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Mannheim's Peritonitis Index Validation Study in the Indian Set-Up

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Abstract: ***The Mannheim peritonitis index emerged as a reliable marker for assessing the severity and prognosis of Intra-abdominal infection. This is a randomised prospective study including 50 cases in our institute having clinical suspicion of peritonitis. Outcome of peritonitis was predicted by Mannheim peritonitis index. Postoperative follow up was done clinically for 30 days. Mortality rate is more with high MPI score. In our study, MPI score is divided in to two or three interval. With high number of MPI score patient has bad prognosis. With age more than 50 year, late presentation, diffuse peritonitis, purulent exudate, non-colonic pathology and organic failure associated with high MPI score and more mortality. The favourable prognostic factor are age less than or equal to 50 year, early presentation, colonic pathology, localized peritonitis, non-purulent exudate without organ failure. MPI is simple useful method to determine the outcome of patient with peritonitis with sensitivity and specificity comparable to APACHE II score which has been adopted as the gold standard by Surgical Infection Society.***

Keywords: MPI- Mannheim peritonitis index, APACHE-Acute Physiology and Chronic Health Evaluation Score.

1. Introduction

Surgical treatment of peritonitis is highly demanding, complex and sometime controversial. Despite improved diagnostic modalities, potent antibiotics, modern intensive care and aggressive surgical intervention; outcome of peritonitis is still poor.

The Mannheim peritonitis index emerged as a reliable marker for assessing the severity and prognosis of intra-abdominal infection with sensitivity and specificity comparable to APACHE II score which has been adopted as the gold standard by Surgical Infection Society. The score designed specifically for peritonitis, combines preoperative and operative data and is easy to apply.

The results of treatment for peritonitis are especially difficult to evaluate because these patients may have various aetiologies, different treatments and there is a lack of universal valid criteria and definitions. Presently, one of the most accepted score is APACHE II, which integrates various physiologic variables during the first 24 hours in the intensive care unit (ICU) with age and chronic health status of the patient. This initial stratification of risk factors and a predicative equation estimate patient outcome. They are, however, both complex and time consuming. In 1986, Wacha H et al. published the Mannheim peritonitis index (MPI) based on analysis of 17 possible risks factors in patients with peritonitis; only eight factors were truly relevant to prognosis (age, sex, organ failure, cancer, duration of peritonitis, involvement of colon, extension of spread and character of peritoneal fluid) and were finally included in the index. The score considers clinical risk factors routinely found in preoperative and operative registers. This information is obtained during first laparotomy to establish an initial classification. Early evaluation of severity of illness using MPI allows us to estimate the probability of patient survival. The MPI is one of the simplest scoring systems in use that allows the surgeon to easily determine outcome risk during initial surgery. The recollection of retrospective data is possible and valid, because MPI only requires information routinely found in surgical registers.

2. Material and Method

- This randomized prospective clinical study was conducted in our institute during a period of August 2010 to October 2012.
- Total 50 cases were included in the study.
- Patients with a clinical diagnosis of peritonitis irrespective of age and sex group were considered for this study.
- A detailed clinical history, examination and relevant investigations (including hemoglobin, blood sugar, blood urea, serum creatinine, ECG, chest X ray, abdominal X-ray etc.) were carried out.
- The operating decision was taken by the senior resident or consultant on duty.
- Operation was performed through a midline exploratory laparotomy incision. Peritoneal fluid was sent for culture and sensitivity. Intra-operative findings (nature of exudates- clear, purulent, fecal, and origin of source of infection etc.) were recorded. The sources of infection were eliminated. Purulent exudates, fecal debris, food particles and blood were drained out. Pelvic regions, paracolic gutters and sub phrenic spaces were adequately drained. Intra-operative peritoneal lavage was given adequately with normal saline. Lavage fluid was completely drained. Appropriate numbers of abdominal drains were inserted according to the site of origin of infection and severity of peritonitis. Abdomen was closed in layers. All specimen / organ removed were sent for histopathological examination. All cases were kept on nasogastric suction and intravenous fluids.
- Intravenous antibiotics (Cefoperazone+Sulbactam, Metronidazole and Amikacin) were started empirically in

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standard dose and later antibiotics were changed according to culture and sensitivity.

