

Original Article

Aetiology and Outcomes of Secondary Peritonitis in a Suburban Teaching Hospital in Nigeria: A Prospective Study

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Abstract

Background: Secondary peritonitis is a common surgical emergency in the developing world. It is associated with high morbidity and mortality rates despite advancements in treatment. This study aimed to determine the causes and treatment outcomes of secondary peritonitis following gastrointestinal perforation in a suburban Nigerian teaching hospital.

Methodology: This prospective study was conducted over one year, enrolling 64 patients with secondary peritonitis due to gastrointestinal perforation. Sociodemographic and clinical data were collected, and samples were analysed using standard procedures. Statistical analysis was performed using STATA software version 16.

Results: The study included 64 patients who met the inclusion criteria, 43 (67.19%) males and 21 (32.81%) females, with a male-to-female ratio of 2:1 and a mean age of 41.21± 2.79 years. Only 4 (6.25%) patients presented within 24 hours of the onset of symptoms, while 14 (21.88%) patients presented in shock. Gastroduodenal perforation (42.2%), ruptured appendicitis (37.5 %), and typhoidal perforation (12.5 %) were the main causes of secondary peritonitis. Complications occurred in 29.7% of patients, with surgical site infections being the most common. The mortality rate was 10.9 %, with comorbidities (p=0.005) and postoperative complications (p=0.004) significantly associated with outcomes.

Conclusions: Common causes of secondary peritonitis following gastrointestinal perforation in this study were gastroduodenal perforation, ruptured appendicitis, and typhoidal perforation. Postoperative complications were linked to mortality, emphasizing the importance of prompt evaluation and resuscitation to prevent complications. Only associations, not predictors, were identified. The limitation of this study is the relatively small sample size, which limits the generalizability of the findings to the Nigerian population. Consequently, larger, preferably multicenter studies are recommended.

Keywords: Aetiology, Outcome, Prognostic factors, Secondary peritonitis, Nigeria

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Introduction

Secondary peritonitis is a severe, life-threatening surgical emergency resulting from contamination of the peritoneal cavity following loss of integrity of a hollow viscus or intra-abdominal organ. It commonly arises from gastrointestinal perforations, intra-abdominal infections, ischemia with bowel gangrene, or abdominal trauma, leading to diffuse peritoneal inflammation, sepsis, and potential multi-organ failure if not promptly treated.^[1,2]

Globally, secondary peritonitis remains a major cause of emergency laparotomy and postoperative mortality. Despite advances in surgical techniques, antimicrobial therapy, and peri-operative critical care, morbidity and mortality remain high, particularly in low- and middle-income countries (LMICs).^[3,4] Sub-Saharan Africa bears a disproportionate burden of the disease, largely due to delayed presentation, limited access to specialist surgical services, diagnostic challenges, and inadequate critical care facilities.^[5,6] Mortality rates of 20–60% have been reported in the region, significantly higher than those observed in high-income countries.^[7,8]

In Nigeria, secondary peritonitis is frequently associated with preventable or treatable conditions such as perforated peptic ulcer disease, ruptured appendicitis, and typhoid intestinal perforation.^[9,10,11,12] Factors such as poor health-seeking behaviour, self-medication, financial constraints, delayed referrals, and long distances to healthcare facilities often result in late presentation with generalized peritonitis and septic shock.^[13,14,15] These challenges negatively impact outcomes even when appropriate surgical intervention is instituted.

Although several Nigerian studies have examined the aetiology and outcomes of secondary peritonitis, most reports originate from urban tertiary centres.^[9,16,17] Outcome data from suburban teaching hospitals, where resource limitations and referral patterns may differ, remain sparse. Given known regional variations in disease patterns, healthcare access, and peri-operative support, locally generated data are essential for understanding outcome determinants and guiding context-specific strategies to improve care. This study, therefore, aimed to evaluate the causes and treatment outcomes of secondary peritonitis following gastrointestinal perforation in a suburban Nigerian teaching hospital.

Materials and Methods

Ethics: This study was conducted in compliance with the guidelines of the Helsinki declaration on research in human subjects, and we obtained informed consent from all the participants for publication. Approval for the study was obtained from the Research and Ethics Committee of ISTH (Approval No: ISTH HREC/20202710/116).

Study Design: This is a prospective study of all 64 eligible patients who underwent exploratory laparotomy for secondary peritonitis, from gastrointestinal pathologies, at the Irrua Specialist Teaching Hospital (ISTH), Irrua, Edo State, Nigeria, over a one-year study period.

Study Population

All eligible consenting patients aged 18 years and above during the study period were included. Patients with tertiary peritonitis were excluded.

