Original Article

Presentation and management outcomes of enterocutaneous fistula in a resource-poor setting: a five-year review

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Abstract

Background: Enterocutaneous fistulae are associated with significant morbidity, mortality and daunting management challenges. This study aims to evaluate the presentation and management outcomes of patients with enterocutaneous fistula in a Sub-Saharan setting.

Methods: A retrospective study of patients with enterocutaneous fistula in Ahmadu Bello University Teaching Hospital, Zaria, Kaduna State, Nigeria from January, 2015 to December, 2019. The notes, charts, management and outcome of these were reviewed. Data was analyzed with the IBM Statistical Product and Service Solutions (SPSS) version 25.0 and p values ≤ 0.05 regarded as statistically significant.

Results: Data from 56 patients (26 males and 30 females, male:female ratio of 1:1.2) were analyzed. Most (91.07%) of the fistulae were post-operative and more in those aged 21-30 years (42.86%). Majority (87.50%) had high output fistulae and 82.14% had deranged electrolytes at presentation. Non-operative management was done for 44.64% of the patients, the rest (55.36%) had surgery. Survival was the outcome in 87.50%, mortality was recorded in 12.50%, with sepsis accounting for a greater percentage (7.14%) of the mortalities. Fistula aetiology, operation before admission, co-morbidities, electrolyte derangements, hypoalbuminaemia, anaemia, and fistula effluent volume were significantly related to mortality (p values of 0.003, 0.001, 0.015, 0.001, 0.004, 0.003 and 0.017 respectively).

Conclusion: Most fistulae seen were post-operative. Non-operative treatment led to healing in 44.64% of all cases with mortality of 12.50%. Fistula aetiology, operative intervention before admission, co-morbidities, electrolyte derangements, hypoalbuminaemia, anaemia, and volume of fistula effluent were significantly related to mortality.

Keywords: Enterocutaneous fistulae, resource-poor setting, five-year review

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INTRODUCTION

Enterocutaneous fistulae have gained the unenviable reputation of being associated with significant potential morbidity and mortality.[1–5] The condition is usually a source of distress to the patient (and surgeon also) accounting for increased cost of care, prolonged hospital stay, severe psychological stress, major lifestyle changes and, sometimes, demise of such patients.[5–7] These challenges are even more daunting in resource-constrained settings, especially those settings where patients have to make out-of-pocket payment for health care.

An enterocutaneous fistula is an abnormal tract that permits communication between the mucosa of the intestine and the skin.[1,8,9] Such fistulae can involve either the small intestine or the colon. Various classification systems have been described by different authors with the physiological classification regarded as eminent in the treatment of these patients.[1,8,9] This physiological classification views enterocutaneous fistulae as high output when their effluent is 500mls or more in 24 hours and as low output when their effluent is less than 500mls in 24 hours.[1,9] High output fistulae are usually associated with marked fluid and electrolyte derangement and pose peculiar treatment challenges such as peri-fistula skin changes, need for nutritional rehabilitation and some may require surgical intervention. Low output fistulae usually have a less pedigree of portraying these challenges.[1,5–7,10,11]

The last five decades have seen advances in the treatment of patients with enterocutaneous fistulae with novel approaches like parenteral nutrition, provision of parenteral amino acids, vacuum-assisted closure, use of synthetic growth factors (like glucagon-like peptide-2, peptide YY and insulin-like growth factor-2) and viable cryopreserved placental membranes being employed with encouraging results.1 However, in sub-Saharan Africa where some of these treatment options may not be readily available, mortality from such fistulae remains considerably high with some studies reporting mortality rates of up to 10-25%.[1–5,11–14] Most cases of mortality are tripodal, being related to the sepsis, malnutrition and electrolyte derangements.[1,11–14]

Enterocutaneous fistulae can be treated either non-operatively or via surgical intervention. Non-operative management usually leads to successful closure of the fistula after unfavourable factors (like distal obstruction, tuberculosis or other chronic granulomatous pathologies, complete disruption of the intestinal lumen, anaemia, malnutrition, malignancy, ongoing intra-abdominal sepsis, fistulae with multiple or short tracts) have been excluded or controlled.[5–7,10] Surgical intervention is warranted following failure of such fistulae to close with non-operative therapy and it is usually evident during such surgeries why the fistulae failed to close with non-operative care.1 The surgeon's main preoccupation when a patient with enterocutaneous fistula presents to him is whether such fistula will respond to non-operative management or whether surgical intervention would be the best option for the index patient. The decision on what mode of treatment is adopted is usually made after taking into consideration the fistula characteristics and the specific pathologies or derangements the patient presented with.

