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# CLINICAL CHARACTERISTICS AND OUTCOMES OF PATIENTS WITH PERFORATED PEPTIC ULCER AFTER LAPAROTOMY

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**ABSTRACT**

Perforated peptic ulcer (PPU) is a common abdominal surgical emergency associated with short-term mortality of up to 30% and morbidity of up to 50%, yet data on its clinical characteristics and outcomes in Indonesian private regional hospitals remain scarce. This study aimed to determine the clinical characteristics and outcomes of patients with PPU after laparotomy at Efarina Etaham Hospital, Pematang Siantar, from November 2022 to June 2026. A descriptive observational study with a retrospective approach was conducted. This study utilized total sampling to select subjects from the population, yielding 67 patients who met the inclusion criteria: patients diagnosed with perforated peptic ulcer who had undergone laparotomy from November 2022 to June 2026, from electronic medical records, then were analyzed descriptively for demographic characteristics, risk factors, symptom onset, perforation site and size, complications, length of stay, and in-hospital mortality. Most patients were male (86.6%) with a mean age of 57.8 ± 14.3 years; 44.8% were aged ⩾60 years. Alcohol consumption was the leading risk factor (65.7%). Symptom onset occurred within 1 – 3 days in 82.1% of patients. The gastric antrum was the most frequent perforation site (71.6%), and 49.3% of perforations exceeded 1 cm. At least one complication occurred in 67.2% of patients, most commonly pneumonia (29.9%) and shock (28.4%). Mean length of stay was 8.2 ± 2.6 days, and in-hospital mortality was 25.4%. Patients with PPU in this private regional hospital were predominantly older males with alcohol consumption as the dominant risk factor. Mortality was lower than in several Indonesian tertiary hospitals but remained higher than global multicenter benchmarks, particularly among patients with delayed presentation and pre-operative shock.

Keywords: clinical characteristics; in-hospital mortality; laparotomy; perforated peptic ulcer; regional hospital

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## INTRODUCTION

Perforated peptic ulcer (PPU) is among the most frequently encountered abdominal surgical emergencies, carrying a short-term mortality of up to 30% and morbidity of up to 50% (Weledji, 2020; Chung & Shelat, 2017). Although age-standardized mortality and disability-adjusted life years attributable to peptic ulcer disease have fallen by 61.5% and 63.1%, respectively, between 1990 and 2021, the absolute number of cases continues to rise with population growth and aging, and the great majority of deaths from ulcer complications still occur in low- and middle-income countries (Almadi et al., 2024; Lanas & Chan, 2017; Hao et al., 2025).

PPU has been documented across a wide spectrum of clinical settings, from isolated case reports (Randhawa et al., 2022) to large international multicenter cohorts. The largest such study to date, the GRACE study, enrolled 1,874 patients from 159 centers in 52 countries and reported a 30-day mortality of 9.3% and morbidity of 48.5%, with 78.3% of patients being male and a median age of 49 years (Abouelazayem et al., 2024). In Indonesia, the burden appears substantially higher: tertiary hospital series from Padang and Surabaya have reported mortality rates of 52.8% and 48.5% respectively (Rivai et al., 2021; Kurniawan & Danardono, 2023), while a smaller series from Aceh reported 44.4% (Sayuti, 2020). A comparable tertiary-hospital series from India reported an overall mortality of 13.4%, with delayed presentation, larger perforation size, and severe anemia identified as significant predictors of death (Murmu et al., 2025), reflecting the diagnostic delay, resource

constraints, and comorbidity burden characteristic of many low- and middle-income healthcare settings.

Management of PPU and its underlying aetiology is addressed by several international and regional clinical practice guidelines, including consensus statements from the World Society of Emergency Surgery (Tarasconi et al., 2020), the Japanese Society of Gastroenterology (Kamada et al., 2021), and the American College of Gastroenterology's guidance on Helicobacter pylori eradication (Chey et al., 2024). Established risk factors for PPU include non-steroidal anti-inflammatory drug (NSAID) use, alcohol consumption, and Helicobacter pylori infection (Almadi et al., 2024; Søreide et al., 2015). In Indonesia, an additional locally relevant risk factor is the consumption of jamu, traditional herbal preparations illegally adulterated with undeclared pharmaceutical compounds such as mefenamic acid, diclofenac, prednisolone, and dexamethasone (Pradika & Hikmah, 2025). This is not a marginal phenomenon: Indonesia's National Agency of Drug and Food Control (BPOM) reported 61 natural medicine products found to contain undeclared pharmaceutical adulterants in 2024 alone, most marketed as pain-relief jamu containing paracetamol and corticosteroids (BPOM RI, 2024). A semi-urban Nigerian series similarly ranked herbal remedy use as the second most common risk factor after NSAIDs, present in 52.2% of PPU cases (Olaogun et al., 2021).

