

Study of Factors Involved in Perforative Peritonitis and Its Significance to Mortality and Morbidity

ABSTRACT

Background: Peritonitis caused by gastrointestinal perforation is one of the most prevalent surgical emergencies worldwide. Early detection and treatment of Perforation Peritonitis may significantly minimize morbidity and death. The result is improved by surgical treatment and good perioperative care. The purpose of this clinical trial is to assess the outcome of perforation peritonitis. Hence the present study was conducted at a tertiary healthcare institute to study factors involved in perforative peritonitis and its significance to mortality and morbidity.

Materials and Methods: It was a Prospective Observational Study, conducted over a period of 18 months at the department of General Surgery, KIMSDU, Karad, among the patients presenting in emergency room of Krishna Institute of Medical Sciences and Research Centre, Karad, between any age group, with symptoms of acute pain in abdomen with gas under diaphragm seen on either chest radiograph or x-ray erect abdomen.

Results: In the present study we assessed the Operative procedures among the study subjects. We observed that open appendectomy was performed among 23.08% study subjects, open perforation closure was performed among 26.92% study subjects, resection and anastomosis was performed among 8.46% study subjects, resection anastomosis and Stomy was performed among 6.92% study subjects, simple closure was performed among 34.62% study subjects.

Conclusions: All the MPI parameters: extension of peritonitis, presence of organ failure, time of presentation, type of exudates, presence of malignancy, age, found to be associated with severity of peritonitis.

Keywords: Manheims peritonitis index; peritonitis; gastrointestinal perforation.

1. INTRODUCTION

Peritonitis caused by gastrointestinal perforation is one of the most prevalent surgical emergencies worldwide. Early detection and treatment of Perforation Peritonitis may significantly minimise morbidity and death. The result is improved by surgical treatment and good perioperative care. Nowadays, conservative trials have minimal function in perforation peritonitis.

Extremes of age, delayed presentation, distal GI (colonic) perforation, comorbidities, sepsis, faecal peritonitis, and other factors all enhance mortality. Careful clinical examination and post-operative assessment aid in the stratification of high-risk patients in order to offer better treatment for them [1,2]. Peritonitis is a surgical emergency that necessitates patient resuscitation, laparotomy and peritoneal toilet insertion, omental patch application, and, in certain cases, surgery for ulcer management [3-4]. It has been well documented that the majority of perforated peritonitis patients in our subcontinent appear late. Typically, these patients have well-established widespread

peritonitis with purulent faecal pollution and septicemia, increasing the risk of morbidity and death and complicating the challenge of providing appropriate perioperative care [4].

Early prognostic assessment of abdominal sepsis is necessary in order to identify high-risk patients for more aggressive therapeutic treatments, offer objective categorization of illness severity, and determine the best perioperative management techniques. Perforations of the proximal gastrointestinal tract were six times more common than perforations of the distal GI tract, according to previous studies from India, which contrasts sharply with studies from developed countries such as the United States [5]. Greece, and Japan, which revealed that distal gastrointestinal tract perforations were more common [6]. The time of presentation to the hospital, early surgical intervention, and perioperative care all have a role in the outcome of perforated peritonitis.

The goal of the operating protocol is to repair the pathology while avoiding any significant mishaps and to use a surgical method with few

consequences. Following initial resuscitation with high volumes of crystalloids and administration of wide spectrum antibiotics against gram negative bacteria and anaerobes, laparotomy and perforation closure are frequently performed.

The mortality rate of perforation peritonitis is affected by age, gender, ulcer location, treatment delay, and treatment modality. Lower GI perforation mortality is substantially greater, and many are linked with malignancy [7,8]. The purpose of this clinical trial is to assess the outcome of perforation peritonitis. Hence the present study was conducted at a tertiary healthcare institute to study factors involved in perforative peritonitis and its significance to mortality and morbidity.

