

Burden, management, and outcomes of enterocutaneous fistula in a resource-limited setting: a 10-year retrospective observational study from a Nigerian tertiary hospital

Olaoluwa Ayoade Afolabi

Bowen University

Chiwendu Uchechukwu Isiakpona

`chiwendu.isiakpona@bowen.edu.ng`

Bowen University

Augustine Elugwaraonu Agbakwuru

Bowen University

James Olaniyi Adeniran

Bowen University

Adewumi Ojeniyi Durodola

Bowen University

Imri Goodness Adefokun

Bowen University

Ibukun Adewumi Okunade

Bowen University

Favour Oluwafemi Kolawole

Bowen University

Sharon Ifedayo Babasola

Bowen University

Research Article

Keywords: Enterocutaneous fistula, surgical complications, postoperative complications, sepsis, high-output fistula, nutritional support, low- and middle-income countries, surgical outcomes, wound management

Posted Date: August 3rd, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-10244887/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.
[Read Full License](#)

Additional Declarations: No competing interests reported.

Title: Burden, management, and outcomes of enterocutaneous fistula in a resource-limited setting: a 10-year retrospective observational study from a Nigerian tertiary hospital.

Authors: Olaoluwa Ayoade, **Afolabi**^{3*}, Chiwendu Uchechuwu, **Isiakpona**^{1*}, Augustine Elugwaraonu, **Agbakwuru**¹, James Olaniyi, **Adeniran**¹, Adewumi Ojeniyi, **Durodola**², Imri Goodness, **Adefokun**¹, Ibukun Adewumi, **Okunade**², Favour Oluwafemi, **Kolawole**⁴, Sharon Ifedayo, **Babasola**¹

Institutional Affiliation

¹ *Department of Surgery, Bowen University, Iwo & Bowen University Teaching Hospital, Ogbomoso.*

² *Department of Family Medicine, Bowen University, Iwo & Bowen University Teaching Hospital, Ogbomoso.*

³ *Department of Obstetrics and Gynaecology, Bowen University, Iwo & Bowen University Teaching Hospital, Ogbomoso.*

⁴ *Department of Nursing Sciences, Bowen University, Iwo, Osun State.*

Corresponding Author

Chiwendu Uchechukwu, **Isiakpona**

Department of Surgery,
Bowen University Teaching Hospital,
Ogbomoso, Oyo State,
Nigeria.

Email: chiwendu.isiakpona@bowen.edu.ng, uchman84@gmail.com

Telephone: +2348169718603

Contribution Statements:

AO and IC contributed equally to this paper and are joint first authors.

Conceptualisation—: AO, IC, AE, AJ, AI, DA, OI, KF, BS.

Writing—Creation of the initial manuscript draft: AO, IC.

Methodology—development or design of methodology; creation of models for data collection, analysis, and interpretation: AO, IC, AE.

Statistical Analysis: AO, IC, KF.

Investigation—conducting the research process, including data collection: AO, IC, BS.

Supervision—oversight and leadership responsibility for the research activity planning and execution, including mentorship: AE.

Visualisation—preparation and presentation of data and study results: AO, IC.

Writing—review and editing—critical revision of the manuscript for important intellectual content: AO, IC, KF, DA, OI, AE, AJ, AI, BS.

All authors contributed to the manuscript, critically revised it, approved the final version for publication, and agree to be accountable for all aspects of the work.

Large Language Model (LLM) Disclosure

Large Language Models (including ChatGPT, OpenAI) were used during manuscript preparation to assist with language editing, improving grammar and clarity, and formatting. All scientific content, data analysis, interpretation, and final editorial decisions were performed and verified by the authors, who accept full responsibility for the accuracy and integrity of the manuscript.

Ethics Approval: Approved by the Bowen University Teaching Hospital Research Ethics Committee (BUTH/REC-1041). Conducted in accordance with the Declaration of Helsinki.

Data availability: Data are available upon reasonable request from the corresponding author.

Patient and public involvement: Patients and/or the public were not involved in the design, conduct, reporting, or dissemination of the plans for this research.

Funding: We did not receive any research grants or any research funds.

Competing interests: None declared.

Clinical trial number: Not applicable

Title: Burden, management, and outcomes of enterocutaneous fistula in a resource-limited setting: a 10-year retrospective observational study from a Nigerian tertiary hospital.

Abstract

Background:

Enterocutaneous fistula (ECF) remains a major cause of postoperative morbidity and mortality, particularly in low- and middle-income countries (LMICs), where access to specialised nutritional support, critical care, and multidisciplinary management is often limited. Despite its burden, data from resource-constrained settings remain scarce. This study evaluated the aetiology, management, and outcomes of ECF in a Nigerian tertiary hospital and identified factors associated with mortality.

