



## EVALUATION OF AETIOLOGY AND CLINICAL OUTCOME OF NONTRAUMATIC PERFORATIONS OF SMALL BOWEL WITH RESPECT TO DIFFERENT MODES OF SURGICAL INTERVENTIONS

### General Surgery

**Dr Sasanka Nath\*** Associate Professor, Dept. Of General Surgery, R.G. Kar MC&H. Kolkata.  
\*Corresponding Author

**Dr Partha Chakraborty** Assistant Professor, Department Of Pediatric Surgery, R.G. Kar MC&H Kolkata.

**Dr Suman Das** Assistant Professor, Dept. Of General Surgery, R.G. Kar MC&H. Kolkata.

**Dr Kuntal Chakraborty** PGT, Dept. Of General Surgery, R.G. Kar MC& H, Kolkata.

**Dr Kaustuv Banerjee** PGT, Dept. Of General Surgery, R.G. Kar MC&H. Kolkata.

**Dr Kaustav Saha** PGT, Dept. Of General Surgery, R.G. Kar MC&H. Kolkata.

### KEYWORDS

#### INTRODUCTION

In developing countries, typhoid ulcers, intestinal tuberculosis and parasitic diseases along with obstructive aetiology are well known causes. Perforations mostly occur within 60cm from the ileo-caecal junction. In underdeveloped and developing countries Typhoid remains an endemic disease and typhoid ileal ulcers, not uncommonly, perforates in the third week.

RESECTION AND ANASTOMOSIS, PRIMARY ILEOSTOMY are currently been made to manage these perforations which are found to have different outcomes depending upon their aetiologies and other important factors viz. time of presentation, adequate resuscitation, delay in surgery, number of perforations, amount of faecal contamination.

#### AIMS

The aim of the study is to evaluate the aetiology and clinical outcome of non traumatic free perforations of small bowel in respect to different modes of surgical interventions taken to manage these perforations.

#### SPECIFIC OBJECTIVES OF THIS STUDY

- To analyse the prevalence of various common aetiologies of non-traumatic small bowel perforations namely 1. Typhoid 2. Tuberculosis 3. Obstruction 4. Crohn's Disease 5. Malignancy
- To analyse the various clinical presentations and compare them: 1. Pain 2. Vomiting 3. Distension 4. Fever 5. Guarding and Rigidity
- To analyze various surgical options in respect to their outcomes and post operative complications and determine the optimal surgical management. 1. Primary repair 2. Resection and Anastomosis 3. Stoma
- To observe the clinical outcome and prognostic determinants of non-traumatic free perforations of small bowel namely: 1. Time of presentation 2. Time interval between onset of acute symptoms an intervention

#### MATERIAL AND METHODS

**1. STUDY AREA:** > General Surgery emergency > General surgery ward > General Surgery OT > General Surgery OPD of R.G. Kar Medical College and Hospital, Kolkata.

**2. STUDY POPULATION:** All patients presenting with features of acute abdomen with peritonitis and varying degrees of hemodynamic instability at General Surgery emergency of R.G. Kar Medical College and Hospital.

**3. STUDY PERIOD:** 1 year will be allotted for selection of study subjects and collection of necessary data from them. Each subjects will be followed up for 6 months. Collected data will be analyzed and report will be prepared during next two months.

**4. SAMPLE SIZE:** All the cases of ileal perforations admitted in the

mentioned time period in all surgical units of R.G. Kar Medical College. Total number of cases will be 60

**5. STUDY DESIGN:** This will be an institution-based observational and prospective study.

#### 6. SAMPLE DESIGN:

#### INCLUSION CRITERIA

- > Sample will comprise of both sexes of various religion and socioeconomic status and age group of > 12 years.
- > Patients suspected of having small bowel perforations with strong clinical background

**EXCLUSION CRITERIA:** > Patients with history of trauma > Cases of duodenal perforations > Patients who left against medical advice at any stage of treatment

