Original Article

# Surgical Management of Peptic Perforation in a Tertiary Care Center: A Retrospective Study

**Tamal Kanti Sengupta, Gautam Prakash, Saugata Ray, Manoranjan Kar**
Department of General Surgery, Midnapore Medical College, West Midnapore, West Bengal, India

## Abstract

**Background:** The purpose of this study is to estimate disease burden, clinical features, and outcome in the emergency surgical management of peptic perforation in a rural government tertiary care center where patients are socioeconomically very poor and also impacted by lack of good quality health-care facility. **Materials and Methods:** The study had retrospectively analyzed 121 patients with peptic perforation who had undergone emergency laparotomy at Midnapore medical college, West Bengal, India, from June 2018 to December 2019. All patients >12 years were included in this study. Exclusion criteria were other traumatic and nontraumatic gastrointestinal perforations. **Results**: The study population had 112 males and 9 females with a mean age of 44.80 ± 15.29 years and maximum incidence in the 6$^{th}$ decade ($P = 0.001$). Smoking and alcohol were associated with 54.5% and 49.6%, respectively. The symptoms were pain abdomen (100%) with vomiting (38.8%) and fever (33.9%). The signs of hypotension, peritonitis, distension, and pneumoperitoneum were observed in 34.7%, 64.5%, 39.7%, and 83.5%, respectively. Only 20.7% of patients were admitted within the first 24 h. The mean duration of symptoms was 2.3 days. Most perforations were located on the duodenum (74.4%) with duodenal to gastric perforation ratio 2.9:1. The mean size was 1.02 cm. Chest infection (19%) was the most common complication. The mortality rate was 9.1%. The mean length of hospital stay was 11.1 days. **Conclusion:** Peptic perforation remains a major disease burden in our environment predominantly due to late presentation, leading to high morbidity and mortality.

**Keywords:** Duodenal perforation, gastric perforation, peptic perforation, peptic ulcer disease, pneumoperitoneum

## Introduction

Worldwide 4 million people suffered annually with peptic ulcer disease (PUD), having an incidence rate of 1.5%–3%.[1] Peptic perforations contribute between 5% to 20% of complicated ulcers with high morbidity and mortality.[2] The geographical pattern of peptic perforation varies with prevailing sociodemographic status and environmental conditions. Risk factors for peptic perforation are smoking, alcohol, nonsteroidal anti-inflammatory drugs intake, irregular and spicy food habits, stressful lifestyle, and low socioeconomic status.[3] Delay in treatment of >12 h results in a three-fold increase in the mortality, while 24 h or more cause a nine-fold increase in the mortality.[4]

## Materials and Methods

This retrospective analytical cohort study was conducted from June 2018 to December 2019 in the department of general surgery, Midnapore medical college and hospital, West Midnapore, West Bengal, India. Institute ethical committee permission was taken before the study. One hundred twenty-one patients were enrolled in the study who were diagnosed as peptic perforation on exploratory laparotomy for perforation peritonitis. Data of these patients were collected and assessed from the medical records department for epidemiology, demographic profile, socioeconomic status was determined by obtaining composite score which included the education and occupation of the family head along with income per month of the family as per the modified Kuppuswamy scale (2017), occupational status, etiology, comorbidity, clinical presentation, and surgical management,

**Address for correspondence:** Dr. Gautam Prakash, Room No. 30, Doctor's Hostel, Midnapore Medical College, Hospital Road, West Midnapore - 721 101, West Bengal, India.
E-mail: gautamprakash27@gmail.com

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intraoperative findings such as site and size of perforation, and clinical outcomes in terms of length of hospital stay (LOHS), morbidity and mortality.

### Procedure

Clinical diagnosis was made with detailed history, physical examination findings and supported by X-ray chest and abdomen (to note for free air under the right dome of the diaphragm). The site of perforation was classified into two categories, namely, gastric and duodenal perforation. All patients were resuscitated with fluid, and nasogastric aspiration was done with an institution of injectable broad-spectrum antibiotics (meropenem, piperacillin-tazobactam, ceftriaxone, metronidazole, ciprofloxacin, linezolid). The surgical procedure involves exploratory laparotomy with peritoneal washing (4 l NS), perforation repair, and abdominal drain placement. Graham's omental patch repair[5] was done for duodenal perforation of size <2 cm and <2.5 cm for gastric perforation. Jejunal patch repair was done for duodenal perforation of size >2 cm and >2.5 cm for gastric perforation.

