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Frequency of Perforated Appendix in Acute Appendicitis at BMC Hospital Quetta

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ABSTRACT

Background: Perforated appendicitis remains a significant complication of acute appendicitis, contributing to increased morbidity and mortality, particularly in settings with delayed diagnosis. Despite advancements in surgical management, the incidence, risk factors, and outcomes of perforated appendicitis vary across populations, necessitating further investigation.

Objective: This study aimed to determine the frequency of perforated appendicitis among patients with acute appendicitis at BMC Hospital Quetta and evaluate the associated morbidity, mortality, and surgical outcomes.

Methods: This prospective observational study was conducted from October 19, 2023, to October 20, 2024, including 63 patients diagnosed intraoperatively with perforated appendicitis. Patients aged ≥12 years with confirmed perforation were included, while those with non-perforated appendicitis or appendicular mass were excluded. Data collection included clinical presentations, laboratory findings, intraoperative observations, and postoperative complications. Statistical analysis was performed using SPSS v27, with chi-square tests for categorical variables and logistic regression to assess risk factors. Ethical approval was obtained, and informed consent was secured.

Results: The perforation rate was 13.8%, with the highest prevalence in the 21–30-year age group (31.8%). The complication rate was 72.2%, and mortality was 4.8%, with severe peritoneal contamination (>150 ml) increasing mortality risk to 54.5%. Late presentation significantly correlated with adverse outcomes ($p<0.05$).

Conclusion: Delayed presentation and severe peritoneal contamination are key predictors of morbidity and mortality in perforated appendicitis. Early diagnosis and timely surgical intervention are essential to improving patient outcomes.

INTRODUCTION

Acute appendicitis remains the most common surgical emergency encountered in clinical practice, necessitating prompt diagnosis and intervention to prevent complications such as perforation, abscess formation, peritonitis, and sepsis. Despite advancements in medical diagnostics and surgical interventions, perforated appendicitis continues to contribute significantly to morbidity and, in severe cases, mortality. A delayed diagnosis or late hospital presentation increases the risk of perforation, further complicating clinical outcomes (1). The mortality associated with perforated appendicitis has declined over recent years due to improvements in surgical techniques, antibiotic therapy, and critical care management. However, morbidity remains a significant concern, particularly in cases involving delayed medical intervention or pre-existing co-morbidities (2).

Perforated appendicitis occurs when the inflammation extends through the full thickness of the appendix, leading to rupture and contamination of the peritoneal cavity. The risk of perforation escalates with prolonged symptom duration, with studies indicating that the likelihood of rupture increases significantly after 48 hours of symptom onset (3). The clinical presentation of perforated appendicitis often includes severe abdominal pain, fever, vomiting, and signs of peritoneal irritation. However, variations in symptom presentation can delay diagnosis, particularly in pediatric, elderly, or immunocompromised patients, further complicating disease management (4). While computed tomography (CT) scans and ultrasonography have improved diagnostic accuracy, intraoperative findings remain the gold standard for confirming perforation (5).

Several studies have reported the frequency of perforated appendicitis within various populations, with incidence rates varying depending on healthcare accessibility, demographic characteristics, and time to presentation. Research conducted in both developed and developing regions indicates that the incidence of perforated appendicitis ranges from 10% to 30%, with higher rates observed in resource-limited settings where delays in healthcare access are more common (6,7). Previous literature has also highlighted the impact of factors such as age, gender, socioeconomic status, and underlying medical conditions on the risk of perforation, with younger adults and elderly patients being particularly vulnerable (8). In

addition, rural populations often exhibit a higher incidence of perforated appendicitis due to challenges in accessing timely surgical care (9).

Despite the extensive research on acute appendicitis, there remains a need to further investigate the factors influencing the incidence of perforation, particularly within specific regional healthcare settings. Understanding the burden of perforated appendicitis at a tertiary care facility is essential for optimizing clinical protocols, improving patient outcomes, and reducing postoperative complications. This study aims to assess the frequency of perforated appendicitis among patients presenting with acute appendicitis at Bolan Medical College Hospital, Quetta. By analyzing patient demographics, clinical presentations, and associated morbidity and mortality rates, this research seeks to provide insights into the epidemiology of perforated appendicitis and identify areas for improvement in early detection and intervention. The findings will contribute to the existing body of knowledge on appendiceal perforation and guide future strategies for reducing its impact in similar healthcare environments.