2. MATERIALS AND METHODS

It was a Prospective Observational Study, conducted over a period of 18 months at the department of General Surgery, KIMSUDU, Karad, among the patients presenting in emergency room of Krishna Institute of Medical Sciences and Research Centre, Karad, between any age group, with symptoms of acute pain in abdomen with gas under diaphragm seen on either chest radiograph or x-ray erect abdomen.

Inclusion Criteria: Patients of either sex all age groups willing to participate in the study with valid consent. Patients presenting with acute abdomen with pneumoperitoneum on X-rays and/or CT scan, USG. Patient presenting with acute abdomen and perforation diagnosed intraoperative. And patients with Positive diagnostic aspirations (abdominal paracentesis) were included in the present study.

Exclusion Criteria: Patients with Iatrogenic perforations, Pregnancy and lactation, Patients with perforative peritonitis not willing to participate in the study, and Patients with acute abdomen without pneumoperitoneum on radiological study were excluded from the present study.

2.1 SAMPLE SIZE ESTIMATION

According to articles the prevalence rate of perforated peritonitis patients was 5% to 10%. Sample size formula used was: $n = Z^2Pq/L^2$, $n \approx 124$, Hence, n was considered as 130, where, L= allowable error (3), P= prevalence (5), Q= 100-P (95). By given formula and reference article, I will study a total of 130 cases.

3. CASE DEFINITIONS

Organ Failure:

- **Renal failure:** serum creatinine more than 2 mg/dl or serum more than 46.78 mg/dl or presence of oliguria < 20 ml/ hour.
- **Shock:** Hypotension (systolic BP less than <90 mmHg) or a reduction of greater than 40 mmHg from baseline, when other causes for the fall in blood pressure are absent.
- **Intestinal obstruction (profound):** paralysis more than 24 hours or complete mechanical ileus.
- **Respiratory failure:** pO₂ less than 50 mmHg or pCO₂ greater than 50 mmHg.
- **Malignancy:** On examination presence of features of malignancy or cases of known malignancy were included in the study.
- **Evolution time:** Less than 24 hour or greater than 24 hour, depending upon history and timing of surgery.
- **Origin of sepsis:** Colonic or non-colonic, according to laparotomy findings.
- **Extension of peritonitis:** Diffuse or localized.
- **Character of exudates or peritoneal fluid:** Clear, Cloudy/purulent, Faecal, Biliious collections in cases of recent perforation without any superadded infection were considered as clear.

The collected data was coded and entered with the help of Microsoft Excel software. The data was analyzed with the help of SPSS Version 22 statistical package. Descriptive statistics were derived in the form of tables and charts for frequency analysis. Appropriate statistical methods were used to analyze the data. Mean, SD and median were used to know the central tendency and dispersion of the quantitative variables.

4. RESULTS

4.1 Demographic Information

In the present study we assessed the Age distribution among the study subjects. We observed that majority of the study subjects belonged to the age group of 46 to 55 years (31.54%), followed by 36 to 45 years (24.62%), more than 66 years among 29.69% study subjects. In the present study we assessed the Gender-wise distribution among the study subjects. We observed that majority of the

subjects were males (73.85%), and 26.15% were females. The male: female ratio in the current study was 2.82:1 (Table 1).

We observed that majority of the subjects presented with duration of 4 to 6 days (47.69%), followed by more than 7 days among 42.31% subjects. 10% study subjects presented with less than 3 days.

4.2 Clinical Presentation

We observed that majority of the subjects presented within duration of 4 to 6 days (47.69%), followed by more than 7 days among

42.31% subjects. 10% study subjects presented within less than 3 days. In the present study we assessed the Clinical presentation among the study subjects. We observed that Fever was noted among 36.92% study subjects, Vomiting was noted among 9.23% study subjects, Pain was noted among 100.00% study subjects, Distension was noted among 60.77% study subjects, Guarding and Rigidity was noted among 67.69% study subjects, Bowel Sound was noted among 11.54% study subjects, Free fluid was noted among 63.08% study subjects (Table 2).