Data Collection

The patients' socio-demographic data, detailed medical history, clinical examination findings, and preoperative investigations were recorded. Before surgery, all participants received intravenous fluid to correct fluid and electrolyte imbalances, had a nasogastric tube inserted to decompress the stomach,

underwent urethral catheterization to monitor urine output, and received broad-spectrum antibiotics. Prior to the operation, patients were assessed using the American Society of Anesthesiologists (ASA) classification. After achieving haemodynamic stability, they underwent exploratory laparotomy under general anesthesia by senior registrars or consultants. The diagnosis of peritonitis and the location of the pathology were confirmed during surgery.

Peritoneal fluid samples were collected for culture and sensitivity testing, tissue biopsies were taken for histopathological analysis, and regional lymph nodes were examined. The appropriate surgical procedure was performed based on the underlying pathology, while taking into consideration the patient's clinical condition. The peritoneal cavity was irrigated and drained as necessary. Patients were discharged home for follow-up in the clinic, usually around postoperative day 5, except those with post-operative complications who stayed longer. The primary outcome of the study was survival, determined by whether a patient was alive and discharged or deceased.

Operational definitions

Shock: systolic blood pressure < 90/60 mmHg at presentation.

Surgical site infection: infection occurring within 30 days postoperatively according to CDC criteria.

Secondary peritonitis: peritoneal infection resulting from gastrointestinal perforation.

The outcomes were assessed by a trained research assistant who was blinded.

Data analysis

Data were analysed using Stata statistical software version 16. The collected data were initially entered into a Microsoft Excel spreadsheet for cleaning, coding, and subsequently exported to Stata for analysis. Descriptive statistics were computed for all relevant variables, including socio-demographic characteristics and Symptoms and Signs of the study participants. Categorical variables were summarized using frequencies and percentages. In contrast, continuous variables were presented as means and standard deviations. The Chi-square (χ^2) test was used to assess associations between categorical variables. The independent samples t-test was used to compare means between two groups for normally distributed continuous variables. Results were also presented in bar charts. A p-value of less than 0.05 was considered statistically significant at a 95% confidence level.

Results

Out of the 71 patients initially diagnosed with secondary peritonitis, 64 met the inclusion criteria for this study. Seven patients were excluded due to peritonitis from non-gastrointestinal causes. Among the participants, 43 (67.19%) were males and 21 (32.81%) were females, with a male-to-female ratio of 2:1. The majority of participants, 33 (51.56%), had a secondary education, while the fewest, 9 (14.06%), had no formal education. The age distribution and other socio-demographic characteristics of the participants are detailed in Table 1.

Table 1: Socio-demographic characteristics of the participants.

Parameter	Number N=64(%)
Age (Years)	
≤20	5 (7.81)
21-30	9 (14.06)

31-40	19 (29.69)
41-50	9 (14.06)
50-60	7 (10.94)
>60	15 (23.44)
Age (Mean \pm SD)	41.21 \pm 2.79
Gender	
Male	43 (67.19)
Female	21 (32.81)

Clinical presentations

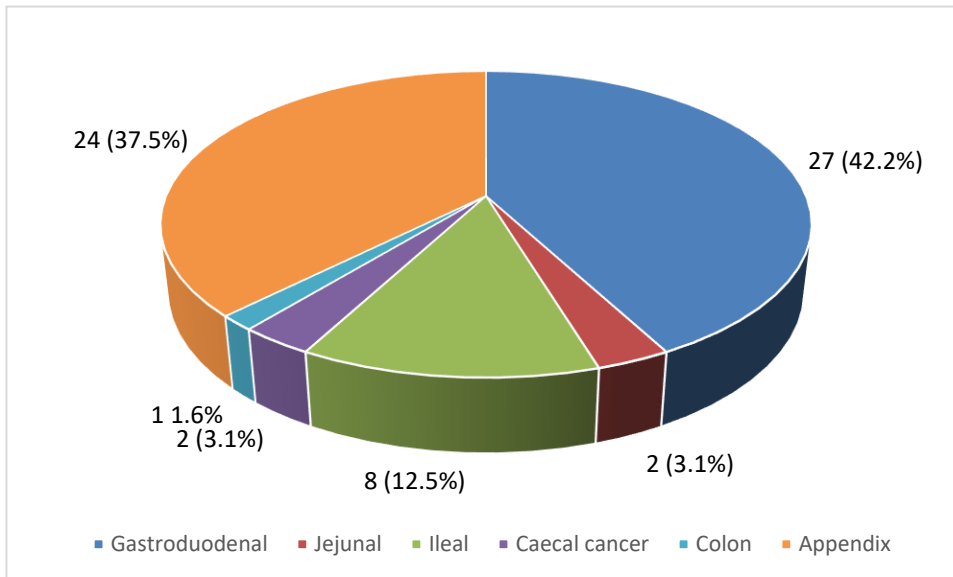
In this study, the majority of the participants (93.75%) presented late to the hospital, more than 24 hours after the onset of symptoms. The most common presenting symptom was abdominal pain, reported by all participants. Generalized peritonitis was diagnosed in 93.75% of the cases. Fourteen participants (21.88%) presented in shock with low systolic blood pressure, 49 (76.56%) had tachycardia, and 44 (68.75%) had a fever (Table 2).

