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Is Mannheim Peritonitis Index Needed in Perforation Peritonitis?

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Keywords

Mannheim peritonitis index; Perforation peritonitis; Gastroduodenal perforation; APACHE II; Jabalpur peritonitis index

Introduction

Peritonitis is inflammation of the peritoneum which lines the abdominal cavity. An effective scoring system is essential to prognosticate the outcome in patients with secondary peritonitis, which is one the most common surgical emergencies in the world.

Material and Methods

Prospective Observational Study, conducted at Jawaharlal Nehru Medical College and Hospital, Aligarh Muslim University, Aligarh between November 2017 to October 2019. A total of 498 patients of perforation peritonitis of more than 18 years of age were included in the study.

Results

Total 498 patients of >18 years were included in the study. 377 were males (75.7%) whereas 121 were females (24.3%). Male to female ratio was 3.2:1. Mean age of the patients was 36.8 years. Mortality due to perforation peritonitis was almost twice in females compared to males (31.4% vs 16.18%). The mortality observed in patients having MPI score <21, 21-29 and >29 was 2.59%, 7.11% and 47.37% respectively. Sensitivity of 84.8% and specificity of 77.2% at a MPI score of 28 was observed. Positive predictive value of Mannheim Peritonitis Index was 52% and negative predictive value was 95.4% at score of 28.

Conclusion

Mannheim Peritonitis Index is a simple yet powerful tool to predict the outcome and should be used routinely in patients of perforation peritonitis

Introduction

Many scoring systems have been developed which prognosticate the outcomes of the patient depending upon their condition at presentation to hospital. These scoring systems help clinicians to approach the high-risk patients with more aggressive management and also guides the nature of surgery to be performed in emergency. Having a scoring system also helps treating clinicians to advise regarding possible outcomes. A good scoring system would also help in better comparison of different available treatment strategies.

In 1987 Linder et al constructed Manheim peritonitis Index based on the experience with 1253 patients suffering from purulent peritonitis. 20 risk factors were studied out of which 8 risk factors were found to affect the outcome significantly [1].

Mannheim Peritonitis Index is a simple scoring system and can be used in most hospitals worldwide. Maximum possible score is 47. Total MPI score is calculated and allotted one of the three score groups <21, 21-29 or >29 [1]. The Mannheim Peritonitis Index is shown in Table 1.

This study was conducted to study the Mannheim Peritonitis Index (MPI) in patients with perforation peritonitis and to evaluate the overall outcome of these patients according to Mannheim Peritonitis Index score.

Table1: Mannheim Peritonitis Index

Study Variable	Adverse factor	Points	Favourable factor	Points
1.Age	>50 years	5	< 50 years	0
2.Sex	Female	5	Male	0
3.Organ Failure	Present	7	Absent	0
4.Malignancy	Present	4	Absent	0
5.Evolution time	>24 hrs	4	<24 hrs	0
6.Origin of sepsis	Non-colonic	4	Colonic	0
7 Extension of peritonitis	Generalized	6	Localized	0
8.Character of exudate	Purulent	6	Clear	0
	Faecal	12		

Materials and Methods

This study was conducted at Jawaharlal Nehru Medical College and Hospital, Aligarh Muslim University, Aligarh between November 2017 to October 2019.

It was a prospective observational study.

Patients attending Jawaharlal Nehru Medical College and Hospital Emergency/ OPD with the diagnosis of perforation peritonitis were included.

The Inclusion Criteria for the Study were

1. Age >18 years
2. Patients of perforation peritonitis
3. Patients giving consent for inclusion in the study

The Exclusion Criteria were

1. Patients not giving consent
2. Primary Peritonitis
3. Age <18 years

A detailed history and examination of the patient was recorded at the time of arrival.