- Outcome of peritonitis was predicted by Mannheim peritonitis index.
- Postoperative follow up was done clinically for 30 days. However relevant investigations were done as and when indicated.
- The following quality indicators: Age, Sex, Duration of peritonitis, Type of peritonitis, Nature of peritoneal exudate, Etiology (colonic v/s. non colonic and malignant v/s. Non-malignant), Organ failure, mortality were assessed in this study.

3. Mannheim Peritonitis Index

Risk Factor	*Score*
Age > 50 years	5
Female sex	5
Organ failure*	7
Malignancy	4
Preoperative duration of peritonitis > 24 h	4
Origin of sepsis non-colonic	4
Diffuse generalized peritonitis	6
Exudate	
Clear	0
Cloudy, purulent	6
Faecal	2

*Kidney failure = Creatinine level >2mg% or urea level >100mg% or oliguria < 20ml/hour
Pulmonary insufficiency = PO2 < 50 mmHg or PCO2 > 50 mmHg
Intestinal obstruction/paralysis > 24hours or complete Mechanical ileus.

4. Observation and Discussion

Table 1: Etiology of Peritonitis

Etiologyof Peritonitis	*Total Patient (N=50)*	*Mortality Rate%*
Prepyloric perforation	10	20.00
Duodenal perforation	05	10.00
Small bowels pathology	16	32.00
Appendix	05	10.00
Colonic	06	12.00
Liver abscess	05	10.00
Other	03	06.00

In our study of 50 patient of peritonitis, small bowel pathology [16/50 (32%)] is most common. Small bowel pathology includes perforation, stricture, tuberculosis, volvulus, neuroendocrine tumour, trauma, Crohn's disease etc. Amongst them tuberculosis is the most common etiological cause. Second most common aetiology is pre-pyloric peptic perforation [10/50 (20%)] than colonic pathology [6/50 (12%)] which includes perforation, trauma, carcinoma, etc. Duodenal perforation [5/50 (10%)], Appendicular pathology [5/50 (10%)], Rupture liver abscess [5/50 (10%)] were also common. Other anatomical origin was from gall bladder, common hepatic duct trauma and uterine perforation.

Table 1 (a): Distribution of Small Bowel Pathology (Table-1a)

Small Bowel Pathology	No of patient (n=16)	%
Tuberculosis	7	43.8
Perforation	5	31.2
Crohn's disease	1	6.2
Volvulus	1	6.2
Gangrene bowel with MVT	1	6.2
Neuro-endocrine tumor	1	6.2

In small bowel pathology tuberculosis (43.8%) is most common and other includes perforation (31.2%), Crohn's disease, Volvulus, gangrene of bowel with MVT and neuro-endocrine tumour.

Table 2: Spectrum of Organism Of Peritoneal Fluid Culture And Sensitivity

Organism Of Peritoneal Culture & Sensitivity	*Total Patient*	*%*
E.coli	28	56
Pseudomonas	09	18
Klebsiella	05	10
Acinetobacter	03	06
Streptococci	02	04
Enterococci	03	06

The most common organism found in peritonitis is E. coli while other organisms cultured are Klebsiella, Enterococci, Bacteroides etc. In our study of 50 patients of peritonitis, E. coli [28/50 (56%)] was the most common organism cultured. Other organisms were Pseudomonas.species [9/50 (18%)], Klebsiella [5/50 (10%)], Acinetobacter [3/50 (6%)], Enterococci [3/50(6%)] and Streptococci [2/50 (4%)].

