ORIGINAL ARTICLE

Spectrum of site of visceral perforation in non-traumatic secondary peritonitis in Civil Hospital, Karachi

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Abstract

Introduction: Non-traumatic secondary peritonitis developed due to visceral perforation is a common surgical emergency that requires early diagnosis and appropriate management.

Objective: To determine the spectrum of the site of visceral perforation in non-traumatic secondary peritonitis in patients presented in civil hospital Karachi.

Study design: Cross-sectional study.

Settings: Surgery Department of Civil Hospital Karachi.

Duration of study: Six months from 16-11-2021 to 15-05-2022.

Material and Methods: This study included 185 patients of visceral perforation in non-traumatic secondary peritonitis selected by a non-probability consecutive sampling technique. All the patients who fulfilled the inclusion criteria were included in the study and detailed demographic and medical history was taken. The vital signs of each patient was measured followed by an evaluation of clinical sign and symptoms. Complete blood count, urine detailed report, plain x-ray, and ultrasound of the abdomen of each patient were performed. All results were collected and filled in Performa accordingly by the researcher and analyzed by using Statistical Package for Social Science (SPSS) software, Version 25.

Results: Out of 185 patients, male patients were 136(73.5%) and female patients were 49(26.5%) with a mean age of 32.74±13.13 (18-60) years. The most commonly reported symptom was abdominal pain in all 185(100.0%) patients followed by vomiting in 175 (94.6%) patients, tachycardia in 70(37.8%) patients, constipation in 51(27.6%) patients, tachypnea in 46(24.9%) patients, and abdominal distention in 31(16.8%) patients and nausea in 22 (11.9%) patients. Most commonly reported site of perforation was ileum in 147(79.5%) patients followed by duodenum in 17(9.2%) patients, appendix in 9(4.9%) patients, colon in 4(2.2%) patients, jejunum in 3(1.6%) patients, stomach in 3(1.6%) patients, caecum in 1(0.5%) patient and rectum in 1(0.5%) patient.

Conclusion: It was concluded from the study that the ileum was the most commonly reported site of visceral perforation in non-traumatic secondary peritonitis followed by duodenum, appendix, colon, jejunum, stomach, caecum, and rectum.

Keywords: Peritonitis, perforation, emergency, diagnosis.

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Introduction:

Peritonitis due to perforation of the gastrointestinal tract is one of the most common surgical emergencies throughout the world as well as in our country. Despite advancements in surgical techniques, antimicrobial therapy, and intensive care, it carries high morbidity and mortality. While management of peritonitis continues to be highly demanding, complexity depending on the cause can vary the treatment.[1,2,11]

Peritonitis may be classified as primary when there is disruption of abdominal viscera, or secondary which includes localized abscess, and tertiary, which is caused by disturbed immune

response and occurs late. Treating medically with drugs is the first line of defense in cases of either primary or tertiary peritonitis while the role of surgeons comes into play in cases of secondary peritonitis.[3,4,12]

The spectrum of etiology of perforation differs from its western counterpart. Primary peritonitis results from bacterial translocation, hematogenous spread, or the iatrogenic contamination of the abdomen without a macroscopic defect in the gastrointestinal tract. By contrast, secondary peritonitis results from the direct contamination of the peritoneum by spillage from the gastrointestinal or urogenital tracts or their associated solid organs. Tertiary peritonitis refers to secondary peritonitis that persists for more than 48 hours after an attempt at surgical source control.[5-10]

Patients with peritonitis usually present as an acute abdomen. Local findings include abdominal tenderness, guarding or rigidity, distension, and diminished bowel sounds. Systemic findings include fever, chills or rigor, tachycardia, sweating, tachypnea, restlessness, dehydration, oliguria, disorientation, and ultimately shock.[6,7] In the majority of cases, peritonitis is diagnosed on clinical findings, whereas diagnostic tools are X-ray, Ultrasound, and Computed Tomography.