North Sumatra presents a distinctive epidemiological context: the Batak ethnic group, which predominates in Pematang Siantar, has been reported to carry a significantly higher risk of H. pylori infection than the Javanese population (OR 6.31, $p < 0.05$) (Syam et al., 2015; Miftahussurur & Yamaoka, 2021; Maulahela et al., 2022). Despite this regional relevance, data on the clinical characteristics and outcomes of PPU patients undergoing laparotomy in private regional hospitals in Indonesia, as opposed to tertiary referral centres, remain scarce. Such data are essential for local service planning, perioperative quality improvement, and as a baseline for future analytical research. This study therefore aimed to describe the clinical characteristics and outcomes of patients with PPU undergoing laparotomy at Efarina Etaham Hospital, a private regional hospital in Pematang Siantar, North Sumatra, from November 2022 to June 2026.

## METHOD

This was a descriptive observational study with a retrospective approach, using secondary data from electronic medical records at Efarina Etaham Hospital, Pematang Siantar, North Sumatra, Indonesia. The study population comprised all adult patients diagnosed with PPU who underwent laparotomy at the hospital's Department of Surgery between November 2022 and June 2026. Total sampling was applied because the accessible population was limited and fully identifiable through electronic records; this yielded 67 patients who met the inclusion criteria. All patients underwent open laparotomy with omental patch repair, the standard approach at facilities without laparoscopic capability, whose comparative outcomes against laparoscopic repair have been characterized in recent systematic reviews and meta-analyses (Chan et al., 2023).

Inclusion criteria were age ≥18 years, PPU (gastric and/or duodenal) confirmed intraoperatively during laparotomy within the study period, and an accessible medical record. Patients were excluded if records were incomplete for key variables, if the perforation was attributable to a cause other than peptic ulcer disease (e.g., malignancy or trauma), or in cases of duplicate records. Data for the study variables were extracted from electronic medical records, comprising patient demographics upon admission to the Emergency Department (ED), medical history, initial physical examinations and vital signs, diagnostic investigations, and intraoperative findings, which include demographic characteristics (sex, age), risk factors (alcohol use, chronic gastritis, NSAID use), symptom onset before admission, intraoperative perforation site and size, perioperative complications, length of hospital stay, and in-hospital mortality. Age was categorized as young (18–40 years), middle-aged (41–59 years), or elderly (≥60 years), consistent with the literature

identifying 60 years as a consistent threshold for increased PPU morbidity and mortality (Ali et al., 2022; Pouroushaninia et al., 2025; Thorsen et al., 2013; Christensen et al., 2007). Symptom onset was categorized as <1, 1–3, or >3 days, reflecting the 24-hour delay threshold embedded in the Boey score (Boey et al., 1982; Lohsiriwat et al., 2009). Length of stay was categorised as ≤5, 6‑8, or >8 days, based on the median postoperative stay of 7‑8 days reported in the GRACE study and comparable European cohorts of open PPU repair (Abouelazayem et al., 2024; Thorsen et al., 2011; Johnson et al., 2019). Complication burden was categorised as none, one, more than one without shock, or more than one with shock, with shock defined according to contemporary consensus critical-care criteria where documented (Singer et al., 2016). Categorical variables were summarised as frequencies and percentages; continuous variables were summarised as mean ± standard deviation or median (range), depending on distribution. All data were analysed descriptively without hypothesis testing, consistent with the study's descriptive design. Ethical clearance was obtained from the relevant institutional research ethics committee, and patient identities were anonymised using sequential study numbers.

## RESULT

Of 67 patients meeting the inclusion criteria, 58 (86.6%) were male, yielding a male-to-female ratio of approximately 6.4:1. The mean age was 57.8 ± 14.3 years (range 21–92), with the largest proportion in the elderly group (≥60 years, 44.8%), followed by middle-aged (41.8%) and young patients (13.4%) (Table 1). Alcohol consumption was the most frequently documented risk factor (65.7%), followed by chronic gastritis (25.4%) and NSAID use (7.5%); only one patient (1.5%) had more than one documented risk factor. Symptom onset occurred 1–3 days before admission in the majority of patients (82.1%), with 6.0% presenting within 24 hours and 11.9% presenting after more than 3 days (mean onset 2.4 ± 1.8 days). Intraoperatively, the gastric antrum was the most common perforation site (71.6%), followed by the prepyloric/pyloric region (17.9%), the duodenum (7.5%), the gastric cardia (1.5%), and the posterior gastric wall (1.5%). No perforation smaller than 0.5 cm was recorded; perforation size was ≥1 cm in 49.3% of cases (mean diameter 1.4 ± 0.5 cm).