Table 2: Comparison of the Symptoms and Signs of the study participants.

Duration of symptoms before presentation (days)	Number N=64(%)
≤ 1	04 (6.25)
1-3	23 (35.94)
> 3	37 (57.81)
Symptoms	
Abdominal pain	64 (100)
Abdominal distension	47 (73.44)
Vomiting	47 (73.44)
Fever	44 (68.75)
Signs	
Tachycardia	49 (76.56)
Generalized Abdominal Tenderness	60 (93.75)
Rebound Tenderness	54 (84.38)
Abdominal guarding	55 (85.94)

Bowel Sound	
Hypoactive	26 (40.63)
Absent	37 (57.81)
Systolic BP < 90mmHg	14 (21.88)

Figure 1: Anatomical site of origin of secondary peritonitis.



This figure shows the distribution of perforation sites among the study participants. Gastroduodenal perforation was the most common site (42.2%), followed by appendiceal rupture (37.5%), ileal perforation (12.5%), and colonic perforation.

Out of 64 participants, 19 (29.69%) experienced complications. Among these, 15 (23.4%) had incisional surgical site infections while 2 (3.1%) had enterocutaneous fistula. The mortality rate was 7 (10.9%) (Table 3)

Table 3: Rate of post-operative complications

Complications	Number	Percentage
Surgical site infections	15	23.4%
Intra-abdominal abscess	1	1.6%
Deep vein thrombosis	1	1.6%
Enterocutaneous fistula	2	3.1%
Mortality	7	10.9%

The post-operative hospital stay duration varied from 6 to 30 days. Participants who developed SSI had a longer hospital stay, which was statistically significant ($p=0.04$), as indicated in Table 4.

Table 4: Comparison of Length of Hospital Stay of the Participants with SSI and those without SSI.

Outcome of participants	Frequency (N)=64	Mean (days) \pm SD	95% conf. interval	P- value
SSI	15	14.85 \pm 2.43	10.14 – 17.41	0.02 ^t
Non-SSI	49	08.56 \pm 2.23	8.09 – 12.24	

t = Independent student t-test, SSI= Surgical site infection, Non-SSI= Non-surgical site infection,

Table 5: Association of clinical characteristics with outcome among patients with secondary peritonitis

Characteristics		Outcome(N64)		Fishers exact test	P value
		Survived(57) (%)	Mortality(7) n (%)		
Duration of symptoms	\leq 24 hours	4(7.02)	0(0.00)	0.725	0.72
	>24 hours	53(92.98)	7(100.00)		
Temperature	\leq 36 °C	3(5.26)	0(0.00)	0.570	0.68
	36-38 °C	38(66.67)	5(71.43)		
	>38 °C	16(28.07)	2(28.57)		

Etiology of perforation	Gastroduodenal	23(40.35)	4(57.14)	0.124	0.36
		24(42.11)	1(14.29)		
	Appendicitis	2(3.51)	0(0.00)		
	Jejunal	7(12.28)	1(14.29)		
	Ileal	2(3.51)	1(14.29)		
	Malignant (colonic)				
Comorbidity	Yes	12(21.05)	5(71.43)	0.241*	0.04
	No	45(78.95)	2(28.57)		
Complications	Yes	19(33.33)	6(85.71)	0.166*	0.05
	No	38(66.67)	1(14.29)		
Mean waiting time \pm SD (hours)		13.82 \pm 3.37	16.32 \pm 4.11	0.251#	0.18
EBL (Mean \pm SD) (mls)		336.66 \pm 174.24	342.90 \pm 179.89	0.072#	0.24
Duration of surgery		121.9 \pm 41.71	136.12 \pm 38.61	0.621#	0.11

SD = Standard Deviation, # = Mann Whitney U Test

Gastroduodenal perforation, ruptured appendicitis, and typhoid perforation were the most frequent causes of secondary peritonitis following gastrointestinal perforation in our hospital. Secondary peritonitis in our setting is associated with a high burden of complications, as well as substantial morbidity and mortality. Gastroduodenal and appendiceal perforations accounted for the majority of cases.

