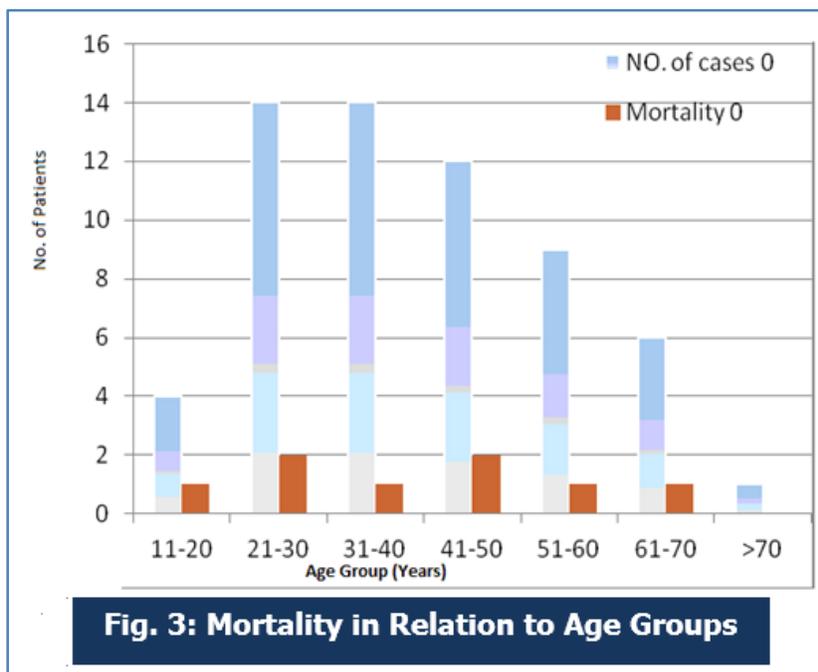


Table 4: Shows that mortality steadily increased with delayed presentation, especially after 48 hours.

Sl. No.	Interval	No. Of Cases	Mortality	%
1.	< 24 hrs	17	-	-
2.	25 to 48 hrs	11	-	-
3.	49 to 72 hrs	15	4	26.6 %
4.	73 to 96 hrs	6	1	16.6 %
5.	> 96 hrs	11	3	27.2 %
	Total	60	8	13.3 %

Table 4: Mortality in Relation to Time Interval Prior to Hospitalization

Table 5: Shows that most of the deaths were due to septicaemia.

Sl. No.	Cause	No. Of Cases	%
1.	Septicaemia	5	62.5
2.	Multiple Organ Failure	2	25
3.	Secondary Haemorrhage	1	12.5
	Total	8	100

Table 5: Mortality Causes

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Table 6: Shows that mortality steadily increased with increased in Mannheim peritonitis index score. For patients with a score less than 21 the mortality rate was 0%, for score 21-29 it was 14.2% and for score greater than 29 it was 50%.

Sl. No.	MPI Score		No. of Cases	Mortality	%
	Categories of Severity	Score			
1	Group I	< 21	24	-	0
2	Group II	21-29	28	4	14.2
3	Group III	>29	8	4	50
	Total	0-47	60	8	13.3

Table 6: Mortality in Relation to MPI score groups

Table 7 shows:

Sensitivity $[a/(a+c) \times 100] = 87.5\%$.

Specificity $[d/(b+d) \times 100] = 78.8\%$.

Predictive value of positive score $[a/(a+b) \times 100] = 38.8\%$.

Predictive value of negative score $[d/(c+d) \times 100] = 97.6\%$.

- For patients with a score less than 26 the mean mortality rate was 2.3% and for score greater than 26 it's 38.8%.
- For a threshold index score of 26, the sensitivity was 87.5%, specificity 78.8% and predictive value of the positive score 38.8% in predicting death.

Sl. NO.	MPI Score	Result		Total
		Expired	Cured	
1.	> 26	(a) 7	(b) 11	(a+b) 18
2.	< 26	(c) 1	(d) 41	(c+d) 42

Table 7: Sensitivity and Specificity for MPI score 26

(a – true positive; b- false positive; c-false negative; d-true negative)

DISCUSSION: Peritonitis is a common surgical problem in this part of the country and requires emergency surgical management. The present study was undertaken on 60 consecutive patients of peritonitis for early prognostic evaluation, selecting high-risk patients; provide objective classification of the severity of disease and to establish the reliability of the Mannheim peritonitis index.