**7. STUDY TOOLS** > Pretested and predesigned proforma. > Straight X-ray of Abdomen in erect posture > CT scan Abdomen > Routine investigations (Complete haemogram, LFT, Urea, Creatinine, RBS, HIV 1&2, HbsAg, Anti HCV) > Widal Test > USG of whole abdomen

#### 8. STUDY TECHNIQUES

❖ All cases of acute abdomen with peritonitis who will be admitted in the emergency of General Surgery Department of R.G. Kar Medical College and Hospital and will undergo laparotomy done by experienced surgeons and found to have free perforations of small bowel will be included in the study. Cases with specific history of trauma and per-operative findings of peptic perforations will be excluded from the study. After initial evaluation of clinical findings and resuscitation all patients will be screened with straight X-Ray of abdomen in erect posture and posted for emergency laparotomy. Per-operative pathological anatomy will be noted. Biopsy will be taken from perforation edge, resected specimen, mesenteric lymph nodes and peritoneum and will be sent for histo-pathological examination to find out the cause. Patients will then undergo definitive surgical procedures. The type of surgical procedure will be decided on basis of per operative findings. Delay in operation will be the time period calculated from the time of onset of severe symptomatology like exacerbation of abdominal pain, distension and vomiting. Infective aetiologies will be managed with appropriate chemotherapeutic agents. The overall outcome and complications will be observed during the post operative period and follow up.

#### 9. STUDY VARIABLES

- Age • Sex • Religion • Presenting symptoms such as- pain, distension, vomiting, fever, constipation

- Per operative findings- No. of perforations Site of perforations Peritoneal collections
- Post operative diagnosis namely- Typhoid, Tuberculosis, Crohn's etc

### 1. METHOD OF DATA COLLECTION

After getting clearance from the ethics committee, the study will be conducted in the department of General Surgery of R.G. Kar Medical College and Hospital from detailed history, clinical examination, BHT, investigation reports, etc. Patients fulfilling inclusion criteria will be enrolled, informed consent will be taken. The patients will be interviewed based on the redesign and pretested proforma to elucidate the history. Clinical examination of the patient will be done. Demographic and clinical variables will be recorded at the time of admission. Variables for each patient include: AGE, GENDER, DIAGNOSIS, RELIGION, PRESENTING SYMPTOMS, PER OPERATIVE FINDINGS etc. The patients will be then followed up in the post operative period regarding histopathological findings, complications and final outcome of the surgical procedure. The analysis will then be done to meet the aims and objective of the study.

### X.PLAN FOR ANALYSIS OF DATA

The data will be analyzed following standard statistical protocols. Statistics will be worked out mainly to test the significance of the difference between different observations. Numerical data will be analyzed by Student 't' Test or MannWhitney Test depending upon the normality. Categorical data will be analyzed by Chi-Square or Fisher exact Test as applicable. Logistic regression will be done for the outcome variables.

### REVIEW OF LITERATURE

Perforations of small bowel is a common cause of peritonitis requiring immediate surgical treatment<sup>1</sup>. Though it is very common in developing countries, its wide range of clinical presentation is a cause of diagnostic dilemma. Volumes have been written regarding its clinical scenario, diagnostic procedures and modes of surgical interventions to improve the outcome of non-traumatic small bowel perforations.

#### • Review of Epidemiology

In regions with inferior hygienic conditions perforations of small intestine is mostly caused by Typhoid ulcers, Intestinal Tuberculosis or parasitic diseases<sup>5,6,7,8</sup>. Worldwide, the most common cause of small bowel perforation is Typhoid fever<sup>9</sup>. It is primarily caused by Salmonella typhi. Clinical manifestations starts with bacteremia, high grade fever, systemic sepsis with characteristic normal or low blood counts and anaemia<sup>3</sup>

- Typhoid ulcers mainly perforate in the 3rd week giving rise to acute abdomen.