The presence of comorbidities and the occurrence of postoperative complications showed significant associations with mortality, underscoring the important contribution of patient-related and perioperative factors to outcomes. Delayed presentation, particularly beyond 24 hours of symptom onset, was also associated with worse outcomes, highlighting the critical role of timely referral and intervention. Out of the total patients, 18.75% had comorbid illnesses. Hypertension was the predominant comorbidity, affecting 12.5% of patients. Other comorbidities included diabetes (3.13%), sickle cell disease (1.56%), and stroke (1.56%).

Discussion

This prospective study evaluated the aetiology and outcomes of secondary peritonitis following gastrointestinal perforation in a suburban tertiary teaching hospital in Southern Nigeria. The study population consisted predominantly of males in the third and fourth decades of life, which is consistent with previous reports from Nigeria and other LMICs.^[9,18,19] The male predominance observed in this study is comparable to findings reported by Agarwal et al.^[3] and other Nigerian studies.^[9,16] However, variations in gender distribution across studies suggest that demographic and regional differences may influence disease patterns.

A notable finding in this study was the high proportion of patients presenting with generalized peritonitis, reflecting delayed presentation to definitive care. Similar trends have been widely reported in Nigeria and other LMIC settings.^[9,16,21] Delays are multifactorial and reflect systemic healthcare challenges, including limited access to specialist surgical services, inefficient referral systems, financial barriers to care, and inadequate emergency transport infrastructure.^[13,14] Late presentation is associated with advanced intra-abdominal contamination and physiological derangement, which may contribute to increased morbidity and mortality.

Gastroduodenal perforation was the most common cause of secondary peritonitis in this study. This finding is consistent with reports by Ghosh et al.¹⁸ and several Nigerian and regional studies that identified peptic ulcer perforation as a leading cause of secondary peritonitis.^[3,21] However, other Nigerian studies by Tagar et al.^[16], Obonna et al.^[15], and Ayandipo et al.^[17] have reported ruptured appendicitis as the most frequent aetiology, while some authors have identified small bowel perforation as the predominant cause.^[12,24] These regional differences likely reflect variations in disease epidemiology, prevalence of peptic ulcer disease, infectious causes such as typhoid fever, and access to early surgical intervention.

Postoperative complications occurred in approximately one-third of patients, with surgical site infection (SSI) being the most frequent complication. Similar SSI rates have been reported in Nigerian studies, including the work of Ihezue et al.^[21] and Adejumo et al.^[22] The observed complication and mortality rates are comparable to those reported in other LMIC settings^[5,19] but remain higher than those typically reported in high-income countries.^[25,26] This disparity likely reflects differences in disease severity at presentation, perioperative optimization, infection control measures, and availability of critical care support.

The study also demonstrated an association between postoperative complications and increased mortality, consistent with previous findings.^[27] Similarly, the presence of comorbid conditions was associated with increased mortality, in agreement with findings by Khan et al.^[27] These findings emphasize the importance of comprehensive perioperative assessment and optimization, even in emergency surgical settings.

The findings of this study have important implications for surgical practice in LMICs. Secondary peritonitis continues to present at advanced stages, resulting in significant morbidity and mortality. Strengthening early diagnosis, improving referral systems, enhancing perioperative care, and ensuring the availability of essential surgical and critical care resources may improve patient outcomes. Overall, this study provides important descriptive data on the aetiology and outcomes of secondary peritonitis in a suburban Nigerian teaching hospital. However, the findings should be interpreted within the context of the study design and sample size. Further multicentre studies with larger sample sizes are needed to better characterize outcome determinants and guide interventions to improve surgical care in similar resource-limited settings.

Conclusion

Gastroduodenal perforation, ruptured appendicitis, and typhoid perforation were the most frequent causes of secondary peritonitis following gastrointestinal perforation in our hospital. Secondary peritonitis in our setting is associated with a high burden of complications, as well as substantial morbidity and mortality. Gastroduodenal and appendiceal perforations accounted for the majority of cases. The presence of comorbidities and the occurrence of postoperative complications showed significant associations with mortality, underscoring the important contribution of patient-related and perioperative factors to outcomes. Delayed presentation, particularly beyond 24 hours of symptom onset, was also associated with worse outcomes, highlighting the critical role of timely referral and intervention.

Limitations: Small sample size and absence of a validated severity score

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Conflict of Interest: None declared

Ethical approval: Approval for the study was obtained from the Research and Ethics Committee of the institution.

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