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Original Research Article

Clinical presentation, intraoperative findings and short-term outcomes among patients with appendicitis at Mbarara Regional Referral Hospital

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ABSTRACT

Background: Appendicitis remains a significant cause of acute abdomen and is characterized by high complication rates despite advancements in surgical care. Factors influencing post appendectomy outcomes, including clinical presentation, intraoperative findings, and procedural interventions, require detailed documentation in our context.
Methods: This retrospective study analyzed 108 patients who were managed surgically for appendicitis. Demographic data, clinical parameters, intraoperative findings, hospital stays, and postoperative complications were assessed. Multivariate logistic regression identified factors associated with unfavorable outcomes ($p<0.05$).
Results: Among the 108 patients, 51.9% were male, with the highest incidence of appendicitis in the 20-39 years age group. Common presentations included RLQ pain (45.4%) and tenderness (86.9%), with 39.0% exhibiting tachycardia >100 bpm. The subumbilical midline incision (SUMI) was predominant (54.6%), while 20.4% presented with a ruptured appendicular abscess. Postoperatively, 23.6% of the patients experienced complications, predominantly constipation (43.5%) and surgical site infections (20.3%). Factors significantly increasing the odds of unfavorable outcomes included age 40-59.9 years (aOR=9.66; 95% CI 1.82-15.2), symptom duration >5 days (aOR=6.14; 95% CI 1.69-12.2), ruptured appendicular abscess (aOR=23.96; 95% CI 1.75-11.97), and peritoneal lavage (aOR=7.72; 95% CI 1.69-9.1).
Conclusions: In this study, most of the patients presented nonspecifically and late with complicated forms of appendicitis, indicating a high incidence of unfavorable postoperative outcomes. We therefore need to increase awareness of the nonspecific presentation and unfavorable outcomes related to late presentation of the condition to all health workers and communities. The adoption of screening protocols such as the Alvarado score could help ensure timely diagnosis and prediction of treatment outcomes to reduce the burden of unfavorable outcomes.

Keywords: Appendicitis, Clinical presentation, Intraoperative findings, Short term, Outcomes

INTRODUCTION

Appendicitis is a common surgical emergency characterized by inflammation of the inner lining of the vermiform appendix, often progressing to involve adjacent tissues if not promptly managed.[1,2] It is a leading cause of acute abdomen and emergency surgical admissions worldwide. The classical presentations include right lower quadrant abdominal pain, vomiting, and other gastrointestinal symptoms. However, the clinical features can vary and often overlap with those of other abdominal conditions, leading to diagnostic uncertainty and delayed intervention. Delayed treatment increases the risk of complications such as perforation, abscess formation, gangrene, and generalized peritonitis.[4,5]

In 2019, appendicitis accounted for approximately 17.7 million new cases globally, with over 33,400 related deaths, translating to an incidence rate of 228 per 100,000 people.[6] While high-income countries report higher incidence rates, outcomes are generally better because of earlier diagnosis, advanced imaging, and timely surgical intervention.[7,8] In contrast, developing countries often face delayed presentations and limited diagnostic resources, contributing to poorer outcomes.[7,8] For example, the incidence in South Africa ranges from 8.2-15 per 100,000, whereas it ranges from 52-233 per 100,000 in developed nations.[9] The lifetime risk of developing appendicitis is estimated to be 8.6% for males and 6.7% for females.[10] Although global mortality rates have declined, the total number of cases increased by 38.8% between 1990 and 2019, likely due to population growth and changes in dietary habits.[8]

In Uganda, there is no published data on the burden of appendicitis. However, hospital records from Mbarara Regional Referral Hospital (MRRH) indicate that 13% of nontrauma acute abdomen cases between 2020 and 2021 were due to appendicular pathology. Additionally, regional data from other African countries show that appendicitis accounts for 15-40% of emergency surgical cases in Nigeria and approximately 25% in Kenya.[11]

The pathogenesis of appendicitis is commonly linked to luminal obstruction caused by lymphoid hyperplasia, appendicoliths, or infections, leading to inflammation, bacterial overgrowth, and ischemia.[12] Typical symptoms include periumbilical or epigastric pain that migrates to the right lower quadrant (McBurney's point), which is often associated with nausea, vomiting, fever, and changes in bowel habits. However, these symptoms may vary depending on the anatomical position of the appendix and the timing of presentation.