History of co-morbid conditions like Diabetes Mellitus, Hypertension, Coronary Artery Disease and Respiratory illness was also taken. History of invasive procedures, drug intake and personal habits were noted. General examination of the patient included the assessment of the vitals i.e. pulse, blood pressure, temperature, Glasgow Coma Scale (GCS) and respiratory rate.

Detailed per abdomen examination of the patient included tenderness, guarding, rigidity and bowel sounds. Systemic examination included the examination of respiratory system, cardiovascular system, urinary system and the central nervous system.

Patients underwent routine biochemical investigations which included blood counts, renal function tests, serum electrolytes, liver function tests and arterial blood gases. Radiological investigations such as x-rays of chest and erect x-ray of abdomen along with ultrasonography of abdomen and pelvis was done. Free air under diaphragm demonstrated by erect x-ray abdomen or pyo-peritoneum demonstrated by ultrasound were recorded. Antibiotics on admission included third generation cephalosporin with Metronidazole. Antibiotics were changed according to culture sensitivity reports. Doses were adjusted according to creatinine clearance in patients with renal insufficiency.

All the patients included in the study underwent exploratory laparotomy.

Intra-operative findings of total blood loss, site and number of perforation, presence of malignancy, peritoneal contamination were noted. Parameters such as wound infection, chest infections, septic shock, MODS and death were noted. Total hospital stay was recorded.

The data regarding the patient's particulars, diagnosis, investigations, surgical procedures and outcome were entered in a prescribed proforma prepared for the study.

Statistical analysis was done using IBM SPSS version 20 (SPSS Inc., Armonk, NY). For continuous variables, mean and standard deviation were calculated and for categorical variables percentage was calculated. Comparison of outcomes was performed by χ^2 (Chi-square) test or Fisher Exact test, wherever applicable. To predict sensitivity and specificity of the MPI scoring system, we draw Receiver operator curve (ROC). $P<0.05$ was considered as statistically significant.

Observation and Results

Maximum number of patients were in 18-25 years of age (33.9%). Mean age of the patients was 36.8 years and median age was 35 years. 364 patients (73.1%) were <50 years of age and 134 patients (26.9%) were ≥50 years of age. (Table 2) of the total 498 patients 377 were males (75.7%) whereas 121 were females (24.3%). Male to female ratio was 3.2:1.

Table 2: Age distribution

AGE DISTRIBUTION	TOTAL		MALES		FEMALES	
	NUMBER	%	NUMBER	%	NUMBER	%
15-25 years	169	33.9	122	72.2	47	27.8
25-35 years	99	19.9	70	70.7	29	29.3
35-45 years	85	17.1	70	82.4	15	17.6
45-55 years	73	14.7	57	78.1	16	21.9
55-65 years	52	10.4	42	80.8	10	19.2
>65 years	20	4.0	16	80.0	4	20.0

Maximum number of perforations were observed in gastro duodenal region in 186 patients (37.3%) and ileum in 185 patients (37.1%). 34 patients (6.8%) had jejunal perforations, 7 patients (1.4%) had Gall Bladder perforation. Appendicular perforation was observed in 46 cases (9.2%), colorectal perforation in 40 (8.1%) patients (caecum in 20,4%; colon in 16, 3.2%; and rectum in 4, 0.8% cases) (Table 3).

116 (23.3%) patients had Mannheim Peritonitis Index Score <21, 211 (42.4%) patients had MPI score of 21-29 and 171 (34.3%) patients had MPI score of >29.

Out of the 498 patients included in the study 399 (80.1%) patients survived the 4 weeks of follow-up, whereas 99 (19.9%) patients expired during the 4 weeks of follow-up (Table 4). Higher mortality (34.3% vs 14.6%) was observed in >50 years aged patients which was statistically significant. (p<0.00001) Among the 377 male patients 61 (16.18%) expired, whereas among 121 female patients 38 (31.4%) expired. Mortality due to perforation peritonitis was almost twice in female. (p=0.0037, significant).

