e-ISSN: 0975-9506, p-ISSN: 2961-6093

Available online on www.ijpqa.com

International Journal of Pharmaceutical Quality Assurance 2026; 17(3); 276-282

Original Research Article

Retrospective Study of Perforation Peritonitis: Etiology, Clinical Profile and Factors Influencing Mortality

Ishwar Devamanvar Ahir[1], Jeemy Shaileshkumar Prajapati[2], Ravikumar Pankajkumar Mendha[3]

[1]Senior Resident, Department of General Surgery, Shri M.P. Shah Government Medical College, Jamnagar, Gujarat, India

[2]Junior Resident (Academic) Department of General Surgery, Shri M.P. Shah Government Medical College, Jamnagar, Gujarat, India

[3]Junior Resident (Academic) Department of General Surgery, Shri M.P. Shah Government Medical College, Jamnagar, Gujarat, India

Received: 14-01-2026 / Revised: 19-02-2026 / Accepted: 20-03-2026

Corresponding Author: Dr. Jeemy Shaileshkumar Prajapati

Conflict of interest: Nil

Abstract:

Background: Perforation peritonitis is one of the most common and life-threatening surgical emergencies encountered in developing countries. Despite advances in surgical techniques, antimicrobial therapy, and intensive care management, it continues to be associated with high morbidity and mortality. The pattern of perforation peritonitis in India differs from that of Western countries, necessitating region-specific studies to evaluate its etiology, clinical presentation, and outcome determinants.

Aim: To study etiology, clinical profile, and factors influencing mortality in patients presenting with perforation peritonitis.

Methodology: This retrospective observational study was conducted in the Department of General Surgery, Shri M.P. Shah Government Medical College, Jamnagar, Gujarat, India, over a period of 9 months. A total of 110 patients aged 14–70 years with perforation peritonitis who underwent emergency laparotomy were included. Data regarding demographic characteristics, clinical presentation, laboratory parameters, operative findings, postoperative complications, and mortality outcomes were collected from hospital records and analyzed using SPSS version 25.0.

Results: Most patients were males (67.3%) and belonged to the 31–50 years age group (47.3%). Duodenal perforation (43.6%) was the most common etiology, followed by ileal perforation (29.1%). Sepsis was present in 70.9% of patients at admission. Mortality was significantly associated with advanced age, delayed presentation, delayed surgical intervention, sepsis, hypoglycemia, elevated blood urea and serum creatinine levels, and higher Mannheim Peritonitis Index scores. The overall mortality rate was 18.2%.

Conclusion: Perforation peritonitis remains a serious surgical emergency with substantial mortality. Early diagnosis, prompt surgical intervention, effective resuscitation, and identification of high-risk patients using simple clinical and laboratory parameters can improve patient outcomes and reduce mortality.

Keywords: Perforation Peritonitis, Gastrointestinal Perforation, Mortality, Sepsis, Mannheim Peritonitis Index, Emergency Laparotomy, Gujarat.

DOI: 10.25258/ijpqa.17.3.46

Introduction

Although there have been many advances in surgical care, antimicrobial therapy, intensive care, and perioperative management, the incidence of perforation peritonitis continues to be a major cause of morbidity and mortality and is among the most common and life-threatening surgical emergencies encountered in the world [1]. The disease is caused by the perforation of any part of gastrointestinal tract which causes the contamination of the peritoneal cavity with gastrointestinal contents, the bacteria and inflammatory mediators. This triggers a chain of local and systemic inflammation which can quickly advance to sepsis, septic shock, multiple organ dysfunction syndrome (MODS) and death if not diagnosed and treated promptly [2]. Surgery, anesthesia and intensive care physicians continue to face the challenge of treating perforation peritonitis due to the diversity of the disease and the different clinical manifestations and severity.

Perforation peritonitis is very different in developed and developing countries. Perforation of the lower

gastrointestinal tract such as diverticular perforation, cancer perforation and inflammatory bowel disease perforation is more frequent in Western countries. However, some countries like India still see upper gastrointestinal perforations as the predominant group of perforations, including peptic ulcer, typhoid fever, tuberculosis, appendicular perforation and traumatic injuries [3] . Some of these differences are linked to socioeconomic factors, nutritional status, access to care, burden of infectious diseases and medication utilization. Thus, the information collected in developed countries may not necessarily be directly applicable to the Indian population and there is a need to conduct region-specific studies to get an idea about the occurrence of disease and outcome in the region to facilitate the design or redesign of interventions.