Despite being a frequent surgical condition, appendicitis presents inconsistently, and its diagnosis is often delayed in resource-limited settings because of overlapping symptoms with other diseases. Several studies have shown that these delays increase the likelihood of adverse outcomes, prolonged hospital stays, and increased healthcare costs.[13,14] In our local setting at MRRH, there is no published data on the clinical and intraoperative characteristics of patients with appendicitis, which are critical for improving diagnosis, predicting disease stage, and guiding management. Understanding these factors is essential, as the stage of presentation and intraoperative findings are closely linked to postoperative outcomes.[15] Early identification of common presenting features can enhance clinical diagnosis, improve patient outcomes, and potentially reduce complications and hospital costs. Moreover, systematic documentation of intraoperative findings will help quantify the burden of appendiceal complications in this population, guiding surgical decision-making. These findings may also support the adoption of standardized diagnostic tools such as the Alvarado score, which have been shown to be effective in other settings.[13]

Management strategies include both surgical (appendectomy) and nonsurgical (antibiotic) treatments. While studies have shown that antibiotic therapy alone can be successful in select cases of uncomplicated appendicitis, appendectomy remains the definitive treatment, particularly for complicated presentations.[16] Surgical intervention reduces the risk of recurrence and complications, leading to better overall outcomes.

This study aims to fill that gap by documenting the clinical presentation, intraoperative findings, and short-term outcomes of patients who underwent surgery for appendicitis at MRRH. Ultimately, this study aims to improve clinical practice and patient care by providing evidence-based insights into the presentation and management of appendicitis in a low-resource context while also laying the groundwork for future research on appendicitis in Uganda.

METHODS

Study design and setting

We conducted a retrospective chart review of patients who underwent surgery for appendicitis at MRRH, Uganda. The review covered cases managed between 1st January 2021 and 31st March 2024. MRRH serves as a referral and teaching hospital in southwestern Uganda.

Study population

The study included all patients who underwent surgical management for appendicitis during the review period. Charts were eligible if they contained sufficient information to address at least two study objectives. Charts with missing key data were excluded.

Sample size

A total of 143 patients underwent appendectomy during the study period. Using Daniel's formula for estimating proportions with a 95% confidence level, 5% margin of error, and a conservative complication rate estimate of 50%, a minimum sample size of 114 was calculated. After adjusting for a 10% potential for missing data, the target sample size was 125. We retrieved and analyzed 108 complete charts. A post hoc power analysis estimated the study power at 79%, which was sufficient to detect significant associations.

Data collection

Data were extracted via a structured checklist by trained research assistants. The extracted variables included age, sex, comorbidities, duration of symptoms, clinical presentation, intraoperative findings, type of surgical incision, postoperative complications, and length of

hospital stay. All the data were anonymized and securely stored.

Data management and analysis

The data were entered into SPSS version 27, cleaned, and exported to Stata version 17 for analysis. Descriptive statistics (frequencies, percentages, medians, and interquartile ranges) were used to summarize patient characteristics. Logistic regression was used to assess associations between independent variables (e.g., demographics, clinical presentation, intraoperative findings) and postoperative complications. Variables with $p \leq 0.1$ in the bivariate analysis were included in a multivariable logistic regression model. Statistical significance was set at $p<0.05$.

RESULTS

A total of 143 patients with appendicitis were admitted between January 2021 and June 2024. Among these patients, 132 (92.3%) underwent surgical management, and 108 patients (81.8%) with adequate data were included in the analysis. The key findings are summarized below, with detailed data presented in Tables 1-4.

The median age was 31 years (IQR: 21-48), with the 20-39 age group accounting for the largest proportion (44.4%). Males comprised 51.9% of the patients. Most patients (70.4%) had no comorbidities, whereas HIV was the most common comorbidity (22.2%) (Table 1).

The median duration of symptoms prior to admission was 5 days (IQR: 3-7). The most common presenting symptoms were fever (58.3%), vomiting (51.9%), and right iliac fossa (RIF) pain (45.4%). On examination, right lower quadrant (RLQ) tenderness was the most frequent sign (86.9%), and 39.0% of patients had tachycardia (>100 beats/min) (Table 2).

Table 1: Sociodemographic characteristics of the study participants, (n=108).

Variables	N
Gender	
Male	56 (51.9%)
Female	52(48.1%)
Age, median (IQR) (in years)	31 (21-48)
0-19	22 (20.4%)
20-39	48 (44.4%)
40-59	27 (25.0%)
60 and above	11 (10.2%)
Co-morbidities	
None	76 (70.4%)
Diabetes	6 (5.6%)
HIV	24 (22.2%)
Malignancy	2 (1.9%)

Table 2: Clinical presentation of the study participants, (n=108).