### Inclusion criteria

All patients of age >12 years with a complete history and physical examination records, the patient who had undergone laparotomy for hollow viscus perforation and diagnosed as peptic ulcer perforation (anterior gastroduodenal perforation).

### Exclusion criteria

Pediatric age group (age <12 years), the patient who was managed conservatively or an only peritoneal drain was given under local anesthesia, and the patient had not undergone laparotomy due to any reasons (anesthesia complication, died before undergoing operation), perforations in bowel other than gastroduodenal region, uterine perforation, and traumatic perforations, and females with the positive pregnancy test.

### Statistical analysis

Statistical calculations were carried out using the Statistical Package for the Social Sciences software version 26.0 (SPSS-26.0, IBM, Chicago, Illinois, USA). The numerical tool for the study variables applied was the One-Sample Student *t*-test and Chi-square test. The mean, median, confidence interval (CI), mean difference (MD), degree of freedom (df), and *P* value (*P*) were calculated. The nonparametric test was applied for categorical data. The relationship between numerical and categorical data of the study variables was assessed by area under the receiver operator curve (ROC) curve. Differences were considered statistically significant when $P < 0.05$.

## Results

The study population was constituted of 121 patients with 112 males (92.6%) and 9 females (7.4%). The sex ratio was 12.5:1. The overall mean age was 44.80 ± 15.29 years, while for male and female population were 44.40 years (CI = 41.53–47.28) and 49.78 years (CI = 38.77–60.79). One sample *t*-test shows $P < 0.00001$ ($t = 32.23$, df = 120, two-tailed, MD = 44.80, CI = 42.05–47.55) and Chi-square test test $P = 0.0013$ (69.488, df = 38). The maximum age incidence was seen in the 6th decade (29.8%), followed by the 4th decade (19.9%) and was least in the 9th decade (0.8%). Most of the study population belongs to the lower class (94.2%) and middle class (5.8%). About 68.6% of patients were unskilled workers (farmer, daily wage laborer, security guard) and 14.9% were skilled workers (mechanic, driver, businessman, tailor, government employees, teacher). About 16.5% population was unemployed, which was mostly constituted by students and homemakers. Several patients were associated with multiple etiological factors. Smoking and alcohol were associated with 54.5% and 49.6% of patients, respectively, as shown in Table 1. About 8.3% of patients had reported a history of PUD and spicy food intake. No comorbid illness was found in 75 patients (62%). Hypertension (13.2%) was the most predominant comorbid condition followed by diabetes (12.4%), as shown in Table 1. One patient was HIV positive. The area under the ROC Curve for age, duration of symptoms (DOS), size, and LOHS for diabetes had reported 0.732, 0.590, 0.613, and 0.651, respectively, as shown in Figure 1. On admission, patients had presented with pain abdomen (100%), vomiting (38.8%), and fever (33.9%), as shown in Table 1. The time of admission after the onset of pain ranged from one to 5 days. About 20.7% of patients were admitted within 24 h after the onset of pain abdomen. Maximum patients (66.9%) were admitted between 24–72 h

**Table 1: Patient profile**

| Variables | Female | Male | Total | *P* |
|---|---|---|---|---|
| Etiological factors | | | | |
| Drug intake | 4 | 6 | 10 (8.3) | 0.000 |
| Alcohol | 0 | 7 | 7 (5.8) | |
| Smoking | 0 | 13 | 13 (10.7) | |
| Alcohol and smoking | 0 | 53 | 53 (43.8) | |
| Peptic ulcer disease | 0 | 10 | 10 (8.3) | |
| Comorbidity condition | | | | |
| Hypertension | 0 | 16 | 16 (13.2) | 0.000 |
| COPD | 0 | 14 | 14 (11.6) | |
| Diabetes | 2 | 13 | 15 (12.4) | |
| HIV | 0 | 1 | 1 (0.89) | |
| Clinical features | | | | |
| Pain abdomen | | | | |
| Upto 24 h | 1 | 24 | 25 (20.7) | 0.000 |
| >24 and <48 h | 3 | 59 | 62 (51.2) | |
| >48 h | 5 | 29 | 34 (28.1) | |
| Fever | 6 | 35 | 41 (33.9) | 0.001 |
| Vomiting | 7 | 40 | 47 (38.8) | 0.018 |
| Hypotension | 9 | 33 | 42 (34.7) | 0.001 |
| Tenderness | 9 | 109 | 118 (97.5) | 0.000 |
| Peritonitis | 8 | 70 | 78 (64.5) | 0.002 |
| Distension | 7 | 41 | 48 (39.7) | 0.029 |
| Pneumoperitoneum inchest X-ray | 8 | 93 | 101 (83.5) | 0.000 |