Table 3: Distribution according to the site of perforation

SITES OF PERFORATION	NO. OF PATIENTS (n=498)	PERCENTAGE
Gastro-duodenal	186	37.3
Jejunum	34	6.8
Gall bladder	7	1.4
Ileum	185	37.1
Appendix	46	9.2
Caecum	20	4.0
Colon	16	3.2
Rectal	4	0.8

Table 4: Outcome of the patients at 4 weeks follow-up

OUTCOME	NUMBER OF PATIENTS	PERCENT
SURVIVED	399	80.1
MORTALITY	99	19.9

In the patients having peritonitis for <24 hours, the mortality was 3.4%, in 1-3 days mortality was 12.6%, 3-5 days mortality was 19.7%, 22.1% and 32.2% for 5-7 days and >7 days respectively. (p=0.0046, significant).

Out of the 126 patients having organ failure 69 (54.8%) expired whereas out of 372 patients not having organ failure only 30 (8.1%) expired. (p<0.00001, significant).

In patients having colon as the origin of contamination 30% mortality was observed whereas in non-colonic origin of contamination mortality observed was 19.0%. (p=0.0945, non-significant).

In the patients having localized peritonitis mortality was 4.8% and in patients having generalized peritonitis the mortality was 20.5%. (p=0.0761, non-significant).

In patients having malignancy the mortality after perforation peritonitis was 50% whereas it was 19.3% in those not having malignancy. (p=0.0159, significant).

In patients having clear peritoneal fluid 0% mortality was observed, in purulent peritoneal fluid mortality was 16.3% and in faecal contaminated peritoneum mortality was 23.4%. (F=4.346, p=0.097, non-significant).

The mortality observed in patients having MPI score <21, 21-29 and >29 is 2.59%, 7.11% and 47.37% respectively (p<0.00001). Mean MPI score was 26.54±5.56. It was 25.15±5.33 in survivors and 32.13±5.42 in expired patients (Table 5).

Table 5: MPI score and mortality distribution

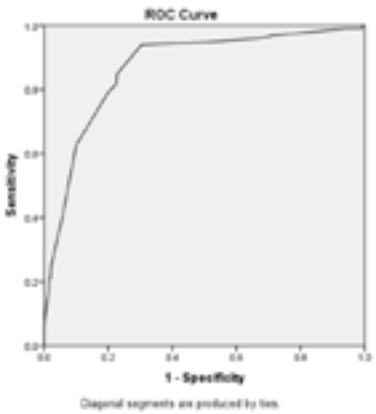
MPI score	NUMBER OF PATIENTS (n=498)	MORTALITY		P value
		(n=99)	%	
<21	116 (23.3%)	3	2.59	<0.00001
21-29	211 (42.4%)	15	7.11	
>29	171 (34.4%)	81	47.37	

Table 6: Observations of MPI Variables

S. No.	Variables	n=498	%	Mortality	%	P value
1	age					
	<50	364	73.1	53	14.6	Chi square value = 24.0298
	>50	134	26.9	46	34.3	p<0.00001
2	gender					
	male	377	75.7	61	16.18	Chi square value = 8.3865
	female	121	24.3	38	31.4	p=0.0037
3	time of presentation					
	<24 hr	29	5.8	1	3.4	Chi square value = 15.0228
	>24 hr	469	94.2	98	20.9	p=0.0046
4	Malignancy					
	present	488	98	94	19.3	Chi square value = 5.8128
	absent	10	2	5	50	p=0.0159
5	organ failure					
	present	126	25.3	69	54.8	Chi square value = 128.861
	absent	372	74.7	30	8.1	p<0.00001
6	origin of contamination					
	colonic	40	8	12	30	Chi square value = 2.7969
	non colonic	458	92	87	19	p=0.0945
7	extension of peritonitis					
	localized	21	4.2	1	4.8	Chi square value = 3.1459
	generalized	477	95.8	98	20.5	p = 0.0761
8	nature of exudate					
	clear	1	0.2	0	0	
	purulent	245	49.2	40	16.3	F=4.346
	fecal	252	50.6	59	23.4	p=0.097

RECEIVER OPERATOR CURVE FOR MORTALITY

Area under curve was 0.868.