Methods:

A retrospective review of all patients managed for ECF at Bowen University Teaching Hospital between February 2014 and January 2024 was conducted. Demographic, clinical, operative, and outcome data were retrieved from medical records and theatre registers. Descriptive statistics summarised patient characteristics and outcomes, while associations between selected clinical variables and mortality were analysed using the chi-square test, with $p < 0.05$ considered significant.

Results:

Thirty-six patients were included (mean age 32.8 ± 18.1 years; 63.9% female). Most fistulas were postoperative (97.2%), commonly following surgery for typhoid perforation (33.3%) and appendicitis (27.8%). Ileal fistulas accounted for 55.6%, and 61.1% were high-output. Over half (61.1%) were referred from peripheral centres. Spontaneous closure occurred in 8.3%, while 77.8% achieved closure after surgery; 13.9% remained persistent. Overall mortality was 22.2%, mainly due to sepsis and multiorgan failure. High-output fistulas were significantly associated with mortality ($p = 0.022$), whereas time to presentation was not ($p = 0.827$).

Conclusion:

ECF in this setting is predominantly postoperative and largely related to preventable conditions. Mortality remains high, driven by sepsis and high-output fistulas. Improved perioperative care, referral systems, nutritional support, and typhoid prevention may improve outcomes.

Keywords:

Enterocutaneous fistula, surgical complications, postoperative complications, sepsis, high-output fistula, nutritional support, low- and middle-income countries, surgical outcomes, wound management.

Introduction

Enterocutaneous fistula (ECF) is an abnormal communication between the gastrointestinal tract and the skin, resulting in the external discharge of intestinal contents. It remains one of the most devastating complications of abdominal surgery, associated with substantial morbidity, prolonged hospitalization, and significant mortality, particularly in low- and middle-income countries (LMICs) (1-6).

Historically, mortality associated with enterocutaneous fistula exceeded 40–60% and was primarily related to uncontrolled sepsis, fluid and electrolyte losses, and malnutrition (7). Advances in critical care, antimicrobial therapy, nutritional support including total parenteral nutrition, wound care, and surgical techniques have reduced mortality to approximately 5–20% in specialized centers (7)."

However, outcomes remain significantly worse in resource-limited environments, where access to critical care, nutritional support, and specialized multidisciplinary teams are often constrained (10-11). This disparity highlights ongoing global inequities in surgical care delivery and reflects broader deficiencies in access to safe, timely, and affordable surgical care in many LMICs (26)

Causes:

Globally, 75%-85% of ECFs are postoperative, frequently arising after bowel resections, appendectomy, or repair of intestinal perforations (8,13,18). In sub-Saharan Africa, enterocutaneous fistula patterns differ, reflecting the persistent burden of infectious diseases and delays in accessing definitive surgical care (3-5). Nonoperative causes such as Crohn's disease, malignancy, trauma, and other inflammatory or infective conditions also contribute, although their relative importance varies across different settings (13–15).

Complications:

The clinical course of enterocutaneous fistula is frequently complicated by sepsis, fluid and electrolyte disturbances, malnutrition, and peristomal skin excoriation, all of which contribute to adverse outcomes (4,16-17). Mortality is strongly associated with high-output fistulas, delayed presentation, and inadequate nutritional support, factors commonly reported in ECF patients managed in low-resource settings (5,8-9,18).

Management Approaches:

Management is complex and typically involves a staged approach, including initial resuscitation and sepsis control, nutritional optimization, and delayed definitive surgical intervention when spontaneous closure fails (1,16,18). In high-resource settings, adjunctive therapies such as total parenteral nutrition, somatostatin analogues, fibrin sealants, and negative pressure wound therapy have been associated with improved outcomes (18,25,28).

In contrast, management in many LMICs relies on conservative measures, enteral nutrition, antibiotics, and selective surgical repair due to limited access to advanced supportive technologies (5-6,10,15). Although multidisciplinary care has been shown to improve outcomes, its implementation remains inconsistent in resource-constrained settings (19,24).

Rationale for Study:

Despite numerous reports from both developed and developing countries, the management and outcomes of ECF remain significant challenges for surgeons, particularly in low-resource settings. There remains a need for context-specific data to better understand the epidemiology, management constraints, and outcomes in such environments.

The aim of this study is to review the causes, clinical presentation, management strategies, and outcomes of ECF at Bowen University Teaching Hospital (BUTH) over a 10-year period. The objective is to provide insight into the challenges of managing ECF in a resource-limited setting and to identify opportunities for improving care.

Methods

Study Design and Setting:

This was a retrospective observational study conducted at Bowen University Teaching Hospital (BUTH), a 200-bedded tertiary referral center in Ogbomoso, Oyo State, Nigeria. The hospital serves as a referral center for Oyo State and neighboring regions, providing specialist services including general surgery, pediatrics, and obstetrics and gynecology. The study reflects care delivery within a resource-constrained setting typical of many low- and middle-income countries.