The aim of this study is to evaluate the presentation and management outcomes of patients with enterocutaneous fistula seen in a sub-Saharan teaching hospital.

PATIENTS AND METHODS

This was a 5-year hospital-based retrospective study of teenage (those aged 13 to 19 years) and adult patients with enterocutaneous fistula admitted and managed in Ahmadu Bello University Teaching Hospital, Zaria, Kaduna State, Nigeria from January, 2015 to December, 2019. Ethical clearance was obtained from the Health Research and Ethical Committee of the hospital before the study commenced. The case notes and charts of these patients were reviewed noting their clinical characteristics, aetiology of the fistulae, mode of management and outcome of such management. Patients with incomplete information in their case notes or charts and those whose case notes were missing were excluded from the study. Information so gathered was entered into a proforma. The data were analyzed with the IBM Statistical Product and Service Solutions (SPSS) version 25.0 (produced by IBM Corporation, released in Armonk, New Jersey, United States of America in January, 2017) and presented as simple percentages and charts. Multivariate

analysis was also done with p values ≤ 0.05 regarded as statistically significant.

What was done for patients with enterocutaneous fistulae were as follows: these patients were admitted through the Accident and Emergency unit as well as the Surgical Outpatient Department of Ahmadu Bello University Teaching Hospital, Zaria. They then had intravenous access secured using wide bore cannula and blood samples were taken for complete blood count, serum electrolytes, urea and creatinine, blood sugar assay, liver function tests and serum proteins. For the purpose of this study, high output fistula was said to exist when the fistula effluent was 500mls or more in 24 hours for jejunal, ileal or colonic fistulae, 200mls or more in 24 hours for pancreatic fistulae, or when change of fistula dressing was done more frequently than every four hours as alluded to by previous researchers.15,16 Anaemia was said to exist when the haemoglobin was less than 10g/dl or haematocrit was less than 30% while hypoalbuminaemia was regarded as serum albumin less than 30g/L.

Resuscitation was done with intravenous fluids and electrolyte replacement therapy as well as oral (where indicated) or parenteral amino acids (given as Astymin®). Nutritional rehabilitation was done using fortified pap prepared by the hospital dieticians which was given orally. The patients' temperature, respiratory rate, pulse rate, blood pressure, urine and fistula output were recorded in the patients' charts. Twice weekly weighing (on Mondays and Fridays) was done for each patient. Radiological investigations were done as indicated and included abdominal ultrasonography, computerized tomography of the abdomen and fistulogram. The collecting device for the fistula was changed as often as was necessary and the peri-fistula skin protected with zinc oxide cream or petroleum jelly (Vaseline®) cream for patients who could not afford zinc oxide cream. The patients were offered surgical intervention to drain intra-abdominal collections and create a surgical stoma or when the fistula failed to heal after a minimum of six weeks of non-operative treatment following correction of biochemical and physical derangements in which case resection of the segment of bowel involved in the fistula with end-to-end anastomosis was done.

RESULTS

Sixty-five patients with enterocutaneous fistula were seen in Ahmadu Bello University Teaching Hospital, Zaria during the study period. The case notes of six of these patients could not be found while three case notes had incomplete information; these nine patients were excluded during data analysis. Data from the remaining 56 patients were analyzed. This consisted of 26 males (46.43%) and 30 females (53.57%) with male:female ratio of 1:1.2.

The ages of the patients ranged from 13 years to 64 years with a mean age of 30.04 ± 3.57 years. The highest number of cases (24 cases, representing 42.86%) was seen in those aged 21-30 years as shown in Table 1.

Most (54 cases, representing 96.42%) of these fistulae were post-operative enterocutaneous fistulae with 51 cases (91.07%) following surgery for benign pathologies and three fistulae (5.36%) following surgery for gynaecologic malignancies. One patient (1.79%) had a post-traumatic fistula and one patient (1.79%) had the fistula following spontaneous rupture of a strangulated umbilical hernia as seen in Table 2.