At least one perioperative complication was documented in 45 patients (67.2%): 25.4% had a single complication, 17.9% had multiple complications without shock, and 23.9% had multiple complications with shock. The most frequent individual complications were pneumonia (29.9%), shock (28.4%), and anaemia (20.9%), followed by acute kidney injury (14.9%) and hypoalbuminaemia (13.4%). Mean length of stay was 8.2 ± 2.6 days (range 2–19), and in-hospital mortality was 25.4% (17/67) (Table 1). Descriptively, no deaths occurred among young patients, among patients without complications, or among those presenting within 24 hours of onset. In contrast, mortality was 87.5% among patients presenting after more than 3 days (7/8) and 87.5% among those with multiple complications accompanied by shock (14/16) (Table 2).

Table 1.
Respondent characteristics (n = 67)

| Respondent characteristics | f | % |
|---|---|---|
| Sex | | |
| Male | 58 | 86.6 |
| Female | 9 | 13.4 |
| Age group | | |
| Young (18–40 years) | 9 | 13.4 |
| Middle-aged (41–59 years) | 28 | 41.8 |
| Elderly (≥60 years) | 30 | 44.8 |
| Risk factor | | |
| Alcohol use | 44 | 65.7 |
| Chronic gastritis | 17 | 25.4 |
| NSAID use | 5 | 7.5 |
| More than one risk factor | 1 | 1.5 |
| Symptom onset before admission | | |
| <1 day | 4 | 6.0 |

| Respondent characteristics | f | % |
|---|---|---|
| 1–3 days | 55 | 82.1 |
| >3 days | 8 | 11.9 |
| Perforation site | | |
| Gastric antrum | 48 | 71.6 |
| Prepyloric/pyloric | 12 | 17.9 |
| Duodenum | 5 | 7.5 |
| Cardia / posterior wall | 2 | 3.0 |
| Perforation size | | |
| 0.5–1 cm | 34 | 50.7 |
| >1 cm | 33 | 49.3 |
| Complications | | |
| None | 22 | 32.8 |
| One | 17 | 25.4 |
| More than one, no shock | 12 | 17.9 |
| More than one, with shock | 16 | 23.9 |
| Length of stay | | |
| ≤5 days | 8 | 11.9 |
| 6–8 days | 30 | 44.8 |
| >8 days | 29 | 43.3 |
| Outcome | | |
| Discharged | 50 | 74.6 |
| Died (in-hospital) | 17 | 25.4 |

Table 2.
Outcome by selected clinical characteristics (n = 67)

| Characteristic | Discharged (f) | Died (f) |
|---|---|---|
| Age: young | 9 | 0 |
| Age: middle-aged | 21 | 7 |
| Age: elderly | 20 | 10 |
| Onset: <1 day | 4 | 0 |
| Onset: 1–3 days | 45 | 10 |
| Onset: >3 days | 1 | 7 |
| Complication: none | 22 | 0 |
| Complication: one | 15 | 2 |
| Complication: >1, no shock | 11 | 1 |
| Complication: >1, with shock | 2 | 14 |

## DISCUSSION

The pronounced male predominance observed in this study (86.6%) exceeded that reported in the GRACE study (78.3%) (Abouelazayem et al., 2024) and is consistent with a Korean population-based study reporting a PPU incidence approximately six times higher in men than in women (Bae et al., 2012). This plausibly reflects the substantially higher prevalence of alcohol-related risk factors among male patients in this North Sumatran population. The mean age (57.8 ± 14.3 years) was broadly comparable to Indonesian tertiary-hospital series (64.8 years in Padang (Rivai et al., 2021); 61.4 ± 12.1 years in Surabaya (Kurniawan & Danardono, 2023), while the substantial proportion of younger and middle-aged patients (55.2% combined) suggests a behavioural, alcohol-driven aetiological pattern distinct from the NSAID-dominant, elderly-skewed pattern typical of high-income settings (Weledji, 2020; Thorsen et al., 2013).