Study Population:

All 36 consecutive patients (adults and children) managed for enterocutaneous fistula (ECF) at BUTH between 1 February 2014 and 31 January 2024 were eligible for inclusion.

Inclusion criteria: patients with a documented diagnosis of ECF managed within the study period.

Exclusion criteria: patients with incomplete medical records lacking key variables required for analysis (e.g., outcomes or fistula characteristics).

Data sources and collection

Data were obtained from patient case notes, admission registers, and operating theatre records. Extracted information included:

All consecutive eligible patients were included.

- Sociodemographic characteristics (age, sex, ethnicity, occupation, and proxies for socioeconomic status)
- Clinical presentation (symptoms and duration prior to index surgery)
- Details of Index Surgery (Indications and Type of Procedure)
- Interval between initial surgery and fistula development
- Fistula characteristics (anatomical site and output classification)
- Management strategies (conservative and operative) and associated challenges
- Clinical outcomes (complications, length of hospital stay, and mortality)

Bias

Several measures were undertaken to minimize potential sources of bias. Selection bias was reduced by including all eligible patients diagnosed with enterocutaneous fistula during the study period who met the predefined inclusion criteria.

Data were extracted using a standardized data collection form to ensure consistency and reduce information bias.

Variables were obtained from multiple sources within patient records, including clinical notes, operative reports, laboratory results, and discharge summaries, to improve data accuracy and completeness.

To minimize misclassification bias, fistula characteristics, complications, and outcomes were defined using established clinical criteria before data collection. Records with substantial missing information that could affect outcome assessment were excluded from the analysis. In addition, data cleaning and cross-verification procedures were performed before statistical analysis to identify and correct inconsistencies.

Variables and definitions

Fistula output was classified as low or high based on standard daily volume thresholds. Outcomes of interest included fistula closure (spontaneous or surgical), hospitalization duration, and in-hospital mortality.

Patients were categorized according to definitive treatment modality into conservative (non-operative) management, surgical management with fecal diversion, and surgical management with primary repair.

Operative Definitions

For the purpose of this study, enterocutaneous fistula (ECF) management modalities were defined as follows:

Conservative (Non-Operative) Management

Conservative management referred to the non-surgical treatment of ECF aimed at achieving spontaneous fistula closure. Management strategies included fluid and electrolyte replacement, nutritional support, sepsis control, skin and wound care, and appropriate antimicrobial therapy, as indicated. Patients in this group did not undergo operative intervention specifically for fistula closure.

Surgical Management with Fecal Diversion:

Surgical management with fecal diversion refers to operative intervention involving proximal diversion of enteric contents through stoma formation to control fistula output and protect the distal bowel. Procedures in this category included diversion ileostomy/colostomy with or without fistula takedown or bowel resection, depending on intraoperative findings and bowel viability.

Surgical Management with Primary Repair:

Surgical management with primary repair referred to definitive operative closure of the fistula tract through direct bowel repair or resection with primary anastomosis without proximal fecal diversion. This approach was undertaken in patients deemed suitable for definitive restoration of bowel continuity at the time of surgery.

Spontaneous Fistula Closure

Spontaneous fistula closure was defined as complete cessation of enteric effluent from the fistula site without the need for operative closure, sustained throughout the admission period or follow-up.

Definitive Fistula Closure

Definitive fistula closure was defined as successful closure of the fistula following operative intervention, with no evidence of persistent enteric drainage or fistula recurrence during the period of follow-up.

Complications

Complications were documented according to clinical assessment and available medical records.

Mortality

Mortality was defined as all in-hospital deaths occurring during the course of management for enterocutaneous fistula.

Data Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) software (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize patient characteristics, clinical features, management approaches, and outcomes. Continuous variables were presented as means $\pm$ standard deviation (SD) or medians with interquartile ranges (IQR), depending on data distribution, while categorical variables were summarized as frequencies and percentages. Associations between categorical variables and clinical outcomes, including mortality and fistula characteristics, were assessed using the Chi-square