Table 1: Age ranges and gender of the study population

Age range (years)	Gender		Total
	Male	Female	
11-20	7	8	15
21-30	10	14	24
31-40	5	3	8
41-50	2	3	5
51-60	1	2	3
61-70	1	0	1
Total	26	30	56

Fifty patients (89.29%) with post-operative enterocutaneous fistula were referred from other hospitals while one patient (1.79%) had the initial surgery done in the hospital where the study was conducted. The lead surgeon was a non-specialist in 47 cases (83.92%), a

resident doctor in 3 cases (5.36%) and a specialist in 1 case (1.79%). Interval between the initial surgery and when the fistula was noticed ranged from 2 days to 21 days as shown in Table 3. Thirty-eight patients (67.86%) had repeat laparotomy before presentation with thirty patients (53.57%) having only one repeat surgery and eight patients (14.29%) having two repeat surgeries. Twenty-one of the patients who had repeat laparotomy (representing 55.26% of this category) before presenting at the study center had healing of their fistulae with non-operative management while 17 of them (representing 44.74% of this category) had surgical intervention for fistula repair which was successful in 10 patients (17.86%) and resulted in mortality in seven patients (12.50%).

Interval between onset of the leakage of bowel content from the abdominal wound and presentation at General Surgery unit in the study hospital ranged between one week and 11 months with most patients (37 cases, representing 66.07%) presenting within 3 weeks of the initial surgery as shown in Table 4.

Four patients (7.14%) had comorbidities which were chronic renal failure in one patient (1.79%) and obesity in 3 patients (5.36%). Forty patients (71.43%) were passing stool per anus on presentation while 16 patients (28.57%) were not. The Eastern Cooperative Oncologic Group (ECOG) Performance status of these patients was 2 in 12 patients (21.43%), 3 in 35 patients (62.50%) and 4 in 9 patients (16.07%).

Forty-six patients (82.14%) had deranged serum electrolytes on presentation. Twenty-two patients (39.29%) had hypokalaemia, 26 (46.43%) had hyponatraemia, 14 (25.00%) had hypochloraemia, 11 (19.64%) had hypernatraemia and hyperchloraemia, and 25 (44.64%) had metabolic acidosis as shown in Table 5. These biochemical abnormalities were corrected in 41 patients (73.21%) but persisted in 15 patients (26.79%). Fifteen patients (26.79%) had hypoalbuminaemia while 41 (73.21%) had normal serum proteins. Thirty-two patients (57.14%) were anaemic on presentation while 24 (42.86%) had normal hematocrit.

Table 2: Aetiology of the enterocutaneous fistulae seen in this study

Aetiology of the fistula	Number of patients	Percentage (%)
Surgery for perforated typhoid ileitis	37	66.07
Surgery for obstructed inguinal hernia	6	10.71
Caesarean section	6	10.71
Appendicectomy	2	3.57
Gynaecologic surgeries	3	5.36
Post-traumatic	1	1.79
Spontaneous	1	1.79
Total	56	100.00

The fistulae were high output in 49 patients (87.50%) and low output in 7 (12.50%). They involved the ileum in 49 patients (87.50%), jejunum in 2 patients (3.57%), caecum in 1 patient (1.79%), sigmoid colon in 3 patients (5.35%) and both the ileum and sigmoid colon in 1 patient (1.79%).

All the patients had abdominal ultrasonography which showed intra-peritoneal collection in 22 patients (39.29%), hepatomegaly in 2 (3.57%) and no peritoneal collection in 32 (57.14%). Six patients (10.71%) had abdominal computerized tomography which showed features of fistula involving the ileum in 3 patients (5.35%) and masses on the ovaries in 3 patients (5.35%). Six patients (10.71%) had fistulogram which showed features of an ileocutaneous fistula in 3 patients (5.35%) and features of a colo-cutaneous fistula in 3 patients (5.35%). Three patients (5.35%) also had intravenous urogram which showed features of a vesico-cutaneous fistula.