Table 1. Time of presentation

Time of presentation	Present study	Tripathy et al. [9]
Less than 3 days	10.00	12.9%
4 to 6 days	47.69	57%
More than 7 days	42.31	75%

Table 2. Status of Shock

Presence of shock	Present study	Dandapat et al. [28]	Bohemen and Delinger et al. [27]
Yes	32.31	62.5%	51%
No	67.69	37.5%	49%

4.3 Site of Perforation

In the present study we assessed the Site of perforation among the study subjects. We observed that stomach was the commonest site of perforation (34.62%), followed by duodenum (26.92%), appendix (23.08%). Ileum (8.46%) and Large intestine (6.92%) was also involved rarely (Table 2).

4.4 Diagnosis

In the present study we assessed the Diagnosis among the study subjects. We observed that Duodenal ulcer perforation was diagnosed among 26.92% study subjects, Gastric ulcer perforation was diagnosed among 34.62% study subjects, Appendicular perforation was diagnosed among 23.08% study subjects, Ileal perforation was diagnosed among 8.46% study subjects, Large intestinal perforation was diagnosed among 6.92% study subjects (Table 2).

4.5 Various Risk Factors

In the present study we assessed the Presence of organ failure among the study subjects. We observed that organ failure was reported among 33.08% subjects. In the present study we assessed the Pre-operative duration among the

study subjects. We observed that majority of the study subjects had pre-operative duration more than 24 hours (78.46%), while 21.54% had it less than 24 hours. In the present study we assessed the presence of Malignancy among the study subjects. We observed that malignancy was present among 14.62% study subjects.

In the present study we assessed the Origin of sepsis among the study subjects. We observed that majority of the study subjects had non-colonic origin of sepsis (86.15%), followed by colonic origin among 13.85% subjects. In the present study we assessed the Type of peritonitis among the study subjects. We observed that localized peritonitis was reported among 26.92% study subjects, whereas majority had diffuse type of peritonitis (73.08%). In our study we observed shock among 32.31% study subjects.

In the present study we assessed the type of exudate among the study subjects. We observed that clear exudate was noted among 9.23% study subjects, purulent exudate was noted among 48.46% study subjects, and fecal exudate was noted among 42.31% study subjects (Table 3).

4.6 Mannheim Peritonitis Index Score

In the present study we assessed the Mannheim Peritonitis Index Score among the study subjects. We observed that majority of the study

subjects had MPI score between 21 to 29 (52.31%), followed by 29.23% subjects had MPI score more than 29, while 18.46% study subjects had MPI score less than 21 (Fig. 1).

Table 3. Manheims peritonitis index score

MPI	Present study	Billing et al.-1 [10]	Billing et al.-2 [10]
<21	18.46	0%	1%
21-29	52.31	24%	50%
>29	29.23	76%	49%

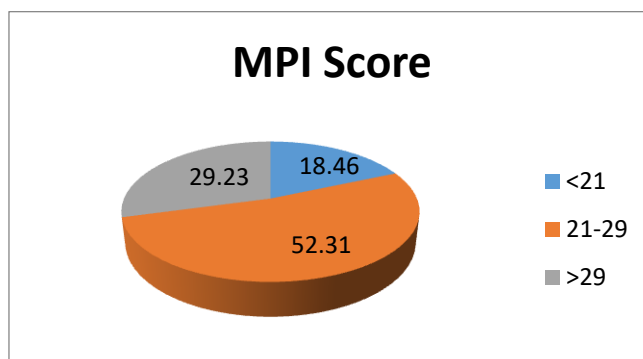


Fig. 1. Mannheim peritonitis index score

4.7 Operative Procedures

In the present study we assessed the Operative procedures among the study subjects. We observed that open appendectomy was performed among 23.08% study subjects, open perforation closure was performed among 26.92% study subjects, resection and anastomosis was performed among 8.46% study subjects, resection anastomosis and Stomy was

performed among 6.92% study subjects, simple closure was performed among 34.62% study subjects.