A study by Hameed T, et al. reported the non-traumatic sites of perforation in secondary peritonitis including gastric and duodenal (52%) followed by distal ileum (20%), appendix (7.4%), jejunum, and ileum tuberculosis stricture perforation (3.1%) cases, caecum and colon(0.9%), Meckel's diverticulum perforation (0.6%) depending on the cause. The most common clinical presentation was tenderness 77.4% followed by abdominal distension 67.1%, obliteration of liver dullness 56%, and rigidity 53.7%.[8]

Rationale Peritonitis case is managed as a surgical emergency when presented in the hospital. Its frequency, etiology, clinical signs and symptoms, and mortality vary from country to country and largely differ from Western countries. Therefore, the current study was designed to determine the spectrum of the site of visceral perforation in non-traumatic secondary peritonitis in patients presented in the surgery department of Civil Hospital, Karachi. Very little research has been conducted in Pakistan on visceral perforation in non-traumatic secondary peritonitis, so our finding will add new data to the literature on visceral perforation in non-traumatic secondary peritonitis and will help in early diagnosis and treatment.

Objectives: To determine the spectrum of the site of visceral perforation in non-traumatic secondary peritonitis in patients presented at Civil Hospital, Karachi.

Operational definition:

1. Visceral Perforation Sites: After initial resuscitation and pre-operative workup, exploratory laparotomy is performed on a patient with secondary non-traumatic peritonitis, during exploratory laparotomy site of perforation categorized anatomically, intra-operatively complete bowel survey carried out to look for all possible sites of perforation.

2. Stomach and Duodenum: The anterior and posterior surfaces of the stomach and duodenum are examined for possible perforation intraoperatively.

3. Jejunum and Ileum: Look for possible perforation intraoperatively at mesenteric and antimesenteric borders of the ileum and jejunum.

4. Appendix: Base and tip of appendix look upon for perforation.

5. Meckel's Diverticulum: A careful bowel survey was done to look for the presence of Meckel's diverticulum in the distal ileum and its possible perforation.

6. Caecum and Colon: Intra-operative tenia coli were identified and looked for possible perforation in between them.

7. Rectum: An intraoperative pelvic survey was done and look for possible rectal perforation.

8. Visceral Perforation: A patient presented with one or more of the following symptoms including abdominal pain or distention, nausea, vomiting (> 1/day), constipation (≥ 3 days without having a bowel movement), fever (> 98.6 °F), tachycardia (heart rate over 100 beats per minute), tachypnea (> 20 breaths per minute), hypotension (systolic blood pressure < 90 mm Hg or diastolic blood pressure < 60 mmHg) and shock (systolic blood pressure < 90 mmHg) and confirmed on the presence of multiple air-fluid level (more than5fluid levels) and pneumoperitoneum (presence of air or gas in the abdominal (peritoneal) cavity) on erect abdominal x-ray.

9. Secondary Peritonitis: A patient presented with one or more of the following symptoms including fever (> 98.6 °F), nausea, vomiting (> 1/day), low urine output(< 400 mm/day), thirst, constipation (≥ 3 days without having a bowel 33movement) and confirmed on the presence of swelling of peritoneum on abdominal ultrasound.

10. Non-Traumatic Secondary Peritonitis: A type of secondary peritonitis developed other than any injury or trauma. The visceral perforation site includes the duodenum, jejunum, ileum, stomach, colon, appendix, caecum, and rectum.

Material and Methods:
Setting: The study was conducted at the Surgery Department of Civil Hospital, Karachi.

Duration of study: Six months from 16-11-2021 to 15-05-2022.

Study design: Cross-sectional study.

Sample Size: The sample size calculation was done using the World Health Organization (WHO) software for "Sample size calculation" by using the mean value of Hameed T, et al. who reported the tuberculosis stricture perforation (3.1%),[8] by taking confidential interval 95% and margin of error 2.5%, the sample size stands to be n=185. NOTE: The least frequency reported by Hameed T Et al. was Meckel's diverticulum (0.6%),[8] But the sample size turned out to be 2500 which could not be achieved during my residency period so the sample size calculated by taking frequency of tuberculosis stricture perforation (3.1%).[8]

Sampling technique: Consecutive sampling technique.

Sample selection:
Inclusion criteria: The patients were included in the study, of both genders (male and female), age 18-60 years. Patients presenting with visceral perforation in non-traumatic secondary peritonitis (according to operational definition). Patient presented in emergency with visceral perforation confirmed by gas under the diaphragm on chest x-ray.

Exclusion criteria: The patients were excluded from the study, with traumatic secondary peritonitis such as road traffic accident and fall from height, not willing to participate in the study.