Table 3: Interval between initial surgery and when the fistula was noticed in the study population

Interval between initial surgery and onset of fistula	Number of patients	Percentage (%)
2 days	3	5.36
3 days	7	12.50
4 days	1	1.79
5 days	13	23.21
6 days	10	17.86
7 days	6	10.71
10 days	4	7.14
12 days	1	1.79
21 days	6	10.71
Total	51	91.07

Twenty-five fistulae (44.64%) healed following non-operative treatment with 19 (33.93%) of these healing within six weeks while another 6 (10.71%) healed between seven to twelve weeks as shown in Table 4. Thirty-one fistulae (55.36%) required surgical intervention which consisted of ileal resection with ileostomy and later ileostomy reversal in 3 patients (5.35%) and bowel resection with primary anastomosis in twenty-eight patients (50.00%) as shown in Table 6 and Table 7. Twenty-six (46.43%) of the patients who had surgery had ileal fistulae. Seven patients (12.50%) developed recurrence of the fistula that necessitated a repeat laparotomy.

Table 4: Interval between fistula onset and admission in the General Surgery unit of the study centre

Interval between fistula onset and admission	Number of patients	Percentage (%)
1 week	8	14.28
2 weeks	24	42.86
3 weeks	5	8.93
8 weeks	8	14.28
9 months	10	17.86
11 months	1	1.79
Total	56	100.00

Forty-nine patients (87.50%) survived while 7 (12.50%) died. The cause of death was sepsis in 4 patients (7.14%) and multiple organ failure in 3 (5.35%).

Table 5: Electrolyte derangements in the study population at presentation

Electrolyte derangement	Number of patients	Percentage (%)
Hyponatraemia	26	46.43
Hypernatraemia	11	19.64
Hypokalaemia	22	39.29
Hypochloraemia	14	25.00
Hyperchloraemia	11	19.64
Metabolic acidosis	25	44.64
Elevated urea	13	23.21
Elevated creatinine	1	1.79
None	10	17.86

Thirty-nine patients (69.64%) had no complaints on follow-up visits while 3 (5.35%) complained of mild colicky abdominal pain and 7 (12.50%) had resolving incisional surgical site infection.

The length of hospital stay ranged between four weeks to twenty-eight weeks with an average of 6.93 ± 1.43 weeks.

Table 6: Mode of definitive management and time to heal for the fistulae seen in this study

Mode of management/Time to heal	Number of patients	Percentage (%)
Non-operative		
4-6 weeks	19	33.93
7-9 weeks	1	1.79
10-12 weeks	5	8.93
Did not heal	31	55.36
Operative		
Ileostomy + ileostomy reversal	3	5.36
Bowel resection + anastomosis	28	50.00

Table 7: Operative details and management outcome of those who had surgical intervention

Indication for surgery	Number of patients	Type of surgery done	Outcome after 1st surgery		Treatment outcome	
			Healed	Recurred	Survived	Died
Peritoneal contamination	3	Ileostomy then ileostomy reversal	3	0	3	0
End fistula	13	Bowel resection and anastomosis	9	4	9	4
Failure to heal after non-operative treatment	15	Bowel resection and anastomosis	12	3	12	3
Total	31	-	24	7	24	7

Table 8: p values for factors significantly and insignificantly related to mortality in this study

Factors significantly related to mortality	Corresponding p value
Aetiology of fistula	0.003
Operative intervention before admission (n = 36 (67.86%), 7 (12.50%) of these died)	0.001 0.015
Comorbidities	0.001
Hypoalbuminaemia	0.004
Electrolyte derangements	0.003
Anaemia	
Volume of effluent	0.017
Factors not significantly related to mortality	
Body-mass index at presentation	0.454
Repeat surgery at study center	0.560

Aetiology of the fistula, operative intervention before admission in the study centre, comorbidities, electrolyte derangements, hypoalbuminaemia, anaemia, and volume of fistula effluent were significantly related to mortality after treatment for enterocutaneous fistula with p values of 0.003, 0.001, 0.015, 0.001, 0.004, 0.003 and 0.017 respectively as shown in Table 8. Body-mass index at presentation and following repeat surgery at the study centre were not significantly related to mortality after treatment for enterocutaneous fistula with p values of 0.454 and 0.560 respectively.