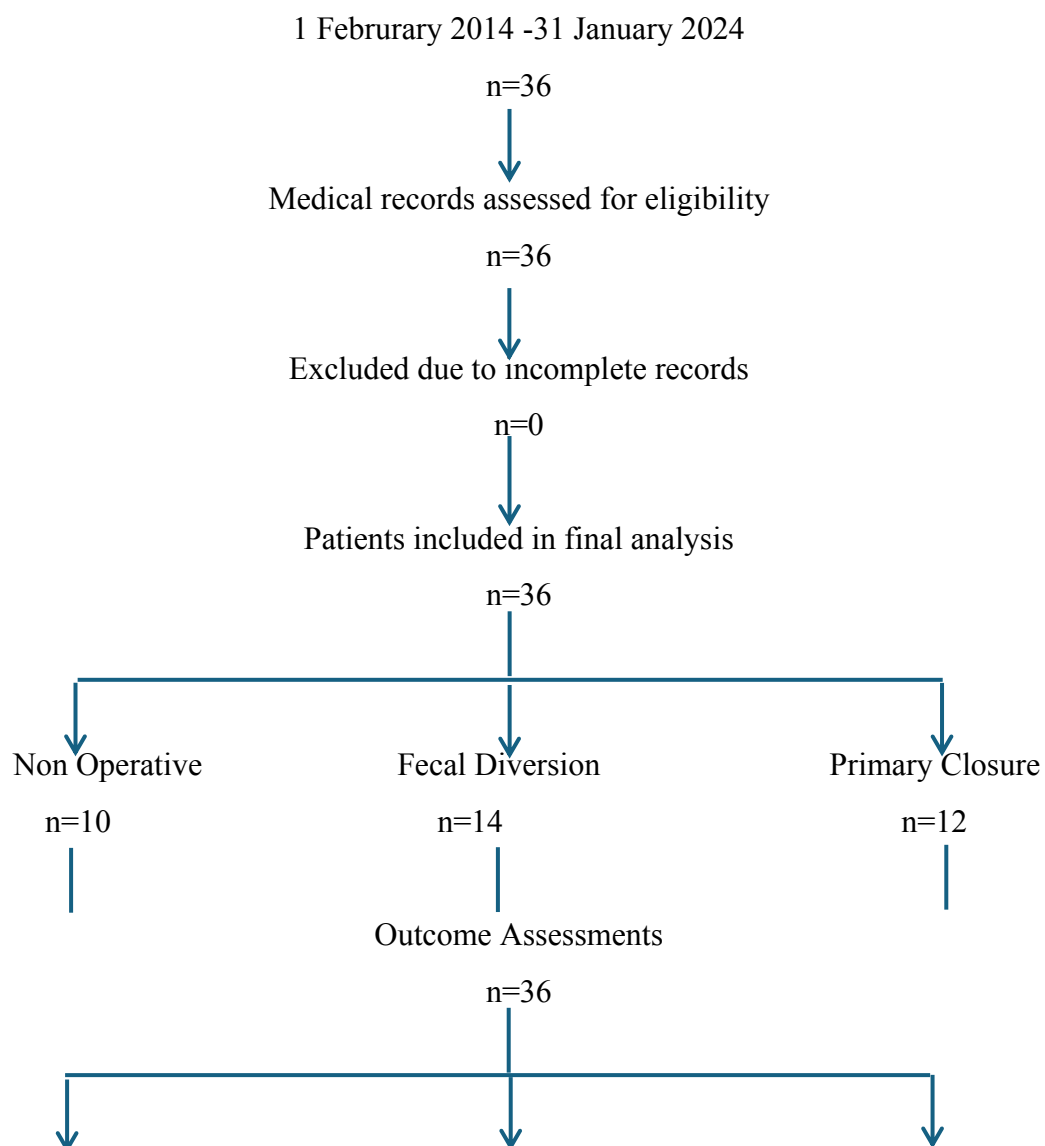
test where appropriate. A p-value of <0.05 was considered statistically significant. Results were presented using tables and figures where appropriate.

Ethical Considerations

Ethical approval for the study was obtained from the BUTH Health Research Ethics Committee. Given the study's retrospective nature, informed consent was waived. Patient confidentiality was maintained by anonymizing all data prior to analysis.

Results

Patients managed for enterocutaneous fistula (ECF) at Bowen University Teaching Hospital (BUTH), Nigeria



Spontaneous Closure n=3	Surgical Closure n=28	No Closure/Persistent n=5
----------------------------	--------------------------	------------------------------

Figure 1. Study flow diagram showing patient selection, management pathways, and outcomes among patients with enterocutaneous fistula treated at Bowen University Teaching Hospital, Nigeria, between February 2014 and January 2024.

Clinical Presentation:

A total of 36 patients met the eligibility criteria and were included in the analysis (Figure 1).The socio-demographic characteristics of the study population are summarized in Table 1. Common symptoms at presentation included abdominal pain, persistent wound discharge, feculent drainage, fever, and weight loss. A representative example of postoperative enterocutaneous fistula with wound dehiscence is shown in Figure 2.

The median time from initial surgery to fistula development was 7 days (range: 3 to 21 days).