Data collection procedure: Before the collection of data, approval was obtained from the hospital ethical committee and research evaluation unit (REU) of the College of Physicians and Surgeons Pakistan (CPSP). Written informed consent was also obtained from patients or their attendants. All those inpatients who fulfilled the inclusion and exclusion criteria were included in the study. The medical history of each patient was collected with name, age, and duration of symptoms. Vital signs of each patient including fever, heart rate, respiratory rate, and blood pressure were measured by using a digital thermometer, pulse oximeter, and digital sphygmomanometer. Clinical signs and symptoms including abdominal pain or distention, nausea, vomiting, constipation, low urine output, thirst, fever, tachycardia, tachypnea, hypotension, and shock were also confirmed. Complete blood count and urine detailed report of each patient was performed. A plain x-ray and ultrasound of the abdomen of each patient was performed. The researcher collects the data of each patient on pro-forma.

Table 1: Distribution of the Site of Perforation

Site of Perforation	Frequency	Percent
Duodenum	17	9.2%
Jejunum	3	1.6%
Ileum	147	79.5%
Caecum	1	0.5%
Colon	4	2.2%
Appendix	9	4.9%
Rectum	1	0.5%
Stomach	3	1.6%
Total	185	100.0

Table 2: Stratification of site of perforation was done with respect to Gender

Gender	Duodenum	Jejunum	Ileum	Caecum	Colon	Appendix	Rectum	Stomach
	N (%)	N(%)	N(%)	N(%)	N(%)	N (%)	N(%)	N(%)
Male	15(88.2)	2(66.7)	105(71.4)	1(100)	3(75.0)	6(66.7)	1(100)	3(100)
Female	2(11.8)	1(33.3)	42(28.6)	0(0)	1(25.0)	3(33.3)	0(0)	0(0)
Total	17(100)	3(100)	147(100)	1(100)	4(100)	9(100)	1(100)	3(100)

Chi-squarevalue=4.315, P-value=0.743(Non-significant)

Table 3: Stratification of site of perforation was done with respect to age in groups

Age in groups	Site of perforation							
	N (%)	N(%)	N(%)	N(%)	N(%)	N (%)	N(%)	N(%)
18-30	7(41.2)	1(33.3)	87(59.2)	0(0)	1(25.0)	6(66.7)	0(0)	3(100)
31-45	10(58.8)	0(0)	34(23.1)	0(0)	1(25.0)	2(22.2)	0(0)	0(0)
46-60	0(0)	2(66.7)	26(17.7)	1(100)	2(50.0)	1(11.1)	1(100)	0(0)
Total	17(100)	3(100)	147(100)	1(100)	4(100)	9(100)	1(100)	3(100)

Chi- square value =31.697, P-value=0.004

Table 4: Stratification of the site of perforation concerning duration of disease

Duration of disease in groups	Site of perforation							
	Duodenum	Jejunum	Ileum	Caecum	Colon	Appendix	Rectum	Stomach
	N (%)	N(%)	N(%)	N(%)	N(%)	N (%)	N(%)	N(%)
1-5	17(100)	3(100)	146(99.3)	1(100)	4(100)	8(88.9)	1(100)	3(100)
6-10	0(0)	0(0)	1(0.7)	0(0)	0(0)	1(11.1)	0(0)	0(0)
Total	17(100)	3(100)	147(100)	1(100)	4(100)	9(100)	1(100)	3(100)

Chi-squarevalue=9.004, P-value=0.252(Non-significant)

Data analysis procedure: After the collection of data the analyses were conducted by using Statistical Package for Social Science (SPSS) software, Version 25. Mean and standard deviation were calculated for quantitative variables like age (years), duration of disease (days), fever (^{o}F), heart rate (beats per 37minute), respiratory rate (breaths per minute), blood pressure (mmHg), sodium (mEq/L), potassium (mEq/L), blood urea nitrogen (mg/dl) and serum creatinine (mg/dl). Frequency and percentages were calculated for qualitative variables like gender, age in groups, duration of disease in group's, signs and symptoms (including abdominal pain or distention, nausea, vomiting, constipation, fever, tachycardia, tachypnea, hypotension, shock, low urine output and thirst), hyponatremia, hypokalemia, Blood Urea Nitrogen, Serum Creatinine, Pneumoperitoneum, air-fluid levels and site of perforation. Effect modifiers like gender, age in groups, and duration of disease were controlled through stratification by applying a chi-square test and taking a value ≤ 0.05 as significant.