MATERIAL AND METHODS

This prospective observational study was conducted at a tertiary care hospital within a government setting to evaluate the frequency and clinical outcomes of perforated appendicitis. Ethical approval was obtained from the Institutional Review Board (IRB) of Bolan Medical College/SPH, Quetta, in accordance with the Declaration of Helsinki, ensuring that all study protocols adhered to internationally accepted ethical guidelines. Informed consent was obtained from all participants prior to enrollment, with strict confidentiality maintained throughout the study. Patients presenting to the emergency department with suspected acute appendicitis were assessed for eligibility based on predefined inclusion and exclusion criteria. The study included individuals over the age of 12 years who were diagnosed intraoperatively with perforated appendicitis, including cases of gangrenous perforation and ruptured appendix. Exclusion criteria encompassed patients younger than 12 years, those diagnosed with non-perforated acute appendicitis, and individuals presenting with appendicular lump or mass, as confirmed through intraoperative findings.

Data collection spanned from October 19, 2023, to October 20, 2024, during which a total of 63 patients with perforated appendicitis were enrolled. Clinical assessments were performed upon admission, including a detailed history and physical examination, with particular emphasis on symptom duration, pain characteristics, and associated systemic manifestations such as fever, vomiting, and abdominal tenderness. Imaging studies, primarily ultrasonography, were conducted in all cases, with computed tomography (CT) scans utilized selectively for ambiguous cases. Preoperative laboratory investigations, including complete blood count, C-reactive protein levels, and renal function tests, were conducted to assess inflammatory markers and overall physiological status. The primary outcome of interest was the frequency of perforated appendicitis among patients diagnosed with acute appendicitis, while secondary outcomes included postoperative complications, length of hospital stay, morbidity, and mortality rates. Intraoperative findings such as the site of perforation, peritoneal contamination volume, and surgical approach were meticulously documented. Postoperative follow-up was conducted to monitor the development of complications, including surgical site infections, wound dehiscence, intra-abdominal abscess formation, intestinal obstruction, and mortality.

Data analysis was performed using SPSS version 27. Continuous variables such as age and duration of hospital stay were presented as means with standard deviations, while categorical variables such as gender distribution, clinical symptoms, and surgical outcomes were expressed as frequencies and percentages. Chi-square and Fisher's exact tests were applied to compare categorical variables, while independent t-tests and Mann-Whitney U tests were employed for continuous variables, where applicable. Logistic regression analysis was conducted to identify factors associated with increased morbidity and mortality. Missing data were handled using multiple imputation methods to minimize potential bias, and sensitivity analyses were performed to assess the robustness of the findings. Potential confounding variables, such as comorbidities and delayed presentation, were adjusted for in multivariate analyses to ensure the validity of the results. By employing standardized data collection methods and rigorous statistical analyses, this study aimed to provide a comprehensive understanding of the burden of perforated appendicitis within the studied population, thereby informing future clinical management strategies and healthcare policy development.

RESULTS

The study analyzed 63 cases of perforated appendicitis, with a mean patient age of 32.5 years (range: 12–78 years). The highest incidence was observed in the 21–30-year age group, accounting for 31.8% of cases. Males were more commonly affected (55.2%) compared to females (44.8%), with a male-to-female ratio of 1.25:1 (Table 1).

All patients (100%) presented with abdominal pain, making it the most prevalent symptom. Vomiting was reported in 64.3% of cases, followed by fever in 38.9%. Other symptoms, including loose stools and abdominal distension, were less frequently observed (Table 2).

Intraoperative findings revealed that the most common appendix location was retrocaecal (54.7%), followed by pelvic (35.7%). Severe peritoneal contamination, defined as fluid accumulation exceeding 150ml, was noted in 9.6% of cases and was strongly associated with increased morbidity and mortality. Postoperative complications were observed in 72.2% of patients, with surgical site infection being the most frequent (42%), followed by wound dehiscence (16.6%) (Table 3).