Table 1: Socio-demographic Characteristics (n=36)

Variable	Frequency (n)	Percentage (%)
Sex		
Male	13	36.1
Female	23	63.9
Age Group (years)		
0-16	9	25.0
17-30	7	19.4
31-40	10	27.8
41-50	7	19.4
>50	3	8.3
Mean Age ±SD	32.81± 18.1	

Occupation

Student	13	36.1
Artisan	2	5.6
Civil Servant	4	11.1
Clergy	2	5.6
Trader	9	25.0
Teachers	2	5.6
Security/Force	2	5.6
Farmers	1	2.8
Unemployed	1	2.8

Highest Level of Education

Primary	10	27.8
Secondary	4	11.1
Tertiary	12	33.3
No Formal Education	10	27.8

Table 2: Time of Presentation

Time of Presentation	Frequency (n)	Percentage (%)
0-4 days	25	69.4

5-9 days	5	13.9
≥10days	6	16.7

Table 3: Etiology of the fistula

Indication for Index Surgery	Frequency (n)	Percentage (%)
Typhoid perforation	12	33.3
Appendicitis	10	27.8
Herniorraphy	3	8.3
Hysterectomy/Myomectomy	4	11.1
Bowel Obstruction Surgeries	4	11.1
Septic Abortion/Trauma	3	8.3

Table 4: Clinical Characteristics of Patients with Enterocutaneous Fistula (n=36)

Referral Status	Frequency (n)	Percentage (%)
Primary Presentation	14	38.9
Referred from a peripheral center	22	61.1
Fistula Origin		
Postoperative	35	97.2
Preoperative	1	2.8

Anatomical Site		
Ileal	20	55.6
Jejunal	3	8.3
Colonic/Unspecified	13	36.1
Fistula Output		
High Output	22	61.1
Low Output	14	38.9

Table 5: Management and Outcomes

Variable	Frequency (n)	Percentage (%)
Non-Operative	10	27.8
Surgical Management with Fecal Diversion	14	38.9
Surgical Management with Primary Repair	12	33.3
Fistula Closure		
Spontaneous Closure	3	8.3
Surgical Closure	28	77.8
No Closure/Persistent	5	13.9
Mortality		
Mortality	Frequency (n)	Percentage (%)

Survived	28	77.8
Died	8	22.2

Table 6: Association Analysis

Variable	Category	Survived	Died	Total	p-value
Fistula Output	High Output	14	8	22	<i>0.022</i>
	Low Output	14	0	14	
Time to Presentation	0-4 days	20	5	25	<i>0.827</i>
	5-9 days	3	2	5	
	≥10days	5	1	6	

Table 7: Association Between Anatomical Site of Fistula and Management Strategy

Anatomical Site	Non-operative	Fecal Diversion	Primary Repair	Total	p-value
Colonic/Unspecified	7	3	3	13	<i>0.072</i>
Ileal	3	8	9	20	
Jejunal	0	3	0	3	
Total	10	14	12	36	

OUTCOME

a. Mortality:

Eight patients (22.2%) died. Seven had high-output fistulas and died of sepsis and multiorgan failure; one died postoperatively from cardiac arrest.

b. Length of Stay:

Hospital stay ranged from 2 weeks to 3 months (median: 5 weeks).

Discussion

The findings demonstrate that enterocutaneous fistula (ECF) in this setting is predominantly a postoperative complication, most commonly following surgery for typhoid perforation and appendicitis (Table 3). This pattern is consistent with reports from other Nigerian centers (2-6,15). This contrasts with trends in high-income settings, where inflammatory bowel disease, malignancy, and diverticular disease are more commonly implicated (12). These differences reflect broader global disparities in disease epidemiology and access to timely, high-quality surgical care (26,30).”

Females constituted the majority of patients in this series. This may be partly related to postoperative fistulas following abdominal and gynecological procedures, such as hysterectomy and myomectomy. In addition, broader disparities in access to timely surgical care in resource-limited settings may influence patterns of disease presentation.

The predominance of patients in the 31-40 year age group reflects the burden of ECF among the economically productive population (Table 1). Similar age distributions have been reported in other African studies (2,4), highlighting the impact of ECF on individuals in their most economically productive years and its associated socioeconomic implications in low-resource settings (16,26)

Site of Fistula:

The ileum was the most frequent fistula site (55.6%) and high-output fistulas accounted for 61.1% of cases (Table 4), which may reflect the burden of infectious small-bowel pathology, including typhoid ileal perforation, in our environment. In contrast, studies from high-income countries report a higher proportion of colonic fistulas due to colorectal malignancies and diverticular disease (1). This divergence underscores the need for context-specific prevention strategies, including improved sanitation, early diagnosis, and timely surgical management of enteric infections.

Closure Rates:

Spontaneous closure rates in this study were notably low (8.3%), whereas 77.8% achieved closure following surgery (Table 5), compared with reported rates of 30–45% in series managed in settings with comprehensive nutritional support and advanced wound care strategies (11). This disparity underscores the importance of nutritional optimisation, including total parenteral nutrition, and specialized wound care techniques in fistula management, which remain limited in many low- and middle-income settings (24). Despite treatment, a small proportion of patients developed persistent enterocutaneous fistulas, as illustrated in Figure 4.