Typical signs of perforation peritonitis are severe abdominal pain, abdominal tenderness, guarding, rigidity, fever, nausea, vomiting, abdominal distension, absence or hypoactive bowel sounds, tachycardia, hypoventilation, shock of different degrees, oliguria and dehydration [4]. Patients can rapidly deteriorate clinically due to bacterial contamination and systemic inflammatory response syndrome (SIRS) can progress to severe sepsis and multiorgan failure. Thus, accurate diagnosis and early resuscitation, timely surgery and proper postoperative management are all very important factors in patient's survival.

Since large numbers of patients in India present late at health care facilities, perforation peritonitis continues to be a big public health problem. Avoidable delays among children are often due to poor awareness, lack of access to specialized health services, financial issues and delays at peripheral health centers. These delays can lead to early contamination of the peritoneum and septicemia, electrolyte imbalance and dysfunction of the organs on admission, which contribute to increased postoperative morbidity and mortality. Even with advancement in surgical methods and intensive care units, the results are still not satisfactory in many developing countries, where resources are limited. So, it is very important to understand the factors that are associated with poor outcomes to better manage patients and patient survival [5].

Several studies have tried to find out any predictors that will be associated with mortality in patients with perforation peritonitis. The various parameters which have been related to adverse outcomes are demographic, clinical, biochemical and physiological. Of these, age, late presentation, presence of pre-existing comorbidities, septic shock, serum lactate levels, metabolic acidosis, base excess abnormalities and multiple organ failure are reported as predictors of mortality [6] . The early identification of these risk factors enables the identification of patients as high risk and aggressive therapy when needed.

Several scoring systems have been developed and evaluated in patients with perforation peritonitis for easier risk assessment. They are the Acute Physiology and Chronic Health Evaluation (APACHE) score, Simplified Acute Physiology Score (SAPS), Boey Score, Multi Organ Failure (MOF) score and Mannheim Peritonitis Index (MPI). While these scoring systems are useful for providing prognostic information, most are complex and time consuming and need a lot of clinical and laboratory data. In addition, some scoring systems include interpatient or post patient variables, making them less useful in the early prepatent assessment of patients. Of the tools which are available, the MPI and MOF scores have shown to be relatively more specific for peritonitis, but their widespread use in practice is yet limited in many health care environments [7].

There is also increasing data that patients with gastrointestinal perforation also are septic at the time of admission and may benefit from early source control and goal-directed resuscitation, which is recommended by The Surviving Sepsis Campaign, particularly if they have peptic ulcer perforation. Early detection of high-risk patients and optimizing their peri operational care can have a significant impact on outcomes and mortality [8].

Although the perforation peritonitis has a high index of disease burden in India, there is dearth of detailed information on etiology, clinical presentation and risk factors for mortality especially from western states like Gujarat. The local disease profile should be considered in order to create a treatment protocol that is effective and is likely to yield a positive outcome [9].

Hence, the present retrospective study was done in Gujarat, India to assess the etiology and clinical profile of perforation peritonitis and to see the factors affecting the mortality of the patients affected by it. This study could help in risk stratification, prompt management and better management strategies for this difficult surgical emergency.

Methodology

Study Design: This study was designed as a retrospective observational study conducted to evaluate the etiology, clinical profile, and factors influencing mortality among patients diagnosed with perforation peritonitis. The study involved review and analysis of hospital records of patients who underwent emergency surgical management for perforation peritonitis.

Study Area: The study was conducted in the Department of General Surgery, Shri M.P. Shah Government Medical College, Jamnagar, Gujarat, India.

Study Duration: The study was carried out over a period of 9 months from September 2023 to May 2024.

Sample Size: A total of 110 patients diagnosed with perforation peritonitis and managed surgically were included in the study.

Sample Population: The study population comprised patients aged 14–70 years, of either sex, admitted with a diagnosis of perforation peritonitis and undergoing emergency laparotomy in the Department of General Surgery. Diagnosis was established clinically based on signs of acute peritonitis, including abdominal pain, tenderness, guarding, rigidity, and abdominal distension, and was confirmed radiologically by the presence of free gas under the diaphragm on erect chest or abdominal radiographs.

