Efficacy of Mannheim Peritonitis Index in Predicting the Outcome of Patients Presenting with Peritonitis at a Tertiary Care Hospital in South India

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ABSTRACT

BACKGROUND
Peritonitis is one of the major causes of morbidity and mortality worldwide. Scoring systems allow grouping of patients based on the severity of illness. Hence such grouping before treatment can allow analysis of morbidity and mortality rates. Mannheim Peritonitis Index (MPI) is a simple scoring system which allows the analysis of both morbidity and mortality rates among the patients presenting with peritonitis. This study was done to evaluate the efficiency of MPI in predicting outcome of patients with peritonitis in a tertiary care hospital, South India.

METHODS
A prospective observational study was conducted among patients with secondary peritonitis in the surgical department. MPI was calculated at admission or during the surgical management. All patients underwent laparotomy and managed according to the cause. Patients are grouped into three categories namely score < 21, between 22 and 29 and ≥ 30 based on MPI score. MPI score ≥ 30 were followed up until discharge or death. Complications such as wound infection, wound dehiscence, respiratory complications, urinary tract infection (UTI), enterocutaneous fistulas and intra-abdominal abscesses were noticed in each group. Mortality rates were also calculated in each group and were statistically analysed.

RESULTS
One hundred patients (68 males and 32 females) with both local and general peritonitis were included in the study. Most of the patients belong to age 15 to 30 with male predominance (male to female ratio was 2 : 1). Local peritonitis was found in 48 cases while general peritonitis was found in 52 cases. Bulks of the local peritonitis was due to appendicitis (47 %). Most common cause of general peritonitis was duodenal perforation (34 %). Among the complications, the most common were wound infection and respiratory complications followed by UTI and enterocutaneous fistulas. The MPI score and complications were found to be statistically significant (Fischer’s exact test = 111, p = 0.0001). When MPI score was < 21, the wound infection rate was very low, and no intra-abdominal abscess was observed. Higher MPI scoring was associated with increased wound infection rate. MPI scores below 21 had good prognosis and 0 % mortality. Scores between 22 and 29 showed highest morbidity and mortality of 45 %. While patients with scores ≥ 30 showed highest (90 %) mortality rate (p = 0.001).

CONCLUSIONS
MPI score provides an easy and reliable means of risk evaluation and classification for patients with peritoneal inflammation. So, an early intensive management for better outcome of patient is possible.

KEYWORDS
Appendicitis, Inflammation, Peritonitis, Mannheim Peritonitis Index, Laparotomy
Peritonitis was the most common surgical emergency attended in a hospital and remains a great challenge to medical fraternity. It can be localized or generalized. Peritonitis is one of the common causes of ‘acute abdomen’. It is one of the major cause of morbidity and mortality worldwide. The disease is perhaps as ancient as mankind. With newer methods in diagnosis such as the sophisticated radiological investigations and progress in treatment strategies such as newer and more effective antibiotics, fluid management, and parenteral nutrition have brought down complication rates. An accurate predictive ability can allow quality of intensive care and other new life - saving technologies. Predictable risk stratification and precise prognosis before treatment would also enable clinical researchers to use observational studies to compare the quality of care in various intensive care units (ICUs). Furthermore, it will help to improve the patient outcome. Such information help in early aggressive management and improved the outcome of patient. To predict severity of the disease several scoring systems are developed. Scoring systems allow the grouping of patients which is based on the severity of illness before treatment. Hence they give a meaningful analysis of both morbidity and mortality rates.

The Mannheim Peritonitis Index (MPI) is a specific score and it has good accuracy. Hence it provides an easy way to predict the individual prognosis of peritonitis patients. Furthermore, it shows a reliable means of risk evaluation and classification for patients with peritoneal inflammation. This will support an early intensive management of patient for a better outcome. This simplest scoring system allows the surgeon to easily determine outcome risk. Data regarding prognostic indicators and mortality and morbidity patterns are lacking from India. Advanced investigative modalities in tertiary care hospitals for treating patients with peritonitis is lacking. Hence, there is a need of scoring method to predict morbidity and mortality and also to decide about the treatment with minimal investigative modalities. This study was designed to determine the efficacy of MPI in predicting the morbidity and mortality in patients with peritonitis admitted in a tertiary care hospital.