DISCUSSION

More females than males were seen in this study (male:female ratio of 1:1.2). Ugochukwu *et al*[1] reported a much higher incidence in females with a male:female ratio of 1:2.1 in a study conducted in Enugu, South-eastern Nigeria. Njeze *et al*[5] and Okoli *et al*[2] also reported more cases of enterocutaneous fistula in females from their studies in Enugu and Owerri respectively, both in South-eastern Nigeria. Additionally, Dodiyi-Manuel *et al*[4] reported more cases of these fistulae in females with male:female ration of 1:2 from their study in Port Harcourt in the South-south part of Nigeria. In contrast, another study by Eni *et al*[3] in Maiduguri, Northeastern Nigeria reported higher numbers of enterocutaneous

fistulae in men than in women. The reason for the discrepancy in these reports may be related to the ease of access to health facilities in the regions that recorded higher cases in females, with the last study mentioned conducted in a part of Nigeria that was plagued with challenges with insecurity at the time.

The cases seen in this study were more in the 21-30 years age group (42.86%). Eni *et al*[3] reported 2 age peaks for enterocutaneous fistula, the first of which (20-29 years age group) was similar to the age peak seen in this study. Ugochukwu *et al*[1] noted a slightly higher peak age group (30-39-year age group) in their study.

Most (96.42%) of the fistulae seen in this study were post-operative enterocutaneous fistulae, a figure similar to the 91.70% cases of such fistulae following surgery reported by Dodiyi-Manuel *et al*.[4] This may be explained by the fact that, with the rise in literacy level and proliferation of private clinics, more abdominal surgeries are now performed in the country. Ugochukwu *et al*[1] and Eni *et al*[3] also reported similar percentages (97% and 95.40% respectively) of fistulae following abdominal surgery while Nwabunike[17] and Okoli *et al*[2] noted that abdominal surgery was the cause of the fistulae in 84% and 85% respectively among patients seen in their study. The low number of patients seen in the latter two studies may explain the discrepancies between their findings and those from other studies.

Three of the post-operative fistulae (5.36%) were noticed on the second day after the surgery. These patients had ileal resection and anastomosis for perforated typhoid ileitis and were all referred from peripheral hospitals. This is a sharp contrast to what has been reported by most earlier works which noted that post-operative enterocutaneous fistulae tended to occur between the 5th and the 10th post-operative days.[9,18,19] The early onset of such fistulae in this study may be related to poor surgical technique which may then have led to anastomotic leakage or dehiscence or inadvertent enterotomy which was undetected during the procedure.[9] Galie *et al*[18] and Pritts *et al*[19] reported most of the post-operative enterocutaneous fistula in their studies occurred within 5-10 days and 5-6 days of surgery respectively. Wercka *et al*[20] reported that the post-operative fistulae in their study occurred an average of 6.3 days after surgery with a range of 2-22 days, with the lower limit of the range being similar to what was found in the index study.

The highest percentage of the patients in this study (51.79%) presented within the first three weeks of noticing the fistula. This may reflect an attempt by the referring doctors to get the patients to a tertiary centre where possibly early definitive operative intervention could be undertaken before dense adhesions would occur, particularly in cases with intra-peritoneal spillage, thereby reducing the risk of encountering a frozen abdomen during the definitive surgery.[21–23]

Perforated typhoid ileitis accounted for more than 2/3rds (66.07%) of the cases of post-operative enterocutaneous fistula in this study. This may be due to the fact that perforated typhoid ileitis was among the most common indications for emergency surgery in the study area[24] and also reflects the high incidence of typhoid enteritis in our environment.[1,24] More efforts should therefore be put into increasing public health awareness on the importance of ingestion of portable water as well as other methods of preventing typhoid fever. The fact that patients with perforated typhoid ileitis usually present with underlying malnutrition and other systemic effects of the disease may also contribute to the patients developing enterocutaneous fistula after surgery for the ailments.[25,26] Ugochukwu *et al*[1] also reported that such fistulae followed laparotomy for perforated typhoid ileitis in the highest number of post-operative fistulae they saw in their study, accounting for 45.50% of all the fistulae that they saw. Okoli *et al*[2] and Eni *et al*,[3] however, reported that the highest number of post-operative fistulae followed surgery for appendicitis.

Surgery for obstructed inguinal hernia was responsible for more of the fistulae seen in this study (10.71%) than appendicectomy (3.57%). This contrasts with earlier studies[1–3,5,20] which reported more cases of such fistulae following appendicectomy than following surgery for obstructed hernias with some researchers offering recommendations on ways of possibly reducing or eradicating post-appendicectomy

enterocutaneous fistulae.[1–3,5,20,27] The results from this study may represent early results from some level of implementation of these recommendations.