In the present study we assessed the duration of hospital stay among the study subjects. We observed that majority of the subjects had the hospital stay between 11 to 15 days (49.23%), followed by less than 10 days (30%) (Table 4).

Table 4. Demographic information

Demographic information	Number of subjects	Percentage	
Age distribution	Less than 50	58	44.62
	More than 50	72	55.38
Gender wise distribution	Male	96	73.85
	Female	34	26.15
Time of presentation	Less than 3 days	13	10.00
	4 to 6 days	62	47.69
	More than 7 days	55	42.31

Table 5. Clinical presentation and diagnosis

Clinical presentation and diagnosis	Number of subjects	Percentage	
Clinical presentation	Fever	48	36.92
	Vomiting	12	9.23
	Pain	130	100.00
	Distension	79	60.77
	Guarding and Rigidity	88	67.69
	Constipation	15	11.54
	Free fluid	82	63.08

Site of perforation	Appendix	30	23.08
	Duodenum	35	26.92
	Ileum	11	8.46
	Large intestine	9	6.92
	Stomach	45	34.62
Diagnosis	Duodenal ulcer perforation	35	26.92
	Gastric ulcer perforation	45	34.62
	Appendicular perforation	30	23.08
	Ileal perforation	11	8.46
	Large intestinal perforation	9	6.92

Table 6. Associated conditions / risk factors

Associated conditions / risk factors		Number	Percentage
Presence of organ failure	Present	43	33.08
	Absent	87	66.92
Pre-operative duration	<24 hours	28	21.54
	>24 hours	102	78.46
Malignancy	Present	19	14.62
	Absent	111	85.38
Origin of sepsis	Colonic	18	13.85
	Non-colonic	112	86.15
Type of peritonitis	Localized	35	26.92
	Diffuse	95	73.08
Type of exudate	Clear	12	9.23
	Purulent	63	48.46
	Fecal	55	42.31
Presence of shock	Yes	42	32.31
	No	88	67.69

Table 7. Operative and post-operative details

Operative and post-operative details		Number of subjects	Percentage
Operative procedures	Open Appendectomy	30	23.08
	Open Perforation Closure	35	26.92
	Resection & Anastomosis	11	8.46
	Resection Anastomosis & Stomy	9	6.92
	Simple Closure	45	34.62
Duration of hospital stay	Less than 10 days	39	30.00
	11 to 15 days	64	49.23
	16 to 20 days	19	14.62
	More than 20 days	8	6.15
Outcome	Discharged	115	88.46
	Mortality	15	11.54