Study Design and Sample
A prospective observational study was conducted in the General Surgery department of Coimbatore Medical College Hospital, Coimbatore, Tamil Nadu, South India during the period Sept 2012 to Sept 2013. Patients (age 15 - 80) who admitted in surgical wards and ICU with secondary peritonitis (both local and general peritonitis) during the study period were included. Patients with primary peritonitis, spontaneous bacterial peritonitis, pancreatitis or intra-abdominal sepsis due to peritoneal dialysis were excluded from the study. Informed consent was obtained from the parent or guardian for selecting their data for the study. The study was conducted according to Helsinki declaration, 1975 as revised in 2000 and was approved by Institutional Ethics Committee.

Study Procedure
MPI were calculated at admission or during management according to the standard procedure given in table 1. MPI calculated at admission or during management by careful history taking and physical examination basic blood investigations which included complete hemogram, blood urea, serum creatinine, ABG analysis and continuous vital monitoring for sick patients. All patients underwent laparotomy and were managed according to the cause. After surgical interventions, antibiotic therapy, vasoactive drugs, resuscitation and ICU care were given as necessary. Intensive care with ventilatory support may be needed especially for unstable and debilitated patients. Immediate objective to was achieved to achieve hemodynamic stability and adequate perfusion of major organs. Antibiotics were given for 10 - 14 days depending on the severity of peritonitis. A favourable response was shown by maintained perfusion and adequate urine output, reduced fever and leukocytosis, resolution of ileus, and returning of sense of wellbeing of patient. Early removal of non-essential catheters was recommended. Early mobilization of patients helped in prevention of deep vein thrombosis and returning of sense of wellbeing of patient. Early enteral feeding was advised which had the advantage of improving the sense of wellbeing as well as restore the gut flora.

Patients followed up until discharge or death. Patients were grouped into three categories (score < 21, 22 - 29 and ≥30) based on MPI score. Mortality rate was calculated in each group. Complications such as wound infection, wound dehiscence, respiratory complications, urinary tract infection (UTI), enter - cutaneous fistulas and intra-abdominal abscesses were noticed in each group.

Statistical Analysis
Statistical analysis was done using SPSS software (Ver. 16, IBM, Illinois, US). Non-parametric data was analyzed using Fisher’s exact and Chi-Square test. p < 0.05 was considered significant.

RESULTS
One hundred patients (68 males and 32 females) with both local and general peritonitis were included in the study (Figure 1). Local peritonitis was found in 48 cases while general peritonitis was found in 52 cases. The bulk of the local peritonitis was due to appendicitis (47 %) (Fisher’s exact value = 305, p = 0.001). Maximum cause of general peritonitis was due to duodenal perforation (34 %) followed by colonic perforation (6 %), ileal perforation (6 %), gastric perforation (6 %), and unknown (1 %) (Figure 2). The exact cause was not identified in one of the patients in whom flank drain was put. Among the total cases, 8 % patients were with malignancy.
Patients presented with appendicitis had early recovery and lesser hospital stay. Highest hospital stay was found among the patients with ileal perforation followed by duodenal and gastric perforation. Colonic perforation has a lower hospital stay as all patients died in immediate postoperative period. All patients with peritonitis secondary to malignancy died due to late presentation and general faecal peritonitis.

Mortality in the study group was found to be 25 / 100 (4%). Among the total death, 23 were from male patients and 2 from female patients it was 2. Eight percent of death among patients was due to malignancy. Among the complications, the most common were wound infection and respiratory complications followed by the UTI and entero - cutaneous fistulas (Table 2). The distribution of complications was found statistically non - significant (Fischer’s exact test = 36.6, p = 0.063). Intra - abdominal abscesses were found to be less in number. Wound infection and respiratory complications were the most common complication found in duodenal perforation followed by UTI and intra - abdominal abscess. Wound infection and respiratory complications were found to be highest in cases with duodenal perforations. Three cases had intra - abdominal abscess had duodenal perforations. Entero - cutaneous fistula was found to be higher in gastric perforation. Most common complication in gastric perforation was respiratory complication followed by entero-cutaneous fistula and wound infection. One patient from appendicitis and ileal perforation cases developed entero-cutaneous fistula

MPI was calculated in patients with peritonitis preoperatively and during the surgical procedure. Calculated MPI scores given were given in table 3. The MPI score and complications were found statistically significant (Fischer’s exact test = 111, p = 0.0001). The incidence of wound infections was evaluated according to MPI score. We found