One patient (1.79%) had the fistula following spontaneous rupture of a strangulated umbilical hernia. This represents a case of enterocutaneous fistula without prior surgery, irradiation or underlying inflammatory bowel disease. Such cases are relatively rare in developed countries but have been reported in developing countries in Africa[3,28–30] and may reflect the reluctance to seek orthodox surgical intervention on the part of the patients which may be linked to the fact that out-of-pocket payment for hospital services may add to the already present financial strain in some households. This will make such patients not to present to a hospital until they are absolutely convinced, beyond any iota of doubt, that the health issue can only be addressed in a hospital.

Majority of the patients (89.29%) were referred from peripheral hospitals and hospitals in rural settings following an abdominal surgery with the lead surgeon being a non-specialist in more than 4/5ths (82.93%) of the cases. This may be explained by the fact that some people who perform surgery in such hospitals in our setting are general practitioners who might have had only limited formal surgical training.[31] Ugochukwu *et al*[1] and Eni *et al*[3] noted that 80.30% and 83.30%, respectively, of the cases they saw were referred from other hospitals.

Recommended means of reducing the rates of post-operative enterocutaneous fistulae from these peripheral hospitals include ensuring that doctors who perform abdominal surgeries in those hospitals are made to attend intermittent update courses on surgical techniques as part of continuing medical education,[32,33] prompt referral to tertiary hospitals for definitive surgery for cases of abdominal sepsis that may require laparotomy (even though resuscitation can be initiated in such peripheral hospitals),[33–36] and enlightening the public that when laparotomy for abdominal sepsis becomes imperative, the patient's relatives should insist on referral to a tertiary hospital.[33,35,36] The National Health Insurance Scheme (NHIS) should also be made to provide wider coverage of the populace so as to mitigate the strain of out-of-pocket payment for health services which would encourage earlier presentation of patients with abdominal sepsis or enterocutaneous fistulae to tertiary hospitals. As NHIS stipulates categories of operations to be carried out at every level of care, it is unlikely that operations for abdominal sepsis (like those with perforated typhoid ileitis) will take place in peripheral hospitals under the scheme.

More than 2/3rds of the patients (67.86%) had repeat laparotomies after the fistula was noticed in a peripheral hospital before admission in the study centre. This may not only be related to poor surgical technique, but may also be because other factors that contribute to anastomotic leakage or disruption of reconstructed bowel (like malnutrition, sepsis, anaemia and immunosuppression) may not have been fully addressed before embarking on such repeat laparotomy resulting in recurrence of the fistula after surgical intervention.[1,37,38]

Twenty-one of the patients who had repeat laparotomy before presentation to the study center (representing 55.26% of this category) had healing of their fistulae with non-operative management while 17 of them (representing 44.74% of this category) had surgical intervention for fistula repair. This may indicate the need to increase the practice which some authors have advocated namely that operative intervention for enterocutaneous fistulae should not always be rushed into and that initial non-operative treatment with emphasis on control of sepsis, management of fluid and electrolyte imbalances, meticulous wound care and appropriate nutritional support be embarked on.[11,32,39,40] They are of the opinion that surgical intervention should be considered if such fistulae fail to heal within a specified time after initiation of these other non-operative measures.[11,32,39,40] Initial non-operative management should, therefore, be considered for patients with enterocutaneous fistula unless or until clear indication for surgical intervention arises.

Most of the patients (87.50%) had high output fistulae. This may be explained by the fact that most of the fistulae seen in this study (90.07%) involved the small intestine which is notorious for producing high output fistulae.[41]

Ugochukwu *et al*[1] reported that high output fistulae were seen in 45.50% of patients in their study but the reason for the discrepancy between their report and ours may be due to the fact that they used an older classification system that viewed fistulae as high, intermediate and low output varieties.

Majority of the patients (82.14%) had deranged electrolytes at presentation. This can be explained by the fact that these patients had ongoing loss of gastrointestinal contents with consequent loss of electrolytes before they were admitted. Ugochukwu *et al*[1] noted that 68.20% of the patients seen in their study had electrolyte derangements on admission.