Digits under bracket shown total percentage of population.
COPD – Chronic obstructive pulmonary disease; HIV – Human immunodeficiency virus

after the onset of the pain abdomen. The mean DOS before admission was 2.3 days, while for males and females, it was 2.21 and 2.89 days, respectively. 34.7% of patients were in a state of hypotension (hypovolemic shock) at the time of admission. On further evaluation, patients had abdominal tenderness (97.5%), peritonitis (64.5%) and abdominal distension (39.7%), respectively, with free gas under diaphragm (pneumoperitoneum) was reported in 83.5% patients, as shown in Table 1. One sample *t*-test for DOS shows $P < 0.00001$ ($t = 23.43$, df = 120, two-tailed, MD = 2.26, CI = 2.07–2.46) and Chi-square test test $P < 0.00001$ (83.25, df = 4). 74.4% of patients had duodenal perforation and 25.6% had gastric perforation, as shown in Table 2. The overall ratio of duodenal: gastric perforation ratio was 2.9:1. In males, the ratio was 2.86:1, whereas in females ratio was 3.5:1. The mean age of the study population for duodenal and gastric perforation was 43.99 years and 47.16 years, respectively. The size of perforation ranged between 0.5 cm and 2.5 cm in the greatest diameter with a mean size of 1.02 cm, as shown in Table 2. The average size of perforation in male and female patients was 1.04 cm and 0.72 cm, respectively. The mean size of duodenal and gastric perforation was 0.96 cm and 1.19 cm, respectively. The maximal size of duodenal and gastric perforation was 2 cm and 2.5 cm, respectively. One sample *t*-test shows $P < 0.00001$ ($t = 25.264$, df = 120, two-tailed, MD = 102.06, CI = 94.07–110.06) and Chi-square test $P < 0.00001$ (84.08, df = 4). Following exploratory laparotomy, patients were managed and monitored in different care units. 9.1%, 27.3%, and 63.6% of patients were managed in the critical care unit, surgical intensive care unit, and high dependency care units, respectively, as shown in Table 3. Sixty-four patients do not develop any complications in the postoperative period, while 57 patients (47.1%) had developed complications, as shown in Table 3. Several patients had suffered from sepsis in the postoperative period. Chest infection was reported in 23 patients (19%), followed by wound infection in 11 patients (9.1%). Three patients had developed a fecal fistula (postoperative leakage) where 2 patients were managed conservatively while re-laparotomy was done in 1 male patient and all were discharged successfully. The area under the ROC curve for age, DOS, size, and LOHS for chest infection had reported 0.533, 0.580, 0.546, and 0.720, respectively, as shown in Figure 2. Out of 121 patients, 110 patients were discharged successfully and 11 patients (9.1%) died during the postoperative period, with

**Area Under the ROC Curve**

| Test Result Variable (s) | Area |
|---|---|
| AGE | 0.732 |
| DOS | 0.590 |
| SIZE | 0.613 |
| LOHS | 0.651 |