#### • PRESENTING SYMPTOMS

Presenting symptoms are variable and are manifested usually as fever, abdominal pain, vomiting and either diarrhoea or constipation. Gandhi GM et al<sup>14</sup> found fever (90%) to be the most common presenting symptom followed by abdominal pain and distension (70%), absolute constipation (40%), bladder problem (20%), vomiting (10%) and melena (4%).

#### • INVESTIGATIONS

Keenan et al<sup>4</sup> and Naaya HU et al reported free gas shadow under diaphragm in only up to 40-50% cases. In a study conducted by Chouhan MK and Pande SK<sup>9</sup> Widal test was positive in 70.5% cases on nontraumatic small bowel perforation.

**OPERATIVE INTERVENTION:** Dunkerley GE et al (1946)<sup>15</sup> found that the average length of history before perforation was 11 days in non-ambulant and 4 days in ambulant patients. The time interval between perforation and operation averaged 11 hours in non-ambulant and 13 hours in ambulant cases. Dickson JAS and Cole GJ (1964)<sup>16</sup> found the duration of symptoms before perforation varied from 1-30 days with an average of 8 days.

#### • PER OPERATIVE FINDINGS:

They observed that lesions were limited to the small intestine where coarse multiple punctate haemorrhagic areas of 0.2-1 cm diameter were found. Ihekwa FN et al (1979)<sup>8</sup> reported 3 cases of ileal perforation due to ascaris lumbricoides. There were A. lumbricoides in

the peritoneal cavity. Gut was healthy, perforation edges were rounded and there was no mesenteric lymphadenopathy. Kapoor VK and Sharma LK<sup>25</sup> found terminal ileum and ileo-caecal region were the commonest sites of involvement in abdominal tuberculosis. The lesions were either hypertrophic or ulcero-constrictive and perforation was located proximal to the lesion.

Ara C, Sogutlu G et al (2005)<sup>2</sup> in their study of 12 cases of spontaneous small bowel perforation due to intestinal tuberculosis found the site of perforation was Ileum in 10 cases an jejunum in 2 cases. Abdul Rashid K et al (2005) reported single perforation in 8.5% cases, double and triple perforations were found in 11% and 3.7% cases respectively.

#### • HISTOLOGICAL DIAGNOSIS

Kaul BK (1975)<sup>2</sup> showed that histopathological examination of the ulcer margin is helpful supportive evidence for diagnosis. Cases of enteric perforations were characterized by presence of plasma cells and lymphocytes. Dhar A (1990)<sup>3</sup> reported granulomatous lesion with tubercular caseation was present in histopathology of tubercular perforation. On histological examination of perforation site Nguyen QC et al (2004) found combination of chronic and acute inflammation and the predominant infiltrating cells were CD68+ macrophages and CD3+ T lymphocytes.

#### OPERATIVE PROCEDURES:

- Badejo OA et al. (1980)<sup>5</sup> their study results convinced them that all cases of typhoid must be promptly and adequately resuscitated, operated, drained, and irrigated. • Rauf A Wani et al. (2006)<sup>6</sup> in their evaluation on the clinical profile, aetiology and optimal surgical management of patients with non-traumatic terminal ileal perforation concluded that Terminal ileal perforation should be suspected in all cases of peritonitis especially in developing countries and surgical treatment should be optimized taking various accounts like aetiology, delay in surgery and operative findings into consideration to reduce the incidence of deadly complications like faecal fistula.

- M.K. Chouhan, S.K. Pande, Typhoid Enteric Perforation (1982)<sup>9</sup> in their review of 344 patients presented with typhoid perforation of the intestine, concluded that enteric perforations should be treated with antibiotics, by fluid and electrolyte replacement and blood transfusion. 52 Surgery is necessary to close the perforated gut and drain the contaminated peritoneum with the minimum surgical interference which will achieve these objectives. Although better conservative management has significantly reduced the mortality of typhoid perforation, early limited surgery is most important if good results are to be obtained.