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**Table 1. Basis for Calculating the Mannheim Peritonitis Index**

*Definition of organ failure: creatinine > 2.0 mg/dL, urea > 60 mg / dL, oliguria 50 mm Hg. Lung: pO₂, 50 mmHg; Shock: hypodynamic or hyperdynamic; Intestinal obstruction: paralysis>24 hrs or complete mechanical ileus.*

**Table 2. Distribution of Cases of Complications in Peritonitis**

*Fischer’s exact test = 36.6, p = 0.063*

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**Table 3. Distribution of Complications with Mannheim Peritonitis Index (MPI) Score**

Fisher’s exact test = 111, p = 0.0001
that when MPI score was < 21, the wound infection rate was very low and no intra-abdominal abscess observed. Higher MPI scoring was associated with increased wound infection rate. The wound infection rate in cases with MPI ≥30 was lower than those with 22 to 29. Respiratory complications had a linear relation with MPI score. Score between 22-29 showed 61% respiratory complications and 5% intra-abdominal abscess. While no wound dehiscence was observed among patients with score between 22 and 29. An MPI score below 21 had less wound dehiscence whereas when it was ≥30, 11.1% cases showed wound dehiscence. Only 1 case, with score ≥30, showed intra-abdominal abscess. UTI were almost uniformly distributed throughout the range of MPI scoring. Enterocolitis cutaneous fistulas were more in group with score ≥30 and less below 21. While it was absent in the group with score between 22 and 29.

Mortality rate was also calculated in three groups of patients (Figure 3). Patients with MPI score < 21 had 0%, score between 22-29 had < 45% and score ≥30 had got maximum mortality of 90% (Chi-square value 48.71 and p = 0.001).

**DISCUSSION**

Results of this study showed male predominance. The male to female ratio was approximately 2:1 which is consistent with previous studies. Most of the patients belonged to age group between 15 and 30. The MPI score and the incidences of complications were found statistically significant (Fisher’s exact test = 111, p = 0.0001). Most common aetiology was acute appendicitis followed by duodenal perforation. Results of the study by Doklestic et al. reported that peptic ulcer and appendicitis were the major aetiologies for secondary diffuse peritonitis. The perforation of proximal gastrointestinal tract was most common as compared to western statistics which site at lower gastrointestinal tract. Major cause of post-operative morbidity was wound infection and respiratory complications. Previous study also reported that wound infection Respiratory infections as the post-surgical complications. UTI was almost uniformly distributed throughout the range of MPI scoring. This was probably due to almost universal use of bladder catheters in patients and indwelling catheter being a single most common risk factor for developing UTI. Duration of hospital stay did not correlate with severity of disease because a patient with MPI score ≥30 succumbs to death in immediate postoperative period. Most of the mortality was due to multi organ failure due to septicemia occurring in immediate post-operative period. This showed that more care may be needed for these patients. Death among patients with secondary peritonitis was due to malignancy. The death can be ascribed to the faecal peritonitis.

Even though intensive care and sophisticated investigative tools helps in managing this patient, it is the major cause of morbidity and mortality. The complications were most common in the group of patients having a MPI score between 22 and 29, whereas those who had a score ≥30 have higher mortality. The scores below 21 had got good prognosis and mortality is 0% in this group. Patients with scores between 22 and 29 the mortality was 45%. Patients with scores ≥30, the mortality were 90%. These findings correlated with study conducted by Notash et al. They found 0%, 60%, 90% mortality in patients with score < 21, 22-29 and ≥29, respectively.

Study published by Nwigwe and Atoyebi showed that MPI score more than 30 has got increased mortality. MPI score of 25 gave the highest degree of accuracy. Study published by Yoshiko et al. showed mortality rate of 28.1% in patients with MPI score more than 26. Recent study from South India showed 29.4% mortality for subjects with MPI score of 26 and more. Furthermore, MPI scores of ≤20, 21-29 and ≥30 showed mortality rate of 5%, 14%, and 50% respectively. Increasing MPI scores was found to be associated with poorer prognosis and hence demands an intensive management.

**CONCLUSIONS**

Patients with MPI scores below 21 had good prognosis and 0% mortality. Scores between 22 and 29 showed high morbidity and mortality of 45%. While scores ≥30 showed highest (90%) mortality rate.

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