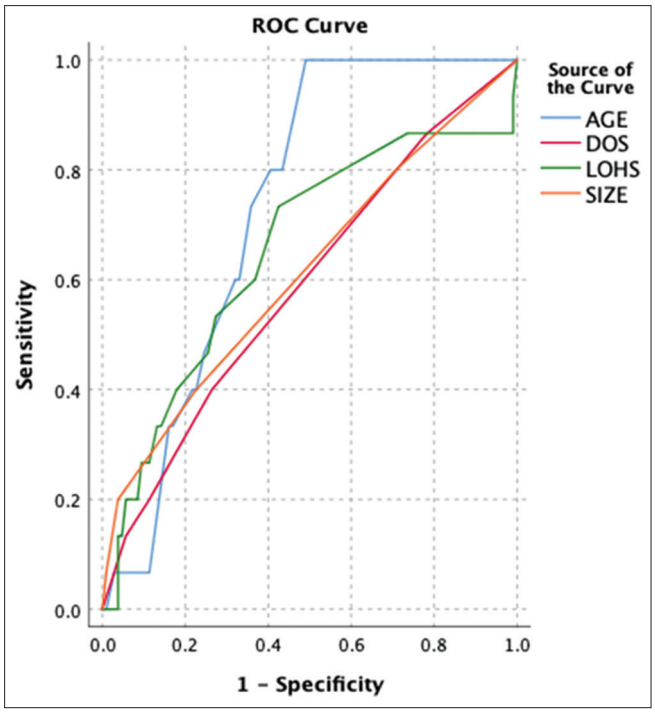


**Figure 1:** Receiver operator curve showing relationship between age, size, duration of symptoms, and length of hospital stay with diabetes

**Area Under the ROC Curve**

| Test Result Variable (s) | Area |
|---|---|
| AGE | 0.533 |
| DOS | 0.580 |
| SIZE | 0.546 |
| LOHS | 0.720 |

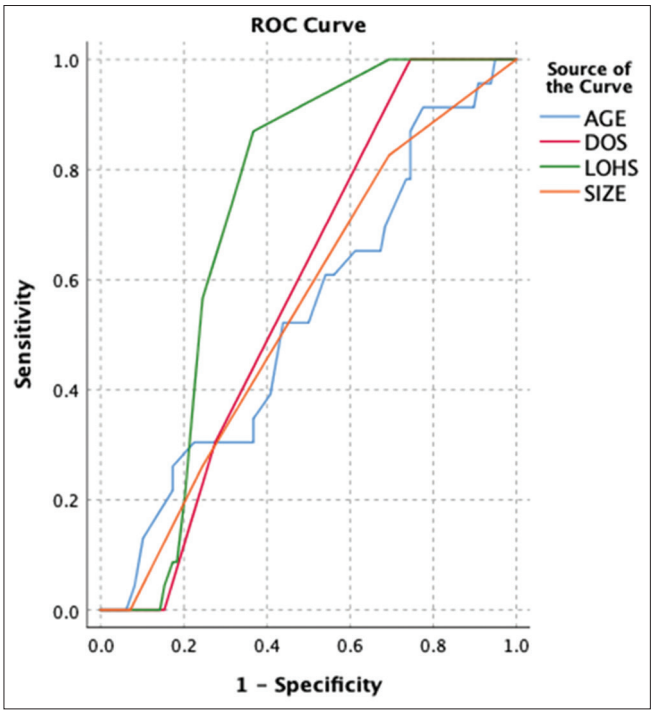


**Figure 2:** Receiver operator curve showing relationship between age, size, duration of symptoms, and length of hospital stay with chest infection

3 patients died within the first 48 h. The most common cause of mortality was a septic shock (8 patients) followed by acute respiratory distress syndrome (ARDS) (2 patients) and acute renal failure (1 patient), leading to uremic encephalopathy. The mortality rate in females was recorded up to 33.3%, while in the male it was 7.14%. The area under the ROC curve for age, DOS, size, and LOHS for death had reported 0.723, 0.871, 0.702, and 0.311, respectively, as shown in Figure 3. Among discharged patients, two patients developed chronic renal failure and need regular hemodialysis. The LOHS ranged from 1 day to 53 days with a mean of 11.16 ± 7.9 days, as shown in Table 3. The mean LOHS for males and females was 10.94 days and 13.89 days, respectively. The average LOHS for duodenal and gastric perforation was 10.93 days and 11.81 days, respectively. One sample *t*-test shows $P < 0.00001$ ($t = 15.53$, df = 120, two-tailed, MD = 11.15, CI = 9.73–12.58) and Chi-square test $P < 0.00001$ (322.18, df = 24). The independent samples Kruskal–Wallis test between comorbidity and LOHS had reported a significant relationship ($P = 0.014$).