**1) Simple Closure** • Freshening of edges and closure has been recommended by Archampong (1985)<sup>7</sup>. Bitar and Tarpley (1985) in their review have advised simple closure for most cases where they describe it as "doing as much as necessary but as little as possible"<sup>8</sup>, the intention being a swift effective operation designed to halt the contamination and remove the existing collection. • Talwar et al. (1997) recommended primary closure and limited surgery with thorough peritoneal lavage. • Nuhu A et al. (2010) concluded in their study that the typically high rate of complications can be reduced if operation is taken earlier. Solitary ileal perforations can be managed safely with simple closure. • Singh S et al. (1995) recommended two layer closure of ileal perforation to prevent leakage.

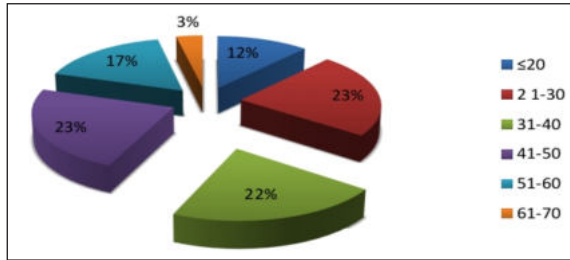
**2) Resection anastomosis** • Jarett and Gibney (1989) recommend resection only for multiple perforation, Gibney recommended resection if there were three or more perforations. Kouame J et al. (2004) Report on their surgical experience of 64 cases with typhoid ileal perforation and recommended the resection of the last 60 centimetres of the ileum, in cases of serious abdominal suppuration, and a large abdominal washout. • Shah AA, Wani KA, Wazir BS (1999), in their prospective study of 81 cases of typhoid enteric perforation concluded that the ideal treatment for typhoid enteric perforation was found to be resection-anastomosis with copious peritoneal lavage.

**3) Ileostomy** • Dr Shaikat Ali et al<sup>10</sup>. (2006), concluded that in cases where the general condition is not good, patients has been partially treated and has lost many precious hours of time has developed renal shut down, metabolic and hemodynamic instability, these patients should be certainly managed by temporary Ileostomy. • Adnan Aziz et al. concluded in their study that loop ileostomy is the stoma of choice for temporary faecal diversion as most of its complications are

manageable non – operatively. • Dr. Muhammad Sher-uz-zaman et al (1952)<sup>11</sup>, found ileostomy to be a lifesaving procedure in our set up where patients presents very late with gross peritoneal contamination. • Santillana recommended exteriorization in moribund patient. If fistula form they variable heal by conservative management. • Srihari G, Sudheer D, in their study of prognostic factors and outcomes in ileal perforations concluded that Typhoid is the most common cause of ileal perforation followed by nonspecific perforations, and type of surgical procedure did not influence outcome, either morbidity or mortality. • Faisal Ghani Siddiqui et al.(2008) recommended defunctioning ileostomy over all the surgical loptions in ileal perforations.

**CHARTS AND TABLES**

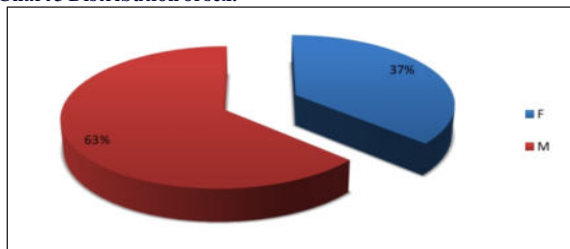
**Chart 1: Distribution of Age in Years**



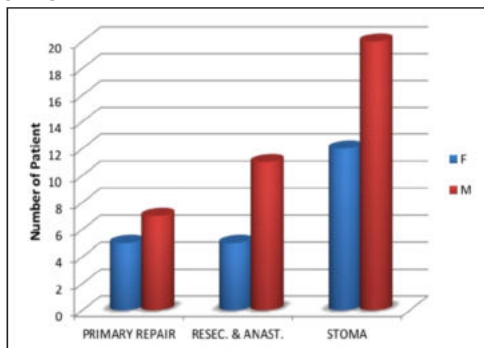
**Chart2: Distribution of Sex**

SEX	Frequency	Percent
Female	22	36.7%
Male	38	63.3%
<b>Total</b>	<b>60</b>	<b>100.0%</b>