The ROC curve for mortality showed a sensitivity of 84.8% and specificity of 77.2% at an MPI score of 28 and 94.9% and 47.1% respectively at a score of 26 (Table 7).

Table 7: Observed Sensitivity and Specificity at different MPI scores

MPI score	Sensitivity	Specificity
26	94.9%	47.1%
27	93.9%	69.7%
28	84.8%	77.2%
29	84.8%	77.2%
30	81.8%	77.4%
31	78.8%	80.2%
32	62.6%	90%

Positive predictive value of Mannheim Peritonitis Index was 52% and negative predictive value was 95.4% at score of 28.

Discussion

A total of 498 patients of perforation peritonitis were admitted to the surgical emergency department of Jawaharlal Nehru Medical College and Hospital between sept 2017- oct 2019.

The patients coming to our hospital were younger in age, the mean Age of the patients was 36.8 years and median age was 35 years.

Our study showed male preponderance in perforation of hollow viscera. Of the total 498 patients 377 were males (75.7%) and 121 were females (24.3%) with a male to female ratio of 3.2:1.

In our study mean age of males was more as compared to females. Among males, mean age was 37.6 years and in females it was 34.2 years.

364 patients (73.1%) were <50 years of age and 134 patients (26.9%) were ≥50 years of age. 271 males and 93 females were <50 years whereas 106 males and 28 females were ≥50 years of age. Proportion of patients >50 years of age was more among males than females. Mortality was 14.6 % in age <50 years and 34.3% in >50 years of age, which was statistically significant (p<0.00001).

Mortality rate was 5.88% for patients <50 years and 31.25% for patients >50 years in the study done by Sumitoj Singh et al in 2017 in Amritsar [2].

Majority of patients belonged to age <40 years in many studies from India, where as studies from western countries show >45 years of age to be commonly involved. Studies from western countries shows older age group to be affected in the range of 44-64.8 years [1,3-6] . The reason for this difference could be attributed to the difference in aetiologies of bowel perforation in Indian and western studies.

Piotr budzynski studied 168 patients of which males were 49.4% and 50.6% were females, in contrast to our study where males> females. Mean age was 48.45 years (17-93 years, SD+/- 22.2) in their study [7].

In a study by M. tez Mahmut Koc on 75 patients of perforated peptic ulcer, mean age was 44 years (16-85), male: female= 6:1 and 10.6% mortality [8].

Sumitoj Singh et al., 2017, in his study on 50 patients of perforation peritonitis found mean age of 40.3 years, 88% males (M:F=7.3:1) [2].

Mishra et al. in 2003, Jabalpur, Madhya Pradesh studied 140 patients of peptic ulcer perforation and devised the Jabalpur Peritonitis Index. Mean age was 38.9 years, average hospital stay of 13.4 days with 10.7% mortality. Jabalpur peritonitis Index studies 6 parameters including age at presentation, perforation to operation interval, mean systolic blood pressure, heart rate and serum creatinine and co-morbid conditions [9].

In the study by Prakash GV et al on 150 patients for comparing Jabalpur Peritonitis Index with Mannheim Peritonitis Index, they observed 58.7% of patients had MPI score less than 21, out of which no patient expired (0% mortality), and 12.8% mortality is seen with MPI score between 21 to 29 and those patients with MPI score more than 29 had the highest mortality (65.2%). They observed that both the prognostic scoring systems are comparable in predicting outcome. Area under curve was 95% for MPI and 96% for Jabalpur prognostic scoring system [10].