The dominance of alcohol as a risk factor (65.7%), far exceeding NSAID use (7.5%), diverges from the Western literature emphasizing NSAIDs and H. pylori as principal aetiologies (Almadi et al., 2024; Søreide et al., 2015) but parallels patterns reported in other developing-country settings: a Tanzanian series documented alcohol use in 85.7% of PPU patients and smoking in 64.3%, with NSAID use in only 10.7% (Chalya et al., 2011). Notably, H. pylori infection has not been consistently demonstrated to be an independent risk factor for perforation specifically, as opposed to uncomplicated peptic ulcer disease, in comparative studies using multiple diagnostic modalities, including rapid urease testing, histology, and serology (Thirupathaiah et al., 2020), which may

partly explain the comparatively limited documented role of H. pylori-related factors relative to alcohol in this cohort. The low documented rate of jamu-related risk factors in this cohort likely reflects under-ascertainment rather than true low exposure, since patients are frequently unaware that their herbal preparations contain undeclared NSAIDs or corticosteroids (Pradika & Hikmah, 2025; BPOM RI, 2024); a Nigerian series found herbal remedy use to be the second most common risk factor overall (52.2%) (Olaogun et al., 2021), suggesting the true contribution of adulterated jamu in this Indonesian cohort may be under-recognized.

The predominance of gastric (antral) over duodenal perforation in this cohort (71.6% vs. 7.5%) contrasts with the duodenal predominance typically reported in Western series (35–65%) (Ali et al., 2022; Thorsen et al., 2013) but is consistent with reports from other Asian settings, and may reflect a geographic gradient in which H. pylori-driven duodenal disease is less dominant relative to alcohol- and gastritis-related gastric injury (Søreide et al., 2015; Thorsen et al., 2013). Perforation size exceeding 1 cm, present in nearly half of cases, has separately been associated with increased mortality risk (Aljiffry et al., 2020), consistent with the association between larger perforation size and mortality reported in the Indian tertiary-hospital series described above (Murmu et al., 2025), and may have contributed to the observed mortality burden.

The strong association between shock and mortality observed descriptively in this cohort (87.5% mortality among patients with multiple complications and shock) mirrors the established role of pre-operative shock as one of three core components of the Boey score, alongside significant comorbidity and delay beyond 24 hours (Boey et al., 1982; Lohsiriwat et al., 2009). Consistent with validation studies of prognostic scoring systems for PPU (Patel et al., 2019; Rivai et al., 2021), this descriptive gradient underscores the clinical utility of simple bedside scores such as the Boey score even in resource-limited settings that lack access to more complex laboratory-based indices. Similarly, the absence of any death among patients presenting within 24 hours, contrasted with 87.5% mortality among those presenting after more than 3 days, is consistent with prior evidence that delayed presentation beyond 24–48 hours significantly increases postoperative complications (Ali et al., 2022; Tarasconi et al., 2020). Mean length of stay (8.2 ± 2.6 days) closely matched the median of open-repair cohorts reported internationally (7–8 days) (Abouelazayem et al., 2024; Thorsen et al., 2011; Johnson et al., 2019), indicating that perioperative recovery in this resource-limited regional hospital was not materially prolonged relative to international standards for open surgery.

In-hospital mortality in this study (25.4%) was lower than in two comparably sized Indonesian tertiary-hospital series (52.8% and 48.5%, n=72 and n=97 respectively) (Rivai et al., 2021; Kurniawan & Danardono, 2023), suggesting relatively favourable perioperative performance despite the absence of laparoscopic facilities. However, it remained substantially higher than the 9.3% 30-day mortality reported by the multicentre GRACE study (Abouelazayem et al., 2024), underscoring a persistent outcome gap between regional Indonesian hospitals and high-resource international centres, consistent with the global pattern in which the majority of ulcer-related deaths occur in low- and middle-income countries (Almadi et al., 2024; Hao et al., 2025).

This study has several limitations. Its retrospective design relies on the completeness of electronic records, particularly for anamnesis-based variables such as risk factors. H. pylori testing was unavailable at the study site, precluding assessment of this established aetiological factor and adherence to current evidence-based eradication guidelines (Chey et al., 2024; Kamada et al., 2021). The complication variable combined pre-existing comorbidities and postoperative complications without a clear temporal distinction. The sample size (n=67) limits generalisability beyond the study setting, and the descriptive design precludes formal hypothesis testing of the associations observed.

## CONCLUSION

In this private regional hospital in North Sumatra, patients with perforated peptic ulcer undergoing laparotomy were predominantly older males with alcohol consumption as the dominant risk factor, a pattern distinct from NSAID- and H. pylori-driven aetiology typically reported in Western literature. The gastric antrum was the most frequent perforation site, and in-hospital mortality (25.4%) was lower than several Indonesian tertiary-hospital series but remained markedly higher than global multicentre benchmarks, particularly among patients with delayed presentation and pre-operative shock. These findings support targeted public health messaging on alcohol-related risk, rapid triage protocols for acute abdomen, and structured perioperative monitoring for shock in similar regional-hospital settings, and provide a baseline for future analytical studies in this population.

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