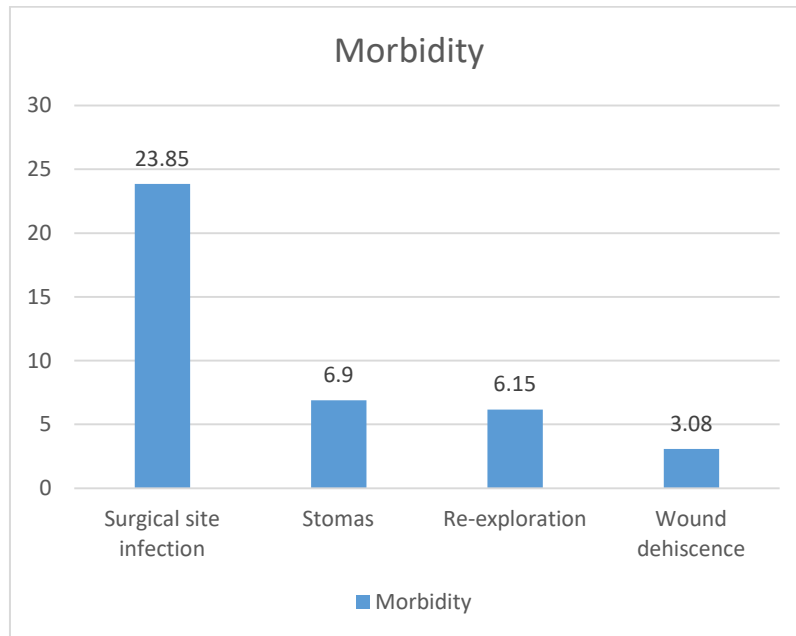


Fig. 2. Morbidity

4.8 Outcome

In the present study we assessed the outcome among the study subjects. We observed 11.54% mortality among the study subjects, while 88.46% study subjects were discharged (Table 4).

In the present study we assessed the Morbidity among the study subjects. We observed that surgical site infection was observed among 23.85% study subjects, Stomas was observed among 6.9% study subjects, Re-exploration was observed among 6.15% study subjects, and Wound dehiscence was observed among 3.08% study subjects (Fig. 2).

5. DISCUSSION

Perforation peritonitis is a common surgical emergency in tropical nations such as India, affecting mostly young men in their prime, as opposed to studies in the West, where it is growing increasingly common among the elderly. The majority of patients arrive at the hospital with well-established widespread peritonitis, purulent or faecal contamination, and variable degrees of septicemia. The signs and symptoms are common, and all patients may be clinically diagnosed with peritonitis [1-2].

Perforations of the proximal gastrointestinal tract were six times more prevalent than perforations of the distal gastrointestinal tract, according to previous research from India. The proximal

gastrointestinal tract perforations are the most prevalent in my research, which is consistent to previous studies in India, although distal GI tract perforations prevail in the Western world.

Hence the current study was conducted at tertiary healthcare teaching institute to study the effect of prognostic factors on mortality and morbidity in perforative peritonitis. In the present study we assessed the Age distribution among the study subjects. We observed that majority of the study subjects belonged to the age group of 46 to 55 years (31.54%), followed by 36 to 45 years (24.62%), more than 66 years among 29.69% study subjects. Peptic ulcer perforation was noticed in increased frequency among the older age group in this study and same was noticed by Strang C et al. [11].

Savnes C et al. has reported that the lethality is higher in the elderly reported that age of a patient, rather than the type of surgery which influences the mortality in perforation peritonitis [12].

In the present study we assessed the Gender wise distribution among the study subjects. We observed that majority of the subjects were males (73.85%), and 26.15% were females. The male: female ratio in the current study was 2.82:1.

Perforation is more common in males than females, because males were subjected to more stress and strain of life and female sex hormone offer some security against perforation as

claimed by Skovgaard [13]. High prevalence of perforation is more in male society as they are more in stress as compared to their female counterparts said by Zahid Amman [14], Sujit Chakma et al. [15] in their study observed that the mean age of their study subjects was 48.28 years and it ranged from 36.8 to 60 years in various studies [16-19]. It was almost equivalent to the mean age of 49 years found by Singh G et al., However their incidence of perforation was slightly higher in female population as compared to other studies [19].

This is in agreement with studies by Bohemen and Delinger et al. who found difference in mortality in different groups as above not statistically significant. To illustrate our point, we further regrouped these into ≤ 50 , > 50 to estimate the significance. We observed that 55.38% subjects had age more than 50 years [20].

5.1 Clinical Presentation

In the present study we assessed the Clinical presentation among the study subjects. We observed that Fever was noted among 36.92% study subjects, Vomiting was noted among 9.23% study subjects, Pain was noted among 100.00% study subjects, Distension was noted among 60.77% study subjects, Guarding and Rigidity was noted among 67.69% study subjects, Bowel Sound was noted among 11.54% study subjects, Free fluid was noted among 63.08% study subjects.