Peter Panhofer et al in his study in Austria found mean age 56.6+/- 15.7 yr. Rishi kumar garg et al. (2016) mean age 30 yrs. M:F= 5.6:1. F Nitrenganya et al reported mean age of 30.54+-14.9yr, and 54% were <29 yr of age. Jang et al. from korea reported mean age was 59.3+/- 15.9 yrs. Male were 64.4% [11].

There is high mortality noted in female patients and those having age >50 yrs. Among the 377 male patients 61 (16.18%) expired whereas among 121 female patients 38 (31.4%) expired. Mortality due to perforation peritonitis was almost twice in female. (p=0.0037, significant).

Clinical features at presentation were similar at presentation in different studies. Abdominal pain was the major complaint in our study for which patients reported to the emergency, 488 patients (98%). Tachycardia (Heart Rate >100/min) in 386 (77.5%), Tachypnoea (Respiratory Rate >16) in 353 (70.9%), Hypotension (Systolic Blood Pressure <90 mmHg) and Pallor in 273 (54.8%) patients. Abdominal distension, non-passage of stool and flatus, fever and vomiting was present in 316 (63.4%), 187 (37.6%), 267 (53.7%) and 209 (42%) respectively. Abdominal tenderness was present in 493 (99.0%) patients.

Rishi kumar garg et al. (2016) reported that most common finding on erect abdominal X-ray was gas under diaphragm (82.7%) followed by ground glass appearance (41.2%). In our study gas under diaphragm was present in 89.3% patients. Similar clinical features with similar frequencies are reported in majority of studies from across the world [12].

Time of presentation to the hospital following the onset of symptoms have great impact on the outcome. Nitrenganya F et al reported 81% patients presented during the first week of symptoms and none presented within 24 hours [13]. Late presentation of patients to seek surgical management is attributable to many factors. Many patients are financially weak, non-availability of transport facilities, some consults untrained medical care

givers in the local areas. Our hospital is a tertiary care hospital to which patients are referred for surgical management from a large catchment area. Only 5.8% patients presented early (within 24 hours) and majority of patients (94.2%) presented after >24 hours. 13.7% patients presented after 7 days of onset of symptoms. The time of presentation had great impact on the outcome which is evident from the mortality results in our study. Only 1(3.2%) out of 29 patients presenting within 24 hours expired whereas 98 (20.89%) out of 469 patients presenting in >24 hours expired. Sumitoj singh observed mortality was 100% in patients presenting after 120 hrs and 66.6% in 97-120 hrs [2,14].

Most significant factor in our study affecting the outcome in patients of perforation peritonitis was organ failure. Organ failure was present in 126 (25.3%) patients.

Renal failure (serum creatinine >2 mg/dl or serum urea >46.78 mg/dl or urine output < 20 ml/ hour) in 11.4%, cardiovascular failure (systolic Blood Pressure of <90 mmHg or a reduction of >40 mmHg from baseline) in 6.8%, respiratory failure (pO2 <50 mmHg or pCO2 >50 mmHg) in 8.2% and Intestinal failure (paralysis >24 hours or complete mechanical ileus) in 7.2% cases.

Out of the 126 patients having organ failure, 69 (54.8%) expired whereas out of 372 patients not having organ failure, only 30 (8.1%) expired ($p<0.00001$). similar association was found by Nitrenganya F et al. Rwanda and other studies from India and western world [1,2,19-21,7,9,10,13,15-18].

In our study presence of malignancy was also associated with higher mortality rates. In patients having malignancy the mortality after perforation peritonitis was 50% whereas it was 19.3% in those not having malignancy. ($p=0.0159$, significant).

Similar observations were made by Sanjay Kopped and Nitrenganya F et al. while evaluating association of malignancy with mortality in patients of perforation peritonitis [13,17].

Maximum number of perforations were observed in gastro duodenal region in 186 patients (37.3%) and ileum in 185 patients (37.1%). 34 patients (6.8%) had jejunal perforations, 7 patients (1.4%) had Gall Bladder perforation. Appendicular perforation was observed in 46 cases (9.2%), colorectal perforation in 40 (8.1%) patients (caecum in 20, 4%; colon in 16, 3.2%; and rectum in 4, 0.8% cases).