Operative closure following patient optimisation achieved high success rates (77.8%), comparable to outcomes reported in structured intestinal failure units when surgery is appropriately timed (20). The overall mortality rate was 22.2% (Table 5). High-output

fistulas were significantly associated with mortality (Table 6), and all deaths occurred among patients with high-output fistulas.

Mortality:

The observed mortality rate of 22.2% (Table 5), exceeds that reported in many high-income settings, but is comparable with the upper ranges described in global series of enterocutaneous fistula outcomes (9). Sepsis and high-output fistulas were the principal drivers of mortality (9). High-output fistulas are associated with severe fluid and electrolyte losses, malnutrition, sepsis, prolonged hospitalization, and increased mortality (21). High-output fistulas were significantly associated with mortality (Table 6), and all deaths occurred among patients with high-output fistulas, underscoring the importance of fistula output in determining outcomes. This finding is consistent with previous reports identifying high-output fistulas as an important predictor of poor prognosis (22,23).

Most patients underwent surgical intervention, either through fecal diversion or primary repair (Table 5). Defunctioning ileostomy was the principal method of fecal diversion in selected patients (Figure 3), while a smaller proportion were managed nonoperatively. Patients managed conservatively demonstrated progressive wound granulation in selected cases (Figure 5). The low rate of spontaneous closure observed likely reflects the high prevalence of unfavorable factors such as sepsis, high-output fistula, and complex bowel pathology. A high proportion of patients ultimately achieved fistula closure following operative management, suggesting that carefully selected surgical intervention remains an effective treatment strategy when conservative measures are unlikely to succeed. Although delayed presentation has been associated with worse outcomes in enterocutaneous fistula, particularly due to sepsis and nutritional compromise (24), this study did not demonstrate a statistically significant association between time to presentation and outcomes (Table 7).

Resource Challenges:

Health system constraints played a central role in shaping outcomes. Limited availability of parenteral nutrition, advanced wound care technologies, and intensive care services significantly restricted optimal management. A high proportion of patients were referred from peripheral centres (61.1%), and nearly all fistulas were postoperative (97.2%) (Table 4), emphasizing the importance of strengthening referral pathways and perioperative care.

These findings align with broader global surgery literature, which identifies workforce shortages, delayed access to specialist care, and weak referral systems as major contributors to preventable postoperative morbidity in low-resource settings (25). Furthermore, typhoid perforation was the most common indication for index surgery in this study, highlighting its importance from a global health perspective as a largely preventable surgical condition. Persistent challenges related to inadequate sanitation, unsafe water supplies, and delayed healthcare-seeking behavior continue to contribute to the burden of typhoid fever in many low- and middle-income countries (29,32).

Consequently, reducing the incidence of typhoid perforation through public health interventions could potentially reduce the occurrence of postoperative enterocutaneous

fistulas and their associated complications. Investments in water, sanitation, and hygiene (WASH) programs and wider implementation of typhoid conjugate vaccination may therefore have important downstream benefits for surgical outcomes (26).”

Socioeconomic Impact:

Beyond clinical outcomes, the socioeconomic burden of ECF is considerable. Most patients were young and economically active, and prolonged hospitalization may result in significant financial hardship for families, particularly in the absence of comprehensive health insurance coverage (30). These findings highlight ECF as not only a surgical complication but also a marker of health system vulnerability and inequity.

Implications:

From a policy perspective, improving outcomes will require a multifaceted systems approach, including strengthening infection prevention strategies, enhancing surgical training at primary and secondary care levels, establishing clear referral pathways, and expanding access to affordable nutritional support. Investment in these areas aligns with broader global surgery priorities aimed at reducing preventable postoperative morbidity and mortality (25,26,30).

Limitations:

Several limitations should be considered. The relatively small sample size limits the ability to detect significant associations between some clinical variables and outcomes. The retrospective nature of the study may introduce information bias and incomplete documentation. Additionally, the study was conducted at a single tertiary institution, which may limit the generalisability of the results to other settings within Nigeria and sub-Saharan Africa.

Furthermore, the study was limited to in-hospital outcomes and lacked long-term follow-up data, preventing assessment of fistula recurrence, long-term survival, quality of life, functional recovery, and socioeconomic consequences after discharge.

Detailed nutritional parameters, including serial serum albumin measurements and comprehensive nutritional assessments, were not available, and patient-reported quality-of-life outcomes were not routinely documented. Despite these limitations, the study provides valuable insights into the patterns and outcomes of enterocutaneous fistula management in a resource-limited environment.