## Discussion

Peptic perforation remained a significant disease burden in India, especially in rural areas where patients were socioeconomically very poor and presented late to the hospital with shock stage and also impacted by a lack of good quality health-care facility. The present research focused on the estimation of peptic perforation disease in a peripheral teaching hospital with patients from rural areas of West Bengal. The present study had reported gradually increasing incidence of the patient with age between 2nd and 6th decades with maximum age incidence in the sixth decade ($P = 0.001$). The mean age was 44.80 years, while other studies had reported the mean age between 39.9 years to 53 years.[6-9] The mean age of the male population was lower than the female population and was similar to the studies.[6,10] Males were almost exclusively affected than females with a sex ratio of 12.5:1 while the sex ratio between 8:1 to 18:2 had been reported by other studies.[6,8,11] Male predominance in this age group was attributed to more prevalence of alcohol consumption and smoking among the male population. The study population had the main source of income from the agriculture sector, with 90% live in rural areas and 54% population had been inhabited by tribal populations with very low socioeconomic status and were below the poverty line. Most of them were unskilled

**Area Under the ROC Curve**

| Test Result Variable (s) | Area |
|---|---|
| AGE | 0.723 |
| DOS | 0.871 |
| SIZE | 0.702 |
| LOHS | 0.311 |

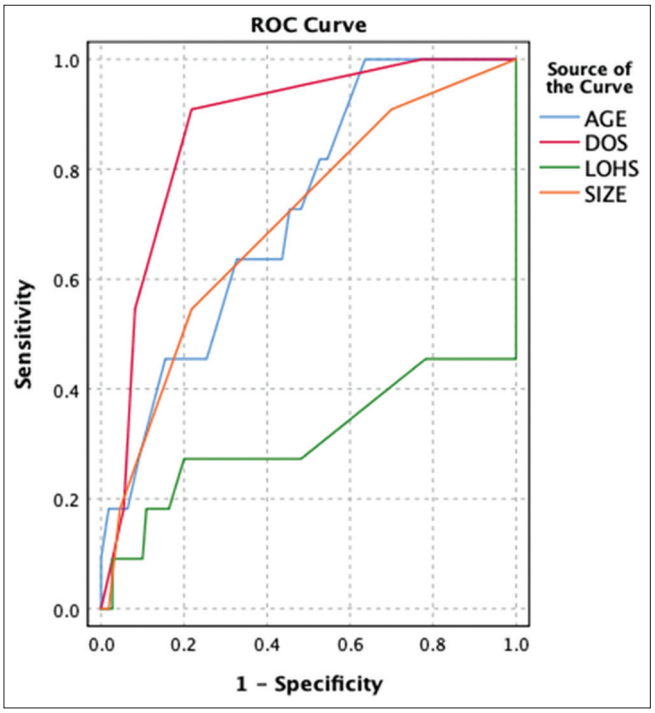


**Figure 3:** Receiver operator curve showing relationship between age, size, duration of symptoms, and length of hospital stay with death

**Table 2: Site and size of peptic perforation**

| Age group (years) | Perforation | | Size of perforation | | | | |
|---|---|---|---|---|---|---|---|
| | Duodenal | Gastric | <0.5 cm | 1 cm | 1.5 cm | 2 cm | 2.5 cm |
| 0-12 | NA | NA | NA | NA | NA | NA | NA |
| 13-20 | 6 | 1 | 6 | 1 | 0 | 0 | 0 |
| 21-30 | 16 (1) | 5 | 10 | 11 (1) | 0 | 0 | 0 |
| 31-40 | 17 (2) | 7 | 8 (2) | 10 | 5 | 1 | 0 |
| 41-50 | 16 (2) | 4 | 5 (1) | 13 (1) | 2 | 0 | 0 |
| 51-60 | 25 (2) | 11 | 4 (2) | 14 | 13 | 3 | 2 |
| 61-70 | 8 (1) | 0 | 1 | 5 (1) | 1 | 1 | 0 |
| 71-80 | 1 | 3 (1) | 0 | 2 (1) | 2 | 0 | 0 |
| 81-90 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| Total | 90 | 31 | 34 | 57 | 23 | 5 | 2 |

Digits under bracket shown female population. NA – Not applicable

**Table 3: Intraoperative findings and postoperative care with complications and hospital stay**

| Variables | Female | Male | Total | *P* |
|---|---|---|---|---|
| Postoperative care | | | | |
| Critical care unit | 1 | 10 | 11 (9.1) | 0.000 |
| Surgical intensive unit | 8 | 25 | 33 (27.3) | |
| High dependency unit | 0 | 77 | 77 (63.6) | |
| Postoperative complications | | | | |
| Acute kidney injury | 1 | 4 | 5 (4.1) | 0.000 |
| Fecal fistula | 1 | 2 | 3 (2.5) | |
| Pelvic abscess | 0 | 4 | 4 (3.3) | |
| Chest infection | 0 | 23 | 23 (19.0) | |
| Wound dehiscence | 1 | 2 | 3 (2.5) | |
| Wound infection | 0 | 8 | 8 (6.6) | |
| Mortality (in days) | | | | |
| Upto 2 | 1 | 1 | 2 (1.65) | |
| >2 and <7 | 1 | 3 | 4 (3.3) | |
| >7 and <14 | 1 | 2 | 3 (2.5) | |
| >14 | 1 | 2 | 2 (1.65) | |
| Length of hospital stay (in days) | | | | |
| 1-8 | 4 | 61 | 65 (53.7) | 0.000 |
| 9-16 | 2 | 40 | 42 (34.7) | |
| >16 | 3 | 11 | 14 (11.6) | |