Table 3: Study of Mannheim's Peritonitis Index In 3 Interval For Mortality Rate

MPI Score	<21	21-29	>29	Total (n=50)
Alive	14	23	02	39
Dead	0	03	08	11
Mortality (%)	0	11.5	80	22

We have studied the Mannheim's peritonitis index validation for the prognosis of 50 cases of peritonitis. We have divided the MPI score in three intervals, i.e. < 21, 21-29 and >29. In our study, global mortality rate is 22% (11/50) and no mortality is seen when MPI score is <21. There is 11.5 % (3/26) mortality rate noted when the MPI score is 21-29 and 80 % (8/10) in case of MPI score >29.

Table 4: Mortality Rate Associated With Mpi Score of Two Intervals

MPI SCORE	**< = 26**	**>26**
Alive	36	03
Dead	01	10
Mortality (%)	2.7	76.9

In our study Mannheim's peritonitis index score is also divided in two interval <= 26 or >26 which is very good prognostic indicator in case of peritonitis. Patient with MPI score <=26 having mortality rate 2.7% (1/37) and there is a 76.9% (10/13) high mortality rate is found in patient with MPI score >26. So MPI score >26 associated with high mortality rate.

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Table 5: Mortality Rate According to Gende

Risk Factor	*Alive*	*Dead*	*Mortality (%)*
Male	35	8	18.6
Female	04	3	42.9

In our study out of 50 patients of peritonitis, there are 43 male patients and 7 female patients. Our study has global mortality rate 22% (11/50) out of which there is a mortality rate of male is 18.6% (8/43) and the mortality rate of female is 42.9% (3/7). In our study female has more mortality the male.

Table 6: Mortality Rate According to Age

Risk Factor	*Alive*	*Dead*	*Mortality Rate (%)*
<= 50 yrs	23	4	14.8
> 50 yrs	16	7	30.4

In our study, there are 27 patients having age less than or equal to 50 years, out of them 4 patients died, mortality rate is 14.8% (4/27).There are 23 patients having age more than 50 years. Amongst this group mortality rate is 30.4% (7/23). It suggests that age is important contributing risk factor for peritonitis. And mortality rate is increased with age and it is more when the patient's age is more than 50 years.

Table 7: Mortality According to Duration of Peritonitis

Risk Factor	*Alive*	*Dead*	*Mortality Rate (%)*
<24 HRS	05	0	0
>24 HRS	34	11	24.4

Preoperative duration of peritonitis is an important contributing factor for prognosis of the patient. In early presentation prognosis of patient is good but in late presentation, patient develop diffuse peritonitis with multiple system involvement so outcome is bad in late presentation. In our study, patient having peritonitis of less than 24 hours, mortality rate is 0. And in other group mortality rate is 24.4% (11/45).

Table 8: Mortality Rate Acc. to Type of Peritonitis

Risk Factor	*Alive*	*Dead*	*Morta-Lity (%)*
Localized Tenderness (Localized Peritonitis)	05	0	0
Generalized Tenderness (Diffuse Peritonitis)	34	11	24.4

Peritonitis can be either local or diffuse. Local peritonitis patient presents early and in case of diffuse peritonitis patient is having late presentation. With localized peritonitis there is no mortality rate and in generalised peritonitis there is a 24.4 % (11/45) mortality rate.

Table 9: Mortality Rate according to Colonic Pathology

Risk Factor	*Alive*	*Dead*	*Mortality (%)*
Colonic Pathology	06	0	0
Noncolonic Pathology	33	11	25.0

In case of colonic pathology, mortality rate is 0% while non-colonic pathology mortality rate is 25 % (11/44).

Table 9 (a): Relation of Colonic or Non-Colonic Pathology to Localized or Diffuse Peritonitis

Type of Peritonitis	Colonic Pathology	Non-Colonic Pathology
Localized	0	5
Diffuse	6	9

Study of above table suggests that patient with colonic pathology present late with diffuse peritonitis but there is no mortality.

Table 10: Mortality Rate According to Organ Failure

Risk Factor	*Alive*	*Dead*	*Mortality (%)*
Organ Failure Present	10	11	52.4
Organ Failure Absent	29	0	0

Organ failure is one of important prognostic indicators. In cases of peritonitis with organ failure, mortality rate is 52.4 % (11/21) and other group having 0% mortality rate.