Our observation for the spectrum of perforation is in contrast with that of western literature where appendicular and colonic perforations are more common. Gastroduodenal perforations and small intestinal perforation follow them. Our results are similar to that of Jhobta RS and Kemparaj T where gastroduodenal perforation was the most common site of perforation, jejunal in 16((3%), ileal in 76(15%), appendicular in 59(12%) and colonic in 19(4%) [22,23]. In a study done by Bali RS et al, they found that duodenal perforation was seen in 150(37.5%), ileal in 90(22.5%), appendix in 74(18.5%), jejunum in 38(9.5%), gastric in 29(7.25%), caecum in 5(1.25%) and colon in 14(3.5%) patients [24].

In the study of Dani T, 25 patients (12.5 %) had colonic origin of sepsis while in 175 patients the origin of sepsis was non colonic which is in contrast to our study but in the study of Jhobta RS, Attri AK, Kaushik R, Sharma R, Jhobta A 19 cases(3.76%) had colonic origin of sepsis which are similar to the findings of our study [19,22]. In patients having colon as the origin of contamination 30% mortality was observed whereas in non-colonic origin of contamination mortality observed was 19.0%. Site of origin of contamination, although affected the outcome but did not reach to statistically significant levels. ($p=0.1042$, non-significant).

In our study, 4.2% had localized peritonitis and 95.8% cases had generalized peritonitis. In the study by Nachiappan M and Litake MM, they found that out of 100 diagnosed cases of peritonitis, 78(78%) had generalized peritonitis and 21(21%) had localized disease [25]. In contrast to our results, Rodolfo L.et al did a study and reported that out of 174 cases of peritonitis, 114(65.5%) had localized disease whereas 60 (34.5%) patients had generalized disease [26]. They concluded that because the most common site of perforation in their study was appendix and therefore majority of the patient had a localized form of disease. In our study, in patients having localized peritonitis mortality was 4.8% and in patients having generalized peritonitis the mortality was 20.5%. ($p=0.0164$, significant).

In our study, 245 (49.2%) patients were having purulent peritoneal fluid, faecal exudates in 252 (50.6%) and clear in only 1 patient. Chaudhari ND, Nakum A, Mahida H conducted a study in which 10(20%) patients out of 50 were having clear exudates, 35(70%) had purulent exudates and 5(10%) had faecal peritoneal fluid [27].

In patients having clear peritoneal fluid 0% mortality was observed. Mortality was high in patients having purulent fluid in peritoneal cavity (16.3%) and even higher in patients having faecal contamination of peritoneal cavity (23.4%), but it was not statistically significant. ($p=0.097$, non-significant).

In our study the mean MPI score was 26.54+/-5.56 points. It was 25.15+/-5.33 in survivors and 32.13 +/- 5.42 in expired patients. Minimum score was 10 and highest score was 43. 23.3% patients were having MPI score of <21, 42.4% between 21-29 and 34.3% were having a score of >29.

Nitrenganya F et al in their study in Rwanda also had similar results, with mean MPI score of 26.78 +/- 6.32, minimum score of 10 and highest score of 39 [13]. Wabwire et al, Kenya, had mean MPI score of 24.7+/-7.4 points [28]. Seiler et al reported a mean MPI score of 27.1 points in their study on 258 patients of perforation of hollow viscera [3].

Increasing score of Mannheim Peritonitis Index is associated with increasing rate of mortality, which is evident in our study and other studies from across the world. Mortality rate in our study was 2.59%, 7.11% and 47.37% in MPI score of <21, 21-29 and >29 respectively.

Sanjay Koppad et al from Karnataka studied 100 patients reported a mean MPI 23.81 (11-39). MPI score <21 had mortality of 0%, 21-29 had 3% and >29 had 11%. Mortality reported in this study was much lower than other studies, which could be attributed to the small number of patients included [17].