All the patients had abdominal ultrasonography while 10.71% had abdominal computerized tomography and 10.71% had fistulography. This may be explained by the fact that facilities for ultrasonography are readily available in most centres and this investigation is also much less expensive than computerized tomography and fistulography.[42,43] Ugochukwu *et al*[1] reported that 74.20% of the cases they saw had ultrasonography compared to 36.50% of their patients who had fistulography; none of the patients in their study had computerized tomography of the abdomen. Wercka *et al*[20] reported that 8.00% and 11.00% of their patients respectively had computerized tomography of the abdomen and fistulography respectively; they did not report doing abdominal ultrasonography for the patients in their study.

A little less than half (44.64%) of the fistulae healed following non-operative treatment. This figure is similar to that (41.67%) reported by Dodiyi-Manuel *et al*[4] and this may be a reflection of the improvements in conservative treatment for patients with this sort of pathology in recent times in terms of patient selection and non-operative interventions given to these patients. Nwabunike,[17] Okoli *et al*[2] and Njeze *et al*[5] reported lower rates of healing of such fistulae following non-operative treatment (34.00%, 10.00% and 31.70% respectively). However, Ugochukwu *et al*[1] and Eni *et al*[3] reported higher rates of healing of enterocutaneous fistulae following non-operative treatment (74.20% and 59.30% respectively).

More than half (55.36%) of the fistulae required operative intervention in this study with an ileal fistula being found at surgery in 46.43% of the patients. This may be explained by the fact that the ileum was commonly involved in the pathology that gave rise to many of the fistulae. The ileum is commonly injured during abdominal surgeries due to the fact that it covers a large aspect of the peritoneal space and is also readily mobile making it liable to be injured by any sharp object which is inappropriately used during an abdominal surgery.[44,45]

Most of the patients (87.50%) survived following management of the fistulae while mortality was recorded in 12.50% patients. This is slightly lower than the mortality rate of 19.40% reported by Dodiyi-Manuel *et al*.[4] Nwabunike,[17] Njeze *et al*,[5] Okoli *et al*,[2] Ugochukwu *et al*[1] and Eni *et al*[3] also reported higher mortality rates (18.00%, 17.00%, 25.00%, 13.70% and 15.00% respectively) from their studies.

The highest cause of death was sepsis (7.14%) in this study. This is not surprising as sepsis has been implicated as one of the major causes of death in patients with enterocutaneous fistula.[46,47] Ugochukwu *et al*[1] also reported that the major cause of mortality in their study was sepsis.

The length of stay for patients in this study averaged 6.93 ± 1.43 weeks. This is similar to what Eni *et al*[3] reported (an average length of hospital stay of 8 weeks).

Factors that were significantly related to mortality were aetiology of the fistula, operative intervention before admission in the study centre, comorbidities, electrolyte derangements, hypoalbuminaemia, anaemia, and volume of fistula effluent (p values of 0.003, 0.001, 0.015, 0.001, 0.004, 0.003 and 0.017 respectively). The earlier study in this institution by Ahmed et al[24] noted that abdominal wall defect and pre-operative hypoalbuminaemia were the main predictors of mortality while Ugochukwu *et al*[1] identified hypoalbuminaemia and referral from other hospitals as being the main factors that were predictive of mortality in their study.

Body-mass index at presentation and following repeat surgery at the study centre were not significantly related to mortality (p values of 0.454 and 0.560 respectively). Earlier studies also did not implicate these factors as being significant causes of mortality in patients.[48,49]

One of the limitations of this study was that it was a single centre study. This may explain the limited number of patients seen during the duration of the study. A multi-centre study would have also provided the authors the opportunity to compare management outcomes between various centers and evaluate the factors that may be responsible for any significant difference observed. Another limitation of this study was the fact that it was a retrospective study. Stringent record keeping and accurate retrieval of such records are crucial in conducting retrospective studies such as this. This was not possible in this study as some folders were missing while some others had incomplete information. These two factors further limited the analysis and interpretation of data obtained from the study.

CONCLUSION

Most of the fistulae seen in this institution were post-operative fistulae referred from peripheral hospitals. They were predominantly high output fistulae with many of them having deranged electrolytes at presentation. More than half of the patients had operative treatment. Mortality was recorded in 12.50% of the patients and was mostly due to sepsis. Aetiology of the fistula, operative intervention before admission in the study center, comorbidities, electrolyte derangements, hypoalbuminaemia, anaemia, and volume of fistula effluent were significantly related to mortality while patients' body-mass index at presentation and repeat surgery at the study center were not significant predictors of mortality.

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Conflicts of interest

There are no conflicts of interest

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