Results:

In the current study, 185 patients of visceral perforation in non-traumatic secondary peritonitis were evaluated for clinical signs and symptoms and site of visceral perforation. The mean and standard deviation of age was 32.74±13.13 (18-60) years. The mean and standard deviation of the duration of the disease was 2.49±1.11(1-10) days. The standard deviation of fever was 98.47±0.52 (98.0-101.70) ^{O}F. The mean heart rate, respiratory rate, systolic blood pressure, and diastolic blood pressure were 102.36±11.26 (90- 130) beats per minute, 17.64±4.85 (12-30) breaths per minute, 113.53±6.94 (80-120) mmHg and 74.68±4.79 (55-80) mmHg respectively. The mean and standard deviation of sodium, potassium, blood urea nitrogen, and serum creatinine were 137.40±1.85 (131-142) mEq/L, 4.46±0.37 (3.1-4.9) mEq/L, 10.55±2.17 (414) mg/dl and 0.83±0.18(0.4-1.0)mg/dl respectively. The frequency of male patients, 136(73.5%), affected were more as compared to female patients, 49(26.5%). In 18-30 years 105(56.8%) patients, in 31-45 years 47(25.4%) patients, and in 46-60 years 33(17.8%) patients.

In this study enrolled patients with duration of disease were grouped as; in 1- 5 days 183(98.9%) patients and in 6-10 days 2(1.1%) patients.

Abdominal pain was present in all 185(100.0%)

patients and absent in (0.0%) patients while abdominal distention was present in 31(16.8%) patients and nausea in 22(11.9%) patients.

The incidence of vomiting was present in 175(94.6%) patients while constipation was present in 51(27.6%) patients. 7(3.8%) patients also presented with fever. Tachycardia was only present in 70(37.8%) patients while tachypnea was present in 46(24.9%) patients.

Hypotension was present in 7(3.8%) patients and shock was present in 5(2.7%) patients. Low urine output was present in 5(2.7%) patients and absent in 180 (97.3%) patients. In this study thirst was present in 5(2.7%) patients and absent in 180(97.3%) patients.

In table 1-3 stratification of site of perforation was done with respect to gender, age in groups and duration of disease. Post- stratification chi-square test was applied by taking p-value ≤ 0.05as significant that shows significant p-value with age in groups and non- significant p-value with gender and duration of disease.

Discussion:

Secondary peritonitis due to visceral perforation of the gastrointestinal tract is the most common surgical emergency throughout the world.[13] These perforations lead to diffuse peritonitis, toxemia, septicemia, metabolic and circulatory instability, renal failure, and pulmonary insufficiency, compounded by advanced age and delay in therapeutic procedures, which leads to high mortality and morbidity.[15,16]

Therefore, the current study was designed to determine the spectrum of the site of visceral perforation in non-traumatic secondary peritonitis in patients presented in the surgery department of Civil Hospital, Karachi. Very little research has been conducted in Pakistan on visceral perforation in non-traumatic secondary peritonitis, hence our findings will add new data to the literature on visceral perforation in non-traumatic secondary peritonitis and will help in early diagnosis and treatment.

In this study, most commonly reported site of perforation was ileum in 147(79.5%) patients followed by duodenum in 17(9.2%) patients, appendix in 9(4.9%) patients, colon in 4(2.2%) patients, jejunum in 3(1.6%) patients, stomach in 3(1.6%) patients, caecum in 1(0.5%) patient and rectumin 1(0.5%) patient. Hameed T, et al.[8] reports the non-traumatic sites of perforation in secondary peritonitis including gastric and duodenal 52% followed by distal ileum 20%, appendicular 7.4%, jejunum and ileum tuberculosis stricture perforation 3.1%, caecum, and colon 0.9% and Meckel's diverticulum perforation (0.6%). Sharma S, et al.[9] report the sites of perforation in secondary peritonitis including gastric and pre-pyloric 16.4%, duodenum 35.0%, jejunum 5.3%, ileum29.6%, appendix 10.3% and colon and rectum 3.2%.