Conclusion

Enterocutaneous fistula in this setting is predominantly a postoperative complication of preventable surgical disease and remains associated with substantial mortality. High-output fistulas and sepsis were the principal determinants of poor outcome, while limited access to nutritional support and specialized care constrained optimal management.

Reducing the burden of enterocutaneous fistula will require investments in health-system strengthening, including improved perioperative care, enhanced referral networks, greater access to nutritional therapy, and strengthened surgical capacity at peripheral facilities. Broad

public health interventions aimed at preventing typhoid perforation through improved water, sanitation, and hygiene services and expanded vaccination coverage may provide important downstream benefits for surgical outcomes in resource-constrained settings. Addressing these gaps is essential to advancing global surgical goals and reducing preventable postoperative mortality in low-and middle-income countries (26,31).

Declarations

Acknowledgements: We sincerely acknowledge the management and staff of Bowen University Teaching Hospital (BUTH) for their institutional support and commitment to excellence in patient care and clinical research. We are particularly grateful to the Department of Surgery, BUTH, for their academic guidance, technical assistance, and continuous support throughout the conduct of this work.

Contribution Statements:

AO and IC contributed equally to this paper and are joint first authors.

Conceptualisation—: AO, IC, AE, AJ, AI, DA, OI, KF,BS.

Writing—Creation of the initial manuscript draft: AO,IC.

Methodology—development or design of methodology; creation of models for data collection, analysis, and interpretation: AO, IC, AE.

Statistical Analysis: AO, IC, KF.

Investigation—conducting the research process, including data collection: AO, IC, BS.

Supervision—oversight and leadership responsibility for the research activity planning and execution, including mentorship: AE.

Visualisation—preparation and presentation of data and study results: AO, IC.

Writing—review and editing—critical revision of the manuscript for important intellectual content: AO, IC, KF, DA, OI, AE, AJ, AI, BS.

All authors contributed to the manuscript, critically revised it, approved the final version for publication, and agree to be accountable for all aspects of the work.

Large Language Model (LLM) Disclosure

Large Language Models (including ChatGPT, OpenAI) were used during manuscript preparation to assist with language editing, improving grammar and clarity, and formatting. All scientific content, data analysis, interpretation, and final editorial decisions were performed and verified by the authors, who accept full responsibility for the accuracy and integrity of the manuscript.

Ethics Approval: Approved by the Bowen University Teaching Hospital Research Ethics Committee (BUTH/REC-1041). Conducted in accordance with the Declaration of Helsinki.

Data availability: Data are available upon reasonable request from the corresponding author.

Patient and public involvement: Patients and/or the public were not involved in the design, conduct, reporting, or dissemination of the plans for this research.

Funding: We did not receive any research grants or any research funds.

Competing interests: None declared.

Clinical trial number: Not applicable



Figure 2: Extensive postoperative enterocutaneous fistula with wound dehiscence following a caesarean section.



Figure 3: A defunctioning ileostomy performed for management of enterocutaneous fistula.



Figure 4: Persistent enterocutaneous fistula with wound dehiscence.



Figure 5: Granulating abdominal wound following postoperative enterocutaneous fistula non-operative management.