No age is bar for perforation peritonitis to occur. Causes of perforation in newborn were reported by Zamir et al (1988).⁵ Jani et al (2000)⁶ reported 100 cases of duodenal perforation in the age group of 16 to 66 years, with mean age of 38 years, out of which 88% were males. Akgun et al (1995)⁷ reported 267 cases of typhoid perforators in the age group of 3 to 76 years, with a mean age of 27 years out of which 71.9% males. In the present study, majority of the

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patients belonged to the age group of 21 to 50 years, with a mean age of 40 years. There were 78.3% male patients and 21.7 % female patients.

Bhansali (1967)⁸ reported a series of 96 cases of G.I. perforations of which aetiological factors were peptic (48), typhoid (29), tubercular (7), traumatic (6) and others (6). In the present study of 60 cases of peritonitis also, peptic perforation (37) was the commonest cause followed by typhoid (13), appendicular (5), Traumatic (3), tubercular (1) and malignancy (1).

In the series of Bhansali (1967),⁸ Budhraj at al (1973)⁹ and Rao at al (1984)¹⁰, the highest incidence of perforation peritonitis irrespective of aetiology was in the duodenum. In the present study also, duodenum was the commonest site of perforation (60) % followed by ileum (21.6 %).

Boey et al (1982)¹¹ reported the median duration between the onset of illness and hospitalization was 12 hours (range 3 hours to 10 days). In the present study it was 3 days (range 2 hours to 15 days). This is because most of the patients were from far off area where health care facilities and communication were not satisfactory.

Billing et al (1994)³ reported the incidence of diffuse peritonitis in their series of 2003 patients in a multicentre study was 38% to 100% (average 65.2%). In the present study the incidence was 91.6% for diffuse peritonitis and 8.3% for localized peritonitis.

In the present study character of the peritoneal exudate was found to be clear in 16.6% of cases, cloudy or purulent in 81.6% of cases and faecal in 1.6% of cases. Most of the patients were having cloudy or purulent exudate because they presented for treatment very late.

Mortality is influenced by several factors, namely age, sex, organ failure, malignancy, preoperative duration of peritonitis, origin of sepsis, localized or diffuse peritonitis and the character of peritoneal exudate. These factors were included in the present study and the overall mortality was found to be 13.3%. Akgun et al (1995)⁷ reported nearly 4 fold increases in mortality among those admitted after 48 hours. In the present study, mortality was 0% in those who presented within 48 hours of onset of illness and 25% in those who presented after 48 hours. So, mortality steadily increased with delayed presentation. Most of the patients in our series presented late as they were from far off areas where health care was far from satisfactory and communication difficult.

Patients were divided into 3 groups according to the severity of peritonitis score, as group I (score less than 21), group II (score 21-29), and group III (score greater than 29). Billing et al (1994) reported the mortality in these three groups, as 2.3%, 22.5% and 59.1% respectively. In the series of Winkeltan et al (1996),¹² the mortality was 3% in group I, 24% in group II and 33% in group III patients. In the present study the mortality was found to be 0 % in group I, 14.2% in group II and 50% in group III. So, mortality steadily increased with increased in Mannheim peritonitis index score. In the series of Billing et al (1994), the mean (range) Mannheim peritonitis index was 22 (14-26), while in the present study it was 23.3 (8-32). Liverani et al (1998)¹³ reported the mean mortality rate of 2% for patients with a score less than 26 and 40.5% for patients with a score greater than 26. In the present study, for patients with a score less than 26 the mean mortality rate was 2.3% and for score greater than 26, 38.8%. This score is the threshold over which the therapeutic approach has to be aggressive. In the series of Demmel et al (1994),¹⁴ for a threshold index score of 26, the sensitivity was 88% and specificity 78%. Similarity Billing et al (1994)³ reported the sensitivity and specificity of 86% and 74%

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respectively. In the present study, for a threshold index score of 26, the sensitivity was 87.5% and specificity 78.8%.

CONCLUSIONS: This study reaffirms the value of Mannheim peritonitis index in identifying high risk patients with peritonitis. Of the present prognostic scoring systems, the Mannheim peritonitis index is one of the easiest to apply and a determination of risk is readily available during the initial operation. As compared to APACHE II and other scoring systems, Mannheim peritonitis index is a very useful predictor of outcome of peritonitis of any duration, in elderly man with compromised organ system function. So, the Mannheim peritonitis index is a well validated peritonitis specific index but further increase of its prognostic power if desirable.

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