Data Collection: Data were collected retrospectively from patients' medical records, operative notes, laboratory reports, anesthesia records, and discharge summaries. Information regarding demographic characteristics, clinical presentation, duration of symptoms, etiology and site of perforation, admission vital signs, laboratory investigations, operative findings, postoperative complications, hospital stay, and mortality outcomes was recorded. Patients were considered septic if they exhibited two or more SIRS criteria, including heart rate >90 beats/minute, respiratory rate >20 breaths/minute or $PaCO_2$ <32 mmHg, temperature >38°C or <36°C, and total leukocyte count >12,000/mm³, <4,000/mm³, or band forms >10%. These variables were analyzed to assess their association with mortality in perforation peritonitis.

Inclusion Criteria

- Patients aged 14–70 years.
- Patients of either gender are diagnosed with perforation peritonitis.
- Patients undergoing emergency laparotomy for perforation peritonitis.
- Patients with complete medical records are available for review.
- Patients present clinical and radiological evidence of gastrointestinal perforation.

Exclusion Criteria

- Patients managed conservatively without surgical intervention.
- Cases of spontaneous bacterial peritonitis.
- Colonic perforations.
- Peritonitis secondary to gastrointestinal malignancy.
- Traumatic perforations.
- Corrosive-induced gastrointestinal perforations.
- Postoperative peritonitis resulting from anastomotic leakage.
- Patients with incomplete clinical records.

Study Procedure: After obtaining ethical approval, the medical records of patients meeting the inclusion criteria were retrospectively reviewed using a structured data collection proforma. Information regarding demographic characteristics, clinical presentation, laboratory and radiological findings, operative details, and postoperative outcomes was recorded. All patients had undergone standard preoperative resuscitation, including intravenous fluid administration, correction of electrolyte imbalances, broad-spectrum antibiotic therapy, and hemodynamic stabilization prior to emergency exploratory laparotomy under general anesthesia. Intraoperative findings, including the site and cause of perforation, were documented, while postoperative records were reviewed to assess complications, duration of hospital stay, and mortality outcomes.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using SPSS version 25.0. Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequencies and percentages. Comparisons between survivor and non-survivor groups were performed using Student's t-test for continuous variables and Chi-square test or Fisher's exact test for categorical variables. Univariate analysis was used to evaluate factors associated with mortality, and a p-value of <0.05 was considered statistically significant. The findings were presented through tables and descriptive statistical measures to identify factors influencing mortality in patients with perforation peritonitis".

Result

Table 1 shows that 110 patients were included in the present study with a diagnosis of perforation peritonitis. Most of the patients were in the age group of 31 – 50 years (47.3%), followed by patients older than 50 years (27.2%) and 14 – 30 years (25.5%). The majority of the patients was male (67.3%) and the female patients accounted for 32.7%. The majority of patients (61,8%) came in within three days of onset of symptoms, while 38,2% came in after three days. A high proportion of patients (70.9%) presented with sepsis.

Table 1: Demographic and Clinical Characteristics of Study Population (N=110)		
Variable	**Frequency (n)**	**Percentage (%)**
Age Group (Years)		
14–30	28	25.5
31–50	52	47.3
>50	30	27.2
Gender		
Male	74	67.3
Female	36	32.7
Duration of Symptoms		
≤3 Days	68	61.8
>3 Days	42	38.2
Sepsis at Presentation		
Present	78	70.9
Absent	32	29.1

Table 2 Duodenal ulcer perforation was the most common cause of perforation peritonitis (43.6%). Perforation of the ileum was the second most common (29.1%), followed by gastric perforation (10.9%) and appendicular perforation (9.1%). Other rare causes (jejunal perforation) contributed less than 10% of the cases. Based on these results, the most common cause of perforation peritonitis in this region was upper gastrointestinal perforation, especially duodenal perforation.

Table 2: Etiology and Site of Perforation Peritonitis (N=110)		
Etiology/Site of Perforation	**Frequency (n)**	**Percentage (%)**
Duodenal Ulcer Perforation	48	43.6
Ileal Perforation	32	29.1
Gastric Perforation	12	10.9
Appendicular Perforation	10	9.1
Jejunal Perforation	5	4.5
Others	3	2.8
Total	**110**	**100**

Table 3 shows that laboratory parameters of survivors and non survivors showed significant difference in some biochemical markers. Hemoglobin levels were higher among non-survivors, but this was not statistically significant (p=0.312). Random blood sugar level was significantly lower and blood urea and blood creatinine level were significantly higher in non-survivors than in survivors ($p<0.05$). These results suggest that hypo-glycemia and renal dysfunction are highly correlated with poor prognosis and could be significant risk factors for mortality among patients with perforation peritonitis.

Table 3: Laboratory Parameters and Mortality Outcome			
Parameter	**Survivors (n=90) Mean ± SD**	**Non-Survivors (n=20) Mean ± SD**	**p-value**
Hemoglobin (g/dL)	12.4 ± 2.1	12.9 ± 2.4	0.312
Random Blood Sugar (mg/dL)	101.6 ± 25.8	83.4 ± 15.2	0.018*
Blood Urea (mg/dL)	48.7 ± 23.5	89.6 ± 48.7	<0.001*
Serum Creatinine (mg/dL)	1.2 ± 0.5	2.3 ± 0.9	<0.001*

Table 4 tells that several clinical factors showed a significant association with mortality. There was a higher death rate of patients older than age 50 years than for those younger. Late presentation (>3 days of symptoms) and surgery performed after 24 hours from onset of symptoms were both significant factors for mortality. Sepsis was seen in all non-survivors and was identified as a significant factor impacting on outcome. Similarly, those patients who had Mannheim Peritonitis Index (MPI) > 29 had significantly greater mortality rates. These results highlight the need for early diagnosis, early surgical management and early treatment of sepsis to increase survival.

Table 4: Factors Influencing Mortality in Patients with Perforation Peritonitis			
Variable	**Survivors (n=90)**	**Non-Survivors (n=20)**	**p-value**
Age >50 years	18 (20.0%)	12 (60.0%)	<0.001*
Symptoms >3 Days	20 (22.2%)	18 (90.0%)	<0.001*
Surgical Delay >24 Hours	14 (15.6%)	15 (75.0%)	<0.001*
Sepsis Present	58 (64.4%)	20 (100%)	0.002*
MPI Score >29	16 (17.8%)	18 (90.0%)	<0.001*

Table 5 significant number of patients had postoperative complications The most frequent complication was surgical site infection (25.5%) followed by respiratory complication (18.2%) and septic shock (13.6%). Other complications, such as wounded dehiscence and intra-abdominal abscess, were less common. But, 30.9% of patients had uneventful recovery without any complications following surgery. The results showed that postoperative infectious complications continue to be a significant problem in the management of peritonitis and play a major role in increasing the patient's morbidity and hospital days.

Table 5: Postoperative Outcome and Complications (N=110)		
Complication	**Frequency (n)**	**Percentage (%)**
Surgical Site Infection	28	25.5
Respiratory Complications	20	18.2
Septic Shock	15	13.6
Wound Dehiscence	8	7.3
Intra-abdominal Abscess	5	4.5
No Complication	34	30.9

Discussion

Even with the improvement in surgical skill, antibiotic treatment and critical care management, perforation peritonitis is still one of the most frequent surgical emergencies in developing nations and is a major cause of morbidity and mortality. In the present study, the majority of the patients were male (67.3%) and age group 31-50 years (47.3%). Similarly, a gender predilection for perforated peritonitis, with more male patients, was seen [10] stemming from the higher incidence of risk factors (such as smoking, alcohol, peptic ulcer disease) among males. Similarly, in [11] the male patients of younger and middle age accounted for the majority of cases of perforation peritonitis. Our results, however, do not fully match those reported by others [12] who reported a mean patient age of 40.04 years, while in our study a higher percentage of patients were older than 50 years, which suggests that there is a growing trend of patients with perforation peritonitis in the elderly".

On etiology of perforation peritonitis, the most frequent cause of perforation in our study was the duodenum (43.6%) followed by ileum (29.1%). The results of this study are similar to the others who reported that 57.14% of patients had duodenal perforation [13] and upper gastrointestinal perforation has been found to be the most common etiology. The increased incidence of DP in India is due to the high prevalence of peptic ulcer disease, Helicobacter pylori infection, the use of non-steroidal anti-inflammatory drugs and delayed health-seeking. However, lower gastrointestinal perforations in diverticular disease and colorectal malignancies have been reported with greater frequency in studies from the western world, suggesting that there are geographical differences in the patterns of disease.

Delayed presentation of perforation peritonitis is a major challenge in the management of perforation peritonitis. In this current study, the proportion of patients who visited more than three days after onset of symptoms was 38.2% and this was statistically significant for mortality. Previous studies [14] have noted that late presentation is an important factor that adds to poor outcomes. Svanes et al. have shown that the mortality, postoperative complications and length of hospital stay significantly increases when delays are greater than 24 hours. Similarly, [15] found that morbidity rates were 3.4 times greater in patients admitted > 24 hours after presentation than in those who were admitted earlier. Our study's results highlight the necessity for timely diagnosis and referral, especially in providers with limited resources where access to care might be delayed.

In our study, age was identified as an important factor with patients over 50 years of age having higher mortality rates compared to those under 50 years of age. This is like the observations of [16] which noted that elderly patients have increased mortality because of decreased physiological reserve, associated comorbidities, and poor response to sepsis. Advanced age has been a consistent poor prognostic sign in perforation peritonitis and a part of several perforation peritonitis prognostic scoring systems.

Also, this study showed that sepsis upon admission was significantly related to mortality. In all cases

where patients died, there was clinical evidence of sepsis, highlighting the importance of systemic infection in patient outcome. The same results have been reported elsewhere [17] and it was noted that patients with perforated peptic ulcer are often septic and require prompt resuscitation and early source control. This high incidence of sepsis may be due to delayed presentation and to a high degree of contamination of the peritoneum in our patients.

Increased blood urea, serum creatinine were significantly associated with death among laboratory parameters. The blood urea and serum creatinine concentrations were significantly higher in non-survivors suggesting renal dysfunction. These results corroborate with those others reported and found blood urea and serum creatinine as independent predictors of mortality. Renal insufficiency upon admission was also reported as a major risk factor for poor outcome by [18]. The pathogenesis of renal dysfunction in perforation peritonitis is probably multifactorial and is related to dehydration, septic shock, third space fluid loss and impaired tissue perfusion.

Another important predictor of mortality in our study was hypoglycemia. The blood glucose level of non-survivors was significantly lower than that of the survivors. The same was found by others [19] who also noted that hypoglycemia was associated with higher mortality in septic patients. Hypoglycemia in perforation peritonitis can be caused by a loss of glycogen, poor food intake, hypermetabolism, and decreased gluconeogenesis due to sepsis. This discovery illustrates the need for regular monitoring of blood glucose in patients admitted to surgery who are critically ill.

In the present study, however, arterial blood gas indicators (e.g., pH and base excess) were not significantly linked to mortality. Likewise, there was no statistically significant association between serum lactate levels and patient outcomes. These results are in contrast with those of other researchers who have found elevated lactate concentrations to be a predictor of mortality among septic patients [20] and hyperlactatemia to be independently associated with mortality in severe sepsis [21]. The differences might reflect differences in patient groups, when lactate was measured, and how sick patients were at presentation.

In our study, the Mannheim Peritonitis Index (MPI) was a helpful prognosis tool. Patients with MPI scores greater than 29 had significantly higher mortality rates compared with those having lower scores. High sensitivity and specificity of MPI in predicting mortality in patients with generalized peritonitis have been demonstrated in similar results [22]. Although the MPI does not fully consider the time of presentation and is partially dependent on what is seen in the operating room, it is still a useful and dependable method of risk stratification.

The total mortality rate in this study was 18.2% which is like 22% mortality reported by other study [22]. Mortality rates have been reported to be from 10% to 30% for various factors including patient characteristics, disease severity and health care resources.

Delayed presentation, sepsis, advanced age, renal dysfunction and delayed surgical intervention are the most likely factors to be responsible for the observed mortality in our study. It is still very important to identify high-risk patients early, treat and resuscitate promptly and provide timely surgery and aggressive post-surgery treatment for better outcomes of perforation peritonitis.

Conclusion

Perforation peritonitis remains as one of the important surgical emergencies associated with high morbidity and mortality, especially in developing countries like Gujarat, India. The present study showed that the age group of middle-aged males was more affected and the most common etiology was duodenal perforation. Significant factors associated with mortality were found to be delayed presentation, sepsis at admission, advanced age, delayed surgical intervention, hypoglycemia, elevated blood urea and serum creatinine levels, and Mannheim Peritonitis Index score. Poor renal function and septicemia were found to be significant predictors of poor outcomes, and postoperative complications (particularly surgical site infection and complications of the respiratory system) added significantly to patient morbidity. It also highlights the need for prompt resuscitation, early diagnosis, early surgical intervention and quick identification of the high-risk group with simple clinical and laboratory parameters. The adverse outcomes of perforation peritonitis can be minimized with increased awareness, early referral and optimized peri-operative care to enhance patient survival.

References

1. Ramakrishnan K, Salinas RC. Peptic Ulcer disease. Am Fam Physician 2007;1:1005-12.
2. Sharma L, Gupta S, Soin AS, Sikora S, Kapoor V. Generalized peritonitis in India- the tropical spectrum. Jpn J Surg 1991;21:272-7.
3. Jhobta RS, Attri AK, Kaushik R, Sharma R, Jhobta A. Spectrum of perforation peritonitis in India-review of 504 consecutive cases. World J Emerg Surg 2006;1:26.
4. Ersumo T, W/Meskel Y, Kotisso B. Perforated peptic ulcer in Tikur Anbessa Hospital; a review of 74 cases. Ethiop Med J 2005;43:9-13.
5. Billing A, Fröhlich D, Schildberg FW. Prediction of outcome using the Mannheim peritonitis index in 2003 patients. Br J Surg 1994; 81:209-13.
6. Møller MH, Shah K, Bendix J, Jensen AG, Zimmermann-Nielsen E, Adamsen S, Møller AM.

Risk factors in patients surgically treated for peptic ulcer perforation. Scand J Gastroenterol 2009;44:145-52.
7. Ersumo T, Kotisso B. Perforated peptic ulcer in Tikur Anbessa hospital: a review of 74 cases. Ethiopian Med J. 2005;43(1):9-13.
8. Dorairajan LN, Gupta S, Deo SVS, Chumber S, Sharma L. Peritonitis in India: a decade's experience. Tropical Gastroenterol. 1995;16:33-8.
9. Doherty GM. Current diagnosis and treatment, Surgery. 13th edition. New York: The Mc Graw-Hill Companies, Inc; 2010:464-8.
10. Afridi SP, Malik F, Rahman S, Shamim S, Samo KA. Spectrum of perforation peritonitis in Pakistan: 300 cases Eastern experience. World J Emerg Surg. 2008;3:31.
11. Singh R, Kumar N, Bhattacharya A, Vajifdar H. Preoperative predictors of mortality in adult patients with perforation peritonitis. Indian J Crit Care Med. 2011;15(3):157-163.
12. Jhobta RS, Attri AK, Kaushik R, Sharma R, Jhobta A. Spectrum of perforation peritonitis in India: Review of 504 consecutive cases. World J Emerg Surg. 2006;1:26.
13. Sharma S, Kaneria R, Sharma A, Khare A. Perforation peritonitis: A clinical study regarding etiology, clinical presentation and management strategies. Int Surg J. 2019;6(11):3972-3978.
14. Svanes C, Lie RT, Svanes K, Lie SA, Søreide O. Adverse effects of delayed treatment for perforated peptic ulcer. Ann Surg. 1994;220(2):168-175.
15. Kocer B, Surmeli S, Solak C, Unal B, Bozkurt B, Yildirim O, et al. Factors affecting mortality and morbidity in patients with peptic ulcer perforation. J Gastroenterol Hepatol. 2007;22(4):565-570.
16. Cohen MM. Treatment and mortality of perforated peptic ulcer: A survey of 852 cases. Can Med Assoc J. 1971;105(3):263-269.
17. Seo HJ, Park HK, Park YH, Lee HK, Lee WG, Cho SY, et al. Prognostic factors in duodenal ulcer perforation. J Korean Surg Soc. 2001;60:425-431.
18. Møller MH, Shah K, Bendix J, Jensen AG, Zimmermann-Nielsen E, Adamsen S, Møller AM. Risk factors in patients surgically treated for peptic ulcer perforation. Scand J Gastroenterol. 2009;44(2):145-152.
19. Kumar NP, Bains L, Lal P, Mishra A, Beg MY, Maranna H. Role of intra-abdominal pressure in perforation peritonitis and its impact on outcomes. Turk J Surg. 2021;37(3):253-259.
20. Balamaddiah G, Ravindranath GG. Etiology and complications of perforated peritonitis: A retrospective study. Int Surg J. 2018;5(4):1365-1369.
21. Chakma SM, Singh RL, Parmekar MV, Singh KHG. Spectrum of perforation peritonitis. J Clin Diagn Res. 2013;7(11):2518-2520.
22. Doklestić K, Bajec D, Djukić V, Bumbaširević V, Detanac D, Detanac A, et al. Secondary peritonitis – evaluation of 204 cases and literature review. J Med Life. 2014;7(2):132-138.