Sujit Chakma et al. in their study observed that abdominal tenderness was the commonest clinical finding and was present in all patients. Abdominal guarding was present in 97.14% patients followed by diminished or absent bowel sound (57.14%), shock (54.29%), tachycardia (54.28%), dehydration (52.85%) and obliteration of liver dullness (48.57%) [15]. Sudershan Kapoor et al. in their study observed that, acute abdominal pain (100% cases) was the most common symptom of perforation peritonitis; other symptoms were abdominal distension (92%), vomiting (88%) constipation (78%) and fever (77%). All the patients (100%) were presented to the hospital with signs of abdominal tenderness, rigidity and guarding, other signs were tachycardia (96%), obliteration of liver dullness (85%), shock (32%) and absence of bowel sounds (80%) [21].

5.2 Site of Perforation

In the present study we assessed the Site of perforation among the study subjects. We observed that stomach was the commonest site of perforation (34.62%), followed by duodenum (26.92%), appendix (23.08%). Ileum (8.46%) and Large intestine (6.92%) was also involved rarely. Sudershan Kapoor et al. in their study observed that most common anatomical site for perforation was terminal ileum (55%) the next common site was stomach (20%), followed by appendix (8%), duodenum (7%), caecum (5%), jejunum (2%) and Meckel's diverticulum (1%). In 2% cases site was not identified due to severe adhesions between gut loops [21].

5.3 Diagnosis

In the present study we assessed the Diagnosis among the study subjects. We observed that Duodenal ulcer perforation was diagnosed among 26.92% study subjects, Gastric ulcer perforation was diagnosed among 34.62% study subjects, Appendicular perforation was diagnosed among 23.08% study subjects, Ileal perforation was diagnosed among 8.46% study subjects, Large intestinal perforation was diagnosed among 6.92% study subjects.

Sujit Chakma et al. [15] in their study observed that 54.29% were duodenal ulcers, 21.43% were typhoid ulcers, 11.22% were appendicular perforations, and 8.57% were traumatic perforations. In their study duodenal ulcer perforation was the most common (54.29%) and same result was shown by other studies. Gastric ulcer perforation accounted for 2.86% of all cases and the incidence was slightly higher than shown by Afridi SP et al., in their study [17]. Sudershan Kapoor et al. in their study observed that most common etiology of perforation peritonitis was Enteric fever (42%) followed by peptic ulcer perforations (27%), tubercular perforations (15%), appendicular perforations (8%), intestinal obstruction (4%), traumatic perforations (3%) and meckel's diverticular perforation (1%) [21].

This study matches with the study of Khanna AK et al. [22] (108 out of 204 cases were of typhoid Etiology), but differs with several other previous studies (Jhobta et al. [16], Vagholkar [23], Gupta et al. [24], Sharma et al. [25] in their studies peptic perforations were the most common etiology and typhoid perforations were 2nd most common etiology).

5.4 Associated Conditions / Findings

In the present study we assessed the Presence of organ failure among the study subjects. We observed that organ failure was reported among 33.08% subjects. In the present study we assessed the presence of Malignancy among the study subjects. We observed that malignancy was present among 14.62% study subjects. In the present study we assessed the Origin of sepsis among the study subjects. We observed that majority of the study subjects had non-colonic origin of sepsis (86.15%), followed by colonic origin among 13.85% subjects. In the present study we assessed the Pre-operative duration among the study subjects. We observed that majority of the study subjects had pre-operative duration more than 24 hours (78.46%), while 21.54% had it less than 24 hours.

Sudershan Kapoor et al. [21] in their study observed that, the average time of presentation to the hospital with signs/symptoms of perforation peritonitis was 2.98 days (71.5 hours). This delay in presentation to the hospital was also noted in the previous studies by Jhobta et al. [16], and Kim et al. [26] (more than 50% cases were explored more than 24 hours after their perforation occurred

In the present study we assessed the Type of peritonitis among the study subjects. We observed that localized peritonitis was reported among 26.92% study subjects, whereas majority had diffuse type of peritonitis (73.08%) [27-29].