Table 1: Demographic Characteristics of Patients with Perforated Appendicitis

Characteristic	Value
Total Patients	63
Mean Age (years)	32.5
Age Range (years)	12-78
Most Common Age Group (21-30)	31.8%
Male (%)	55.2%
Female (%)	44.8%
Male-to-Female Ratio	1.25:1

Table 2: Clinical Presentation of Patients with Perforated Appendicitis

Symptom	N (%)
Abdominal Pain	63 (100%)
Vomiting	40 (64.3%)
Fever	24 (38.9%)
Loose Stools	3 (4.7%)
Not Passed Stool	2 (2.4%)
Abdominal Distension	1 (1.6%)

Table 3: Operative Findings and Complications

Finding	N (%)
Retrocaecal Appendix	33 (54.7%)
Pelvic Appendix	23 (35.7%)
Ileal Appendix	2 (3.2%)
Postileal Appendix	3 (4.0%)
Subhepatic Appendix	2 (2.4%)
Severe Peritoneal Contamination	11 (9.6%)
Surgical Site Infection	26 (42%)
Wound Dehiscence	10 (16.6%)
Intestinal Obstruction	1 (1.6%)
Fecal Fistula	1 (1.6%)

Table 4: Surgical Approach and Outcomes

Surgical Procedure	N (%)
Appendectomy	61 (96.8%)
Right Hemicolectomy	2 (3.2%)
Tube Cecostomy	1 (1.6%)
Laparoscopic Approach	3 (4.8%)
Midline Incision (Peritonitis)	12 (19.9%)

Table 5: Morbidity and Mortality Analysis

Variable	Value
Complication Rate	72.2%
Mortality Rate	4.8%
Morbidity in Late Presentation	85%
Mortality in Late Presentation	26%
Mortality in Severe Peritoneal	

Surgical management predominantly involved appendectomy (96.8%), with right hemicolectomy required in 3.2% of cases due to extensive contamination. Laparoscopic appendectomy was feasible in only 4.8% of cases due to the advanced stage of perforation and peritoneal contamination in most patients. A midline incision was used in 19.9% of cases presenting with generalized peritonitis (Table 4).

The overall mortality rate in this study was 4.8%, with the highest risk observed in patients presenting late (beyond 72 hours of symptom onset) and those with severe peritoneal contamination. Among patients with >150ml of peritoneal contamination, mortality reached 54.5%. The morbidity rate among late presenters was significantly higher at 85%, emphasizing the impact of delayed intervention on patient outcomes (Table 5).

The findings highlight the importance of early diagnosis and timely surgical intervention in reducing the risk of perforation-related complications. The study also suggests that severe peritoneal contamination and delay in hospital presentation are key determinants of poor prognosis. These insights underline the necessity for enhanced public awareness regarding the urgency of seeking medical

attention for acute abdominal pain and improving healthcare access to facilitate early intervention.

DISCUSSION

Perforated appendicitis remains a significant surgical challenge, contributing to increased morbidity and mortality despite advancements in diagnostic imaging, surgical techniques, and perioperative care. The present study found that perforation occurred in 13.8% of acute appendicitis cases, a rate comparable to previous studies that reported incidence ranges of 10–30% (6,7). The mean patient age was 32.5 years, with the highest prevalence observed in the 21–30 age group. This age distribution is consistent with prior research, which has similarly identified young adults as the most affected demographic (8). The male predominance observed in this study, with a male-to-female ratio of 1.25:1, aligns with epidemiological trends reported in the literature, where males exhibit a higher susceptibility to perforated appendicitis, potentially due to differences in healthcare-seeking behaviors and anatomical variations (9).

Delayed presentation emerged as a critical factor contributing to perforation and adverse postoperative outcomes. The study revealed that 62.7% of patients presented three or more days after symptom onset, correlating with a higher morbidity rate (85%) and increased mortality (26%). These findings are in agreement with previous research emphasizing that the risk of perforation escalates significantly after 48 hours of persistent symptoms (3,10). This delay is often attributed to misdiagnosis, inadequate healthcare access, or patients' reluctance to seek timely medical attention, particularly in rural settings where healthcare facilities are limited (11). Moreover, our data indicated that severe peritoneal contamination (>150 ml) was associated with a mortality rate of 54.5%, underscoring the critical impact of intra-abdominal sepsis in disease progression and postoperative recovery. These findings reinforce existing evidence that the volume of peritoneal contamination serves as a prognostic marker for clinical outcomes in perforated appendicitis (12).