References

1. Draus JM Jr, Huss SA, Harty NJ, Cheadle WG, Larson GM. Enterocutaneous fistula: Are treatments improving? *Surgery*. 2006;140(4):570-8.
2. Njeze GE, Achebe UJ. Enterocutaneous fistula: A review of 82 cases. *Niger J Clin Pract*. 2013;16(2):174-7.
3. Okoli C, Oparocha D, Onyemkpo J. Enterocutaneous fistula: Aetiology and management outcome in a tertiary centre in Nigeria. *Afrimed J*. 2013;4(1):17-21.
4. Bashir BM, Abubakar IU. Management of enterocutaneous fistula: An eleven-year experience from a tertiary hospital in North-Western Nigeria. *Ann Basic Med Sci*. 2024;5(1):484-7.
5. Dodiya-Manuel A, Igwe PO. Enterocutaneous fistula in University of Port Harcourt Teaching Hospital. *Niger J Med*. 2013;22(2):93-6.
6. Chalya PL, Mchembe MD, Gilyoma JM, Mabula JB, Mwales B, Genda E. Enterocutaneous fistula: A Tanzanian experience in a tertiary care hospital. *East Cent Afr J Surg*. 2010;15(2):104-12.
7. Lloyd DA, Gabe SM, Windsor ACJ. High-output fistula. *Clin Colon Rectal Surg*. 2004;17(2):89-98.
8. Edmunds LH Jr, Williams GM, Welch CE. External fistulas arising from the gastrointestinal tract. *Ann Surg*. 1960;152(3):445-71.
9. Ajao OG, Shehri MY. Enterocutaneous fistula. *Saudi J Gastroenterol*. 2001;7(2):51-4.
10. Owen RM, Love TP, Perez SD, Srinivasan JK, Sharma J, Pollock JD, et al. Definitive surgical treatment of enterocutaneous fistula: Outcomes of a 23-year experience. *J Am Coll Surg*. 2013;216(4):734-41.
11. Lloyd DA, Gabe SM, Windsor ACJ. Nutrition and management of enterocutaneous fistula. *Br J Surg*. 2006;93(9):1046-55.
12. Martinez JL, Luque-de-Leon E, Mier J, Blanco-Benavides R, Robledo F. Systematic management of postoperative enterocutaneous fistulas: Factors related to outcomes. *World J Gastroenterol*. 2008;14(27):4364-8.
13. Hollington P, Mawdsley J, Lim W, Gabe SM, Forbes A, Windsor ACJ. An 11-year experience of enterocutaneous fistula. *Br J Surg*. 2004;91(12):1646-51.
14. Eni UE, Naaya HU, Gali BM. Aetiology, management and outcome of enterocutaneous fistula in Maiduguri, Nigeria. *Niger J Clin Pract*. 2007;10(1):47-51.
15. Ugochukwu AI, Amu OC, Nzegwu MA. Management and outcome of enterocutaneous fistula in an urban centre in Nigeria. *J Adv Biores*. 2011;2(1):67-72.
16. Lawal OO. Challenges in the management of enterocutaneous fistula in resource-poor settings. *Niger J Surg Res*. 2003;5(1-2):11-16.
17. Alegbeleye BJ. Enterocutaneous fistula in African settings: Evidence-based strategies and updates. *Surg Res Upd*. 2020;8:1-10.

18. Joyce MR, Dietz DW. Management of complex gastrointestinal fistula. *Curr Probl Surg*. 2009;46(5):384-430.
19. Kuvshinoff BW, Brodish RJ, McFadden DW, Fischer JE. Serum transferrin as a prognostic indicator of spontaneous closure and mortality in gastrointestinal cutaneous fistulas. *Ann Surg*. 1993;217(6):615-23.
20. Irving M, White R, Tresadern J. Three years' experience with an intestinal failure unit. *Ann R Coll Surg Engl*. 1985;67(1):2-5.
21. Taggarshe D, Bakston D, Sharma R, Barsuk D. Factors affecting closure and outcomes of enterocutaneous fistula. *J Surg Res*. 2011;170(1):116-21.
22. Ghimire P. Management of enterocutaneous fistula: A review. *JNMA J Nepal Med Assoc*. 2022;60(245):93-100.
23. Supe AN, Rangnekar NP, Deshpande AA, Moorthy KM. Factors predicting morbidity and mortality in intestinal fistulae. *Indian J Gastroenterol*. 1997;16(2):49-51.
24. Martinez JL, Luque-de-León E, Ballinas-Oseguera G, Mendez JD, Juárez-Oropeza MA, Román-Ramos R. Factors predictive of recurrence and mortality after surgical repair of enterocutaneous fistula. *J Gastrointest Surg*. 2012;16(1):156-63.
25. Gribovskaja-Rupp I, Melton GB. Enterocutaneous fistula: Proven strategies and updates. *Clin Colon Rectal Surg*. 2016;29(2):130-7.
26. Meara JG, Leather AJM, Hagander L, Alkire BC, Alonso N, Ameh EA, et al. Global Surgery 2030: Evidence and solutions for achieving health, welfare, and economic development. *Lancet*. 2015;386(9993):569-624.
27. World Health Organization. Typhoid vaccines: WHO position paper, March 2018—recommendations. *Vaccine*. 2019;37(2):214-6.
28. Rahbour G, Siddiqui MR, Ullah MR, Gabe SM, Warusavitarne J, Vaizey CJ. A meta-analysis of outcomes following use of somatostatin and its analogues for the management of enterocutaneous fistulas. *Ann Surg*. 2012;256(6):946-54.
29. Mogasale V, Desai SN, Mogasale VV, et al. Burden of typhoid fever in low-income and middle-income countries: A systematic review and meta-analysis. *Lancet Glob Health*. 2014;2:e570-80.
30. Kruk ME, Gage AD, Arsenault C, et al. High-quality health systems in the Sustainable Development Goals era. *Lancet Glob Health*. 2018;6:e1196-252.
31. Shrimme MG, Dare AJ, Alkire BC, O'Neill K, Meara JG. Catastrophic expenditure to pay for surgery worldwide. *World J Surg*. 2015;39:1-6.
32. Mogasale VV, Ramani E, Mogasale V, Park JY, Wierzbica TF. Estimating typhoid fever risk associated with lack of access to safe water: A systematic literature review. *J Environ Public Health*. 2018;2018:9589208.