Mukesh Krishna V., Prasanna Kumar T.J., Vivek V. in their study on 100 patients observed that for patients with a score below 21 the mortality rate was 0%, for score between 21 to 29 it was 41.37% and for score higher than 29 it was 84.21% [29].

C.Ohmann observed 0% mortality in score group <21, 29% in 21 – 29 score group and reported100% mortality in the score group >29 [30].

Qureshi AM et al, Rawalpindi, reported mean MPI score was 23.3+/-7.6. Mortality rate of 1.9%, 21.9% and 28.1% in patients having MPI score <21, 21-29 and >29 respectively ($p<0.01$). Mortality rate was 4.3% at MPI score <26 and 28.1% at MPI score >26 ($p<0.01$) which was close to our study where it was 2.5% and 30.82% at score of <26 and >26 respectively [31].

Kusumoto Yoshiko et al in their study on 108 patients reported mortality of 3.8% and 41.0% in patients having MPI score <26 and >26 respectively [32].

Most studies from around the world have reported a significant rise in mortality above a critical score of 26. Batra P et al, Maharashtra in their study on evaluation of MPI on 160 patients of perforation peritonitis reported sensitivity of 100% and specificity of 65.54% at a score of 26. Sensitivity of 93.9% and specificity of 69.7% was found at score of 26 in our study. Mortality rate was found to be 5.7% which was significantly lower than other studies from India. Mortality in our study was found to be 19%. (16) A meta-analysis by Billing in 2003, demonstrated a mean mortality rate of 2.3% (0-11%) in MPI score <21, 22.5% (10.6-50%) in score 21-29 and 59.1% (41-87%) in score of >29.(5) In a study by Piotr budzynski, mortality by MPI score <21, 21-29 and >29 was noted to be 1.75%, 28.13% and 50% respectively.(7) In another study by Notash et al survivors had a Mean MPI score of 19.39 and non survivors 33.07.(15)
In a comparative study between Mannheim Peritonitis Index and APACHE II Rogy M Fugger noted high sensitivity and specificity of MPI than APACHE II [33].

Mortality observed in our study was 19%. Rishi Kumar Garg et al (2016) observed mortality of 12.63%. Most common post-operative complication was SSI (52.45%) followed by respiratory infections (36.88%) [12]. Sumitoj Singh observed a mortality of 100% in patients presenting after 120 hrs and 66.6% in 97-120 hrs [2]. According to Mishra et al in 2003, mortality according to time of presentation was observed as: <24 hr= 3%, 25-72 hrs= 4.5%, 97-120 hr= 17%, >120 hrs=80% [9]. Jang et al. from Korea observed a mortality rate of 11.2% where most of the patients were having colonic perforations and mean age was 59.3+/- 15.9 yrs [34].

Conclusion

Increasing score of Mannheim Peritonitis Index is associated with increasing rate of mortality, thus is helpful in identifying the high-risk patients and plan the appropriate management. Having a scoring system also helps treating clinicians to advise regarding possible outcomes. The clinical profile of the patients differs in various parts of the world which is also responsible in part for variation of different sensitivity and specificity of the MPI and therefore it becomes important to determine an optimum cut off value of MPI for particular demographic area to achieve highest predictive power of the scoring system. Despite the simplicity of MPI it has certain shortcomings. MPI is not applicable at the time of admission, as intraoperative findings are required for its calculation. It also does not take into account any chronic illness which affects the outcome of patients directly or indirectly. Type of surgery performed also has an impact on the outcome, which is not standardized in the scoring system.

Inspite of its limitations, Mannheim Peritonitis Index is a simple and easy scoring system and can be very useful in assessment of outcome of patients with perforation peritonitis. On the basis of experience in present study we recommend that Mannheim Peritonitis Index is needed in perforation peritonitis.

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