The clinical presentation of perforated appendicitis in this study mirrored findings from previous reports, with abdominal pain as the universal symptom (100%), followed by vomiting (64.3%) and fever (38.9%). Guarding, tachycardia, and tenderness in the right iliac fossa were the predominant clinical signs, consistent with established diagnostic patterns (13). Intraoperative findings revealed that the retrocaecal appendix was the most common anatomical variation (54.7%), which is in line with studies suggesting that a retrocaecal position may contribute to diagnostic delays due to atypical symptom presentation (14). The study further demonstrated that surgical site infection (42%) and wound dehiscence (16.6%) were the most frequently observed postoperative complications, corroborating previous findings that highlight infection control as a major concern in perforated appendicitis management (15).

Surgical intervention remains the cornerstone of treatment, and in this study, appendectomy was the primary procedure performed (96.8%), with right hemicolectomy required in 3.2% of cases due to extensive caecal involvement. The need for advanced surgical interventions in select cases aligns with literature indicating that delayed diagnosis often necessitates more extensive resections, increasing morbidity (16). While laparoscopy has been advocated as a minimally invasive approach with superior outcomes in uncomplicated appendicitis, it was only feasible in 4.8% of cases in this study due to the advanced stage of disease presentation, reaffirming the limitations of laparoscopic intervention in complicated appendicitis (17). These findings suggest that while laparoscopy may offer benefits in selected cases, conventional open surgery remains the standard of care in patients presenting with extensive contamination and perforation.

Despite its strengths, this study has several limitations that warrant consideration. The relatively small sample size (n=63) may limit the generalizability of the findings to broader populations. Additionally, as a single-center study, institutional factors such as surgical expertise and resource availability could influence the reported outcomes, restricting the applicability of the results to other healthcare settings. The study also relied on intraoperative findings to confirm perforation, which, while a gold standard, may introduce observational bias. Future research should incorporate multicenter studies with larger sample sizes and standardized diagnostic criteria to enhance the robustness of findings. Furthermore, investigations into predictive biomarkers for early perforation detection and the role of preoperative risk stratification in guiding management decisions are needed to optimize patient outcomes.

The findings of this study hold important clinical implications, emphasizing the need for public awareness campaigns to encourage early medical consultation for acute abdominal pain. Additionally, healthcare policies should focus on improving diagnostic accessibility, particularly in rural areas where delayed presentations are more common. Given the high morbidity associated with perforated appendicitis, postoperative monitoring should be tailored to at-risk patients, particularly those with severe peritoneal contamination and comorbidities. The integration of enhanced recovery after surgery (ERAS) protocols and evidence-based antibiotic regimens may further improve patient outcomes by reducing infection rates and hospital stay durations.

This study reinforces the significance of timely diagnosis and surgical intervention in mitigating the complications of perforated appendicitis. Delayed hospital presentation remains a major predictor of adverse outcomes, highlighting the need for improved healthcare accessibility and patient education.

While open appendectomy remains the primary surgical approach in perforated cases, ongoing research should explore the feasibility of laparoscopy in complicated appendicitis to expand minimally invasive options. Future studies should also focus on refining early diagnostic tools and perioperative management strategies to reduce morbidity and improve overall patient prognosis.

CONCLUSION

This study found that perforation occurred in 13.8% of acute appendicitis cases at BMC Hospital Quetta, with the highest incidence in the 21–30-year age group and a male predominance. Delayed hospital presentation was a key factor contributing to increased morbidity (72.2%) and mortality (4.8%), particularly in cases with severe peritoneal contamination. Abdominal pain was the most common symptom, and surgical site infection was the leading postoperative complication. While appendectomy remained the standard treatment, extensive contamination necessitated advanced surgical interventions in select cases. These findings underscore the need for improved public awareness, early diagnosis, and timely surgical intervention to reduce complications associated with perforated appendicitis. Clinically, optimizing perioperative management, including infection control strategies and tailored postoperative care, is essential for improving outcomes. Future research should focus on predictive markers for early perforation detection and evaluating minimally invasive surgical approaches to expand treatment options for complicated appendicitis cases.

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