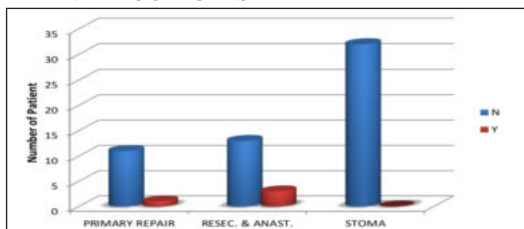
**Chart 3 Distribution of sex.**



**Chart 4 ASSOCIATION BETWEEN SEX VS OPERATIVE PROCEDURE**



**CHART 5 ASSOCIATION BETWEEN FISTULA AND OPERATIVE PROCEDURES**



**TABLE1 DISTRIBUTION OF OPERATIVE PROCEDURE**

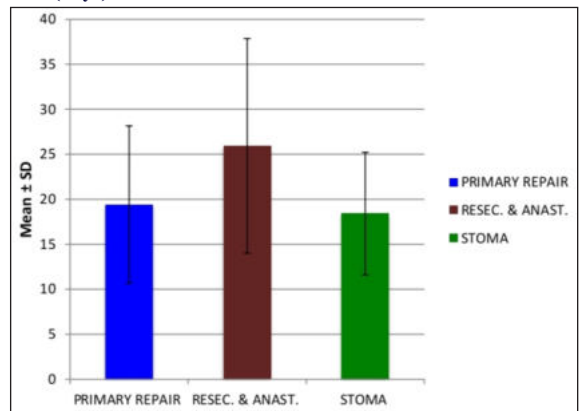
OPERATIVE PROCEDURE	Frequency	Percent
PRIMARY REPAIR	12	20.0%
RESEC. & ANAST.	16	26.7%
STOMA	32	53.3%
<b>Total</b>	<b>60</b>	<b>100.0%</b>

**TABLE 2 ASSOCIATION BETWEEN DEATH VS OPERATIVE PROCEDURE**

DEATH	OPERATIVE PROCEDURE			TOTAL
	PRIMARY REPAIR	RESEC. & ANAST.	STOMA	
<b>No</b>	11	13	32	56
Row %	19.6	23.2	57.1	100.0
Col %	91.7	81.3	100.0	93.3
<b>Yes</b>	1	3	0	4
Row %	25.0	75.0	0.0	100.0
Col %	8.3	18.8	0.0	6.7
<b>TOTAL</b>	<b>12</b>	<b>16</b>	<b>32</b>	<b>60</b>
Row %	20.0	26.7	53.3	100.0
Col %	100.0	100.0	100.0	100.0

Chi-square value: 6.0938; p-value:0.0475

**CHART 6 DISTRIBUTION OF MEAN HOSPITAL STAY(days)vs OPERATIVE PROCEDURE**



Non traumatic small bowel perforation is still a common cause of obscure peritonitis in developing and underdeveloped countries. These cases with varied presentations often produce a diagnostic dilemma to the surgeons. Laparotomy is often carried out suspecting a perforated appendicitis or a duodenal ulcer. Ileal perforation is best treated by surgery is universally accepted, but the exact nature of the surgical procedure remains controversial to date.

**AGE:** The mean age in our study was higher than other studies 76 as the children below 12 years were excluded from the study and causes other than typhoid perforations were considered. The age of the patients ranged from 15 years to 64years. The maximum number of cases were in the age group of 21-30 years and 41-50 years accounting for 23.3% each, closely followed by 31-40 years age group (21.7%).