Variables	N
Duration of symptoms, median (IQR) days	5 (3-7)
Symptoms	
RIF pain	49 (45.4%)
RUQ pain	10 (9.4%)
Vomiting	56 (51.9%)
Diarrhea	24 (22.2%)
Lower abdominal pain	22 (20.3%)
Constipation	43 (39.8%)
Nausea	23 (21.3%)
Loss of appetite	40 (37.0%)
Abdominal fullness	22 (20.4%)
Migratory periumbilical pain	28 (26.0%)
Generalized abdominal pain	36 (33.3%)
Fever	63 (58.3%)
Others (LIF pain, failure to pass urine)	2 (1.9%)
Signs	
Guarding	41 (38.0%)
Rebound tenderness	44 (41.1%)
Right lower quadrant tenderness	92 (86.9%)
Psoas sign positive	11 (10.2%)
Rovsing's sign positive	24 (22.2%)
Generalized abdominal tenderness	15 (13.9%)
Abdominal distension	7 (6.5%)
Others (RIF mass, abdominal rigidity, obturator sign positive, peri umbilical tenderness)	10 (9.4%)
Pulse rate >100 beats/minute, n=59,	23 (39.0%)
WBC ($\times 10^9$/L) (n=29)	18 (62.1%)

The most commonly used incision was the subumbilical midline (54.6%). The most frequent intraoperative finding was an inflamed erythematous appendix (38.9%), followed by localized appendicular abscess (34.3%) and ruptured appendicular abscess (27.7%) (Table 3).

Postoperative complications occurred in 45 patients (23.6%), with the most common being constipation (43.5%), ileus (21.3%), and surgical site infections (20.3%). The median hospital stay was 7 days (IQR: 4-10), and 43.5% of patients stayed ≥7 days. No mortality was recorded during the study period (Table 4).

Multivariate logistic regression identified several independent predictors of postoperative complications. Patients aged 40-59.9 years had greater odds of unfavorable outcomes than did those under 20 years (adjusted OR=9.66; 95% CI: 1.82-15.2; p=0.008). A symptom duration of more than 5 days was associated with a significantly increased risk (adjusted OR=6.14; 95% CI: 1.69-12.2; p=0.006). Ruptured appendicular abscess was the strongest predictor (adjusted OR=23.96; 95% CI: 1.75-11.97; p=0.04), whereas use of peritoneal lavage was also associated with higher complication rates (adjusted OR=7.72; 95% CI: 1.69-9.1; p=0.008).

Table 3: Intraoperative findings and management, (n=108).

Variables	N
Incision type	
Extended midline	15 (13.9%)
Sub umbilical midline	59 (54.6%)
Lanz	17 (15.7%)
Grid iron	15 (13.9%)
Lanz plus extended midline	2 (1.9%)
Intraoperative findings	
Inflamed erythematous appendix	42 (38.9%)
Localized appendicular abscess	37 (34.3%)
Ruptured appendicular abscess	30 (27.7%)
Appendicular mass	6 (5.6%)
Normal appendix	4 (3.7%)
Perforated appendix	20 (18.5%)
Gangrenous intact appendix	7 (6.5%)
Auto amputated appendix	5 (4.6%)
Gynecologic conditions (Ovarian abscess, twisted ovarian cyst)	3 (2.8%)
Others (ascites, lymphadenitis)	6(5.6%)
Fecalith	3 (2.8%)
Procedure	
Appendectomy	69 (64.0%)
Abscess drainage	65 (60.9%)
Peritoneal lavage	69 (63.9%)
Nothing done, closed abdomen	7 (6.5%)
Others (adhesion lysis, cystectomy, cecostomy and oophorectomy)	4 (3.7%)

Table 4: Postoperative outcomes, (n=108).

Characteristics	N
Complications	45 (23.6%)
Ileus	23 (21.3%)
Constipation	47 (43.5%)
Intra-abdominal abscess	11 (10.2%)
Surgical site infection	22 (20.3%)
Enterocutaneous fistula	3 (2.80%)
Pneumonia	4 (3.7%)
Others (Septic shock, hypoglycemia and peritonitis)	3 (2.79%)
Duration of hospital, median (IQR), days	7 (4-10)
Prevalence of an unfavorable outcome	23.6% (CI 18.0-30.1%)
Mortality rate	0 (0%)

DISCUSSION

Clinical presentation

The demographic and clinical profile of appendicitis patients in our study offers crucial insights into the local disease pattern, revealing characteristics that are both globally familiar and uniquely regional. The male predominance observed (51.9%) is consistent with a large body of international literature, such as the comprehensive review by Kollias et al and the specific systematic review on sex differences by Kollias et al although the precise etiological basis for this gender disparity remains a subject of investigation.[17