Table 2 In the present study we assessed the Type of exudate among the study subjects. We observed that Clear exudate was noted among 9.23% study subjects, purulent exudate was noted among 48.46% study subjects, and fecal exudate was noted among 42.31% study subjects. In our study we observed shock among 32.31% study subjects.

In the present study we assessed the Manheims Peritonitis Index Score among the study subjects. We observed that majority of the study subjects had MPI score between 21 to 29 (52.31%), followed by 29.23% subjects had MPI score more than 29, while 18.46% study subjects had MPI score less than 21.

5.5 Management

In the present study we assessed the Operative procedures among the study subjects. We observed that open appendectomy was performed among 23.08% study subjects, open perforation closure was performed among 26.92% study subjects, resection and anastomosis was performed among 8.46% study subjects, resection anastomosis and Stomy was performed among 6.92% study subjects, simple closure was performed among 34.62% study subjects. In the present study we assessed the Duration of hospital stay among the study subjects. We observed that majority of the subjects had the hospital stay between 6 to 10 days (49.23%), followed by less than 5 days (30%).

Sudershan Kapoor et al. [21] in their study observed that suturing of the perforation was the most common surgical procedure done in 35% of the cases, followed by omental patching in 27% of the cases, followed by ileostomy in 17% of the cases. Resection and anastomosis was done in 14% of cases followed by appendectomy in 7% of the cases. Exploratory laparotomy was done in all cases after 3 to 4 hours of initial resuscitation. Pre-operative resuscitation included I.V fluids with electrolytes, Ryle's tube aspiration, Foley's catheterization, maintenance of input – output balance, blood transfusion, I.V antibiotics against gram positive, gram negative and anaerobes, monitoring of temperature, pulse and blood pressure regularly. Sujit Chakma et al. in their study observed that primary closure was done in all cases of typhoid ileal perforation and mortality rate was 6.67%. Reported mortality of other studies ranges from 7.9% to 31% [15].

5.6 Outcome

In the present study we assessed the Outcome among the study subjects. We observed 11.54% mortality among the study subjects, while 88.46% study subjects were discharged. Jhobta et al. in their study observed mortality among 51 (10%) within 30 postoperative day which is comparable with other published series despite delay in seeking medical treatment. This was probably because of lower mean age (which is a factor determining mortality) of patients in our study. The main cause of death in the present series of patients was septicemia(59%) [16]. Sujit Chakma et al. in their study observed that overall mortality in this study was 10% and similar mortality were reported by various studies varying from 6% to 38% [15].

In the present study we assessed the Morbidity among the study subjects. We observed that surgical site infection was observed among 23.85% study subjects, Stomas was observed among 6.9% study subjects, Re-exploration was observed among 6.15% study subjects, and Wound dehiscence was observed among 3.08% study subjects. Sudershan Kapoor et al. [21] in their study observed that pain was the most common morbidity which was present in 100% of cases followed by fever which was the 2nd most common early postoperative complication (94%). The next common early postoperative complication was paralytic ileus (85%) and superficial wound infection was present in 70% cases. Other postoperative complications were anemia/hypoproteinemia (30%), chest infection (25%), burst abdomen (12%) and anastomotic leak (8%), abscess in 5% of cases. 4 cases of intestinal obstruction (4%) and 2 cases of incisional hernia (2%) were encountered during the follow up period of 3 months.

6. CONCLUSIONS

The present study concluded that:

The male: female ration in the present study was 2.82:1 (male preponderance). The majority of perforation peritonitis cases in the study comprised of gastric ulcer perforations followed by duodenal, appendicular and traumatic perforations, Faecal exudates was more ordinarily associated with colonic origin of sepsis, and it was associated with worse outcomes. All the MPI parameters: extension of peritonitis, presence of organ failure, time of presentation, type of exudates, presence of malignancy, age, found to be associated with severity of peritonitis. Cases of peritonitis carry a high mortality which can be reduced by early diagnosis, risk stratification, appropriate treatment based on risk score.

CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Author has declared that no competing interests exist.

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