**SEX:** The incidence of small bowel perforation is higher in male patients. In our study male : female ratio is 1.72 : 1 which is comparable to other studies but the ratio is somewhat less. This has been corroborated by other studies 44,77,78,

**PRESENTING SYMPTOMS:** Pain abdomen was the commonest symptom (100%) among all the patients as shown in the study of Rauf A Wani et al followed by fever (95%). Welch TP and Martin NC<sup>19</sup> reviewed 50 cases of enteric perforation and reported that all patients had abdominal pain and fever. They also reported diarrhoea and in 42% cases. In our study it is 35% which somewhat comparable. In this study constipation was present in 41.7% cases which is comparable to what Gandhi Gm et al<sup>14</sup> has reported (40%). Other significant presenting symptoms were distension (78.3%), vomiting (68.3%) and obstipation (43%).

**INVESTIGATIONS:** Straight X-ray abdomen in erect posture was the most commonly performed investigation as this could be done in

all the patients at the time of admission. It revealed free gas under diaphragm in 32 patients (53.3%), which is less than Welch TP and Martin NC, Purohit PG, Rathore AH et al and Akgun Y et al who reported 70-80% positive free gas shadow under diaphragm. This observation is comparable to the observation of Dickson JAS and Cole GJ<sup>16</sup> Gandhi GM et al<sup>14</sup>, Kennan et al and Naaya HU et al who reported free gas under diaphragm in 40-50% patients. The precise reason for this low occurrence is not known but adhesions around the perforation, sealing of the perforation and reabsorption of the gases due to delayed presentation can be cited as few causes. Other pre operative investigations revealed azotaemia in 14 (23.3%) patients, dyselectrolytemia in 16 (26.7%) patients, raised serum creatinine in 32 (53.3%) patients and anaemia in 40 (66.7%) patients. The number of patients who had USG at the time of diagnosis is nil due to lack of emergency USG facility in our institution and the economic constraint of the patients.

**Time interval between onset of acute symptoms & operative intervention:** More than half of the patients, 71.7% had received definitive operative intervention after 72 hours of onset of acute symptoms and only one of them attended our hospital within 24 hours of onset of acute symptoms. All the delays were pre-hospital except 1 male patient, a known alcoholic who presented with features of acute onset pain in the epigastric region of one day and straight X-ray revealed no free gas under diaphragm. In this case our provisional diagnosis was acute pancreatitis and it was only the next day that we arranged an USG for the patient which reported to be a case of suspected hollow viscus perforation with free fluid in the peritoneum and we operated upon the patient that very day and it came out as a case of double perforation of the terminal ileum. The pre-hospital delays were due to the fact that most of the cases came from remote areas where the medical facilities are scarce. The more delayed was the presentation the more it contributed to increased morbidity and mortality.

**PER-OPERATIVE FINDING:** 35 patients (58.3%) had solitary perforation which is almost similar to the finding of Jan WA et al<sup>8</sup> and Sharma MB et al who observed single perforation in 81.63% and 87% respectively. While 20 patients (33.3%) had double perforations and 8 (6.66%) had 3 or more perforations. The peritoneal content was feculent in most of the patients. In a series of 112 patients studied by Arshad M. Malik et al<sup>15</sup>, a single perforation of about 1cm size was found on the anti-mesenteric border of terminal ileum in 98 (87.5%) patients, while more than one perforation was found in 14 (12.5%) patients. The perforations though present throughout the small gut, the most common location was the terminal ileum ranging 15cm to 30 cm proximal to I-C junction which is corroborative of most of the studies<sup>27,45,83</sup> done previously which states that the terminal 50 cm of the ileum is the most common site of non-traumatic perforation of the small bowel.

**HISTOLOGICAL DIAGNOSIS:** Histologically, the presence of mainly macrophages and lymphocytes and necrosis of Peyer's patches with ulceration of the intestinal mucosa is suggestive of typhoid perforation. Presence of caseating granuloma in the background of inflammation and necrotic lymph node is suggestive of tubercular perforation. Nonspecific inflammation of the terminal ileum was another predominant cause. In such cases, the operative findings were similar to that of typhoid fever but no laboratory evidence of the disease was found. In our study we found 17 cases (28.3%) diagnosed as tubercular perforation while 32 cases (53.3%) were due to typhoid perforation. Non-specific inflammation were reported in 8 cases (13.3%), and 2 (5%) diagnosed as Crohn's disease. Worldwide the most common cause of non-traumatic small bowel perforation is typhoid fever<sup>58,61</sup>. In our study most common cause of perforation is tubercular perforation. This is probably due to reduction in typhoid fever by public measures such as provision of clean water supply, safe disposal of sewage and improvement in personal hygiene, the increased incidence of tuberculosis, cases of drug defaulter of tuberculosis and development of MDR tuberculosis. In a series of 170 patients of ileal perforation by Muneer et al, typhoid and tuberculosis were found to be the leading causes with an incidence of 60% and 14.7% cases respectively [74]. In a series of 108 patients of ileal perforation by Faisal Ghani Siddiqui et al, the incidence of typhoid and tuberculosis was 68.5% and 21.3% respectively. Our study confirms findings of similar studies.

**OPERATIVE PROCEDURES:** In our study the most commonly performed operation was ileostomy 32 cases (53.3%) followed by

resection and anastomosis in 16 cases (26.7%) and trimming of the perforation margin followed by primary closure in 12 cases (20%).

**OUTCOME:** The various complications encountered in this study were wound infection, burst abdomen, pulmonary complications, intra abdominal abscess, enterocutaneous fistula, anastomotic leaks and ileostomy specific complications. Wound infection was the most common complication encountered and account for 44 (73.3%) cases. The overall complication rate is bit higher in our study probably because of the late presentation and gross contamination of the peritoneal cavity as compared to various studies conducted which revealed it to be approximately 14,20,30. 4 (6.7%) patient in our study developed fecal fistula. There were 4 deaths in this study. The overall mortality rate being (6.7%) This is far less than that is reported (more than 50%) in various studies<sup>9,16,58</sup>. This may be due to less extensive and safer procedure like ileostomy was adopted in most of the cases. In our study 14 (23.3%) patients with an ileostomy developed ileostomy related complications causing increase in the hospital stay duration up to 42 days.

## SUMMARY AND CONCLUSION

The study was conducted in the Department of General Surgery, R. G. Kar Medical College and Hospital, Kolkata. Mean age was found to be 37.33 years, ranging between 15 years to 64 years with 23.3% between 21-30 years and 41-50 years along with 21.7% in the age group of 31-40 years. Male:female ratio was 1.72:1. 56.7% of the patients were Hindu, 40% were Muslim and 3.3% were Christians. Pain abdomen was the commonest symptom (100%) followed by fever (95%) and abdominal distension (78.3%). Tender abdomen was present in all the patients (100%) while abdominal guarding and rigidity was present in 96.7%. Mild to moderate dehydration was present in 88.3% patients at the time of admission. Hypotension was present in 71.1% patients. Straight X-ray of abdomen revealed free gas under diaphragm in 53.3% patients. Most of the patients (71.7%) had received operative intervention after 72 hours of onset of acute symptoms mostly due to pre-hospital delay. Typhoid perforation was the most common cause of non-traumatic small bowel perforation in this study (53.3%) followed by Tuberculosis (28.3%) and nonspecific inflammation (13.3%). Most commonly performed operation was exteriorization ileostomy (53.3%) followed by resection of the perforated diseased segment followed by end to end anastomosis (26.7%) and primary closure (20%). Wound infection was the most common complication encountered and accounted for 73.3% cases. The overall mortality rate was 6.6%. Most of the patients underwent operative intervention more than 72 hrs after the onset of acute symptoms. The cause of death in all the cases was sepsis due to anastomotic leak and formation of faecal fistula.

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