Afridi SP, et al.[17] reports the sites of perforation in secondary peritonitis including duodenum 43.6%, ileum 37.6%, jejunum 3.3%, stomach 2.3%, and colon 8.1%, appendix 5.0%, caecum 0.6% and rectum 0.3%. All similar studies report that most of the perforation was reported in the ileum and duodenum whereas some of the perforation was also reported in the appendix, colon, jejunum, stomach, caecum, and rectum.

In this study, out of 185 patients with visceral perforation in non-traumatic secondary peritonitis, male patients were 136(73.5%) and female patients were 49(26.5%). Similar studies report similar results that the majority of the male patients were suffering from disease as compared to female patients such as; Hameed T, et al.[8] report that 76.6% of male patients and 23.4% of female patients, Sharma S, et al.[9] reports the 83.57% male patients and 16.43% female patients and a Pakistani study Afridi SP, et al.[17] also reports the higher 68.3% male patients and 31.7% female patients.

In this study, mean age of patients was 32.74±13.13 (18-60) years and most of the patients were in the age group of 18-30 years having 105(56.8%) patients, followed by age group of 31-45 years having 47(25.4%) patients and age group of 46-60 years having 33(17.8%)

patients. Similar studies report that adults with increasing age are mostly affected with non-traumatic secondary peritonitis. Such as Hameed T, et al.[8] report a mean age of 39.6 years and most of the patients were in the age group of 31-40 years, Sharma S, et al.[9] reports that the most commonly affected age group was 21 to 30 years (19.64%) and Afridi SP, et al.[17] reports the mean age of 40.5 years. In this study mean age of patients was less as compared to other studies due to a selection of patients. In this study patients aged 18-60 years were selected whereas other studies included patients aged more than 60 years. Still, all similar studies report that adults with increasing ages of 18-40 years are mostly suffering from disease.

In this study, the most commonly reported symptom was abdominal pain in all 185(100.0%) patients followed by vomiting in 175(94.6%) patients, tachycardia in 70(37.8%) patients, constipation in 51(27.6%) patients, tachypnea in 46(24.9%) patients, abdominal distention in 31(16.8%) patients, nausea in 22(11.9%) patients, fever in 7(3.8%) patients, hypotensionin 7(3.8%) patients, shock in 5(2.7%) patients, low urine output in 5(2.7%) patients and thirst in 5(2.7%) patients. Hameed T, et al.[8] also report abdominal pain as the most common symptom reported in 83.1% patients followed with obstipation 75.5%, anemia 59.4%, dehydration 42.4%, vomiting 32.0%, shock 28.0%, fever 25.4% and diarrhea 3.1%. Sharma S, et al.[9] also report abdominal pain as the most common symptom reported in 100.0% of patients followed by abdominal distension at 95.0%, constipation at 88.5%, vomiting at 22.8%, and fever at 34.3% and diarrhea at 4.3%. Afridi SP, et al.[17] also report abdominal pain as the most common symptom reported in 78.3% followed by abdominal distention at 45.0%, altered bowel habit 26.6% nausea and vomiting 21.3%, and fever 20.0%. Abdominal pain, abdominal distension, nausea, vomiting, and constipation are some of the commonly reported signs and symptoms.

One limitation of this study was being single centered. This study is also limited by exclusion criteria to determine the spectrum of the site of visceral perforation in non-traumatic secondary peritonitis and does not follow the patients for their treatment and outcomes on long term.

Conclusion:
It was concluded from the study that the ileum was the most commonly reported site of visceral perforation in non-traumatic secondary peritonitis followed by duodenum, appendix, colon, jejunum, stomach, caecum, and rectum. These findings have added new data in the literature on visceral perforation in non-traumatic secondary peritonitis which will not only be helpful in early diagnosis and treatment of the patients, but will also help other researchers in future researches.

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Role and contribution of authors:
Bushra Shakeel, collected the data, references and did the initial writeup.

Mohammad Taha Kamal, collected the data, references, and helped in introduction writing.

Nargis Maqbool, collected the references and also helped in discussion and result writing.

Komal Faheem, critically went through the article and made useful changes.

Anam Khan, collected the data, references, and helped in discussion writing.

Shehzadi Rimsha, collected the data, references and helped in interpretation of data and also helped in introduction writing.

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