Table 11: Mortality With Nature of Peritoneal Exudate

Risk Factor	*Alive*	*Dead*	*Mortality (%)*
Clear	09	1	10.0
Purulent	26	9	25.7
Faecal	04	1	20.0

In cases of peritonitis the nature of intraoperative peritoneal fluid (exudate) is one of the good predicting prognostic factors of the patient. In our study, clean, purulent and faecal exudate, mortality rate is 10% (1/10), 25.71% (9/35) and 20% (1/5) respectively.

Table 12: Abdominal Complications of Peritonitis

Abdominal Complication	*Only*	*With Other*	*Total Patient*	*%*
WOUND INFECTION (WI)	12	16	28	56
PARALYTIC ILEUS (PI)	05	12	17	34
BURST ABDOMEN (BA)*	03	05	08	16
SMALL BOWEL OBSTRUCTION (SBO)	0	02	02	04
TERTIARY PERITONITIS (TP)	0	02	02	04
ENTERO-CUTENOUS FISTULA (ECF)	0	02	02	04

*Wound infection present in the all patients having burst abdomen.

In our study, wound infection 56 %(28/50) is a most common abdominal complication found in case of peritonitis. Another is paralytic ileus 34% (17/50), burst abdomen 16% (8/50), small bowel obstruction 4% (2/50), tertiary peritonitis 4% (2/50) and entero-cutaneous fistula 4% (2/50). So wound infection is the most common abdominal complication in operated case of peritonitis. In our study 17 patients had only one complication and 33 patients had more than one complication

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Table 13: Systemic Complications of Peritonitis

Systemiccomplication	*Total Patient*	*%*
Endotoxic Shock	11	22
Pneumonia	24	48
Pleural Effusion	26	52
Renal Failure	11	22
ARDS	12	24
MODS	11	22

Multiple systemic complications in peritonitis are depend on age, sex, time of presentation and localized or diffuse peritonitis. Patient with high MPI score is having high morbidly rate and in our study pleural effusion 52% (26/50) is a most common systemic complication of peritonitis. Other are Pneumonia 48% (24/50), ARDS 24% (12/50), Endotoxic shock 22% (11/50), Renal failure 22% (11/50)) and MODS 22% (11/50). Thus the respiratory system complication is more common during post-operative period in operated case of peritonitis. Renal failure and endotoxic shock also common complication after peritonitis.

5. Summary and Conclusion

In our study of 50 patient of peritonitis, mortality rate is more with high MPI score. MPI score can be divided in to two or three interval. With high number of MPI score patient has bad prognosis.

With age more than 50 year, late presentation, diffuse peritonitis, purulent exudate, non-colonic pathology and organic failure associated with high MPI score and more mortality.

The favourable prognostic factor are age less than or equal to 50 year, early presentation, colonic pathology, localized peritonitis, non-purulent exudate without organ failure. So, MPI is simple useful method to determine the outcome of patient with peritonitis. This study has smaller number of patient and single centre study. Larger number of patient and multi-centre study require for further evaluation of MPI score system.

6. Future Scope

MPI is simple useful method to determine the outcome of patient with peritonitis with sensitivity and specificity comparable to APACHE II score which has been adopted as the gold standard by Surgical Infection Society.

7. Abbreviation

AASI-American Anaesthesiology Surveillance Index
APACHE-Acute Physiology and Chronic Health Evaluation Score
ARDS-Acute Respiratory Distress Syndrome
BP-Blood Pressure
C/S-Culture and Sensitivity
Cat.-Category
CECT-Contrast Enhance Computer Tomography
DM-Diabetes
F-Female
GI Tract-Gastro-Intestinal Tract
Gm-Gram
Mg-Milligram
M-Male
MODS-Multi-Organ Dysfunction Syndrom
MPI-Mainnham's Peritonitis Index
P-Present
SIRS-Systemic Inflammatory Response Syndrome
Wt-Weight

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