*Digits under bracket shown total percentage of population

workers, mainly farmers (50%) and corresponds with the sociodemographic profile of Paschim Medinipur district, West Bengal.[12] The maximum incidence had been reported in students (22.2%), followed by farmers (17.8%) in other studies.[13] Smoking (54.5%) and alcohol (51.3%) were the two most common etiological agents associated with peptic perforation in our study, which corresponds to various other studies.[6,14] The high incidence of peptic perforation in the Indian population had also been attributed to heavy, spicy food habits. We found comorbid illness was documented in 38% of patients in our study, while between 18% to 41% had been reported by other studies.[10,10,15] Hypertension was the most common comorbidity followed by diabetes in our study, while similar incidence had been reported in other studies.[10] Associated comorbid illnesses had reported an increased incidence of wound and chest complications. The adverse outcome of patients was especially seen associated with diabetes and chronic obstructive pulmonary disease in our study. Abdominal pain and tenderness were the most common consistent clinical features in our study. The late presentation had been reported in 79.9% of patients, while other studies had reported late presentation between 53.8% and 68%.[10,16] Delay in referrals from primary care centers due to logistical constraints (transport and road facility) may have accounted for the large number of patients reported after 24 h from onset of pain in our study. The mean DOS was 2.3 days, while between 2.5 to 3.5 days had been reported by other studies.[7,8] Other symptoms had reported a similar presentation.[7,11] Chest radiographs had demonstrated free gas under the diaphragm (pneumoperitoneum) in 83.5% patients while similar incidence had been reported in other studies.[6,7] Late presentation and hypovolemic shock at the time of admission was associated with poor outcome in our study. Following laparotomy, the first part of the duodenum was the most common site of perforation. The duodenal-to-gastric ratio was 2.84:1, while other studies had reported similar incidence between 2.41:1 and 12.7:1.[7,14,15] The mean size was similar to another study.[7] 71.1% of perforation have size up to 1 cm, while other studies had reported similar incidence between 56% to 92.9%.[6,11] Graham omental patch repair was done in all cases (100%) in our study. About 36.4% of patients were admitted to the intensive care unit following laparotomy due to postoperative unstable vitals and sepsis at the time of admission. The complication rate in our study had reported being similar incidence to various other studies.[6-16] The mortality rate was seen in 9.9% of patients, while other studies had reported similar incidence between 8.5% to 11%.[6,10] Septicaemia was the most common cause, followed by ARDS and AKI. The average LOHS was 11.1 days, while between 8.85 and 10 days had been reported by other studies.[7,11]

## Conclusion

Peptic perforation is predominantly a disease of middle-aged men. It is more common in lower socioeconomic status, with smoking and alcohol are a very important risk factor in peptic ulcer perforation. Most of the patients have a late presentation due to a lack of accessibility of quality health care facilities along with unawareness of the disease in rural areas leading to increased morbidity and mortality. High morbidity in these patients is mainly attributed to delay in presentation, hypovolemic shock, delay in surgical management after admission. Graham's omental patch repair remains the treatment of choice. We recommend a prospective study, preferably a multi-center one, to ascertain the epidemiology, risk, and prognostic factors of the disease. Health education aimed at improving the health care seeking habit of the population would also be beneficial. We could conclude that peptic perforation is a common surgical emergency that can be easily dealt with laparotomy followed by simple closure. The outcome is usually good if there are no associated co-morbidities, and surgery is done timely.

### Limitations of the study

The retrospective study had vulnerable to poor record notes in a few patients managed, with clinical findings that had been better appreciated in the prospective study. The study lack follows up recordings of patients so long-term complication and long term clinical outcome of care could not be defined. A randomized prospective study would address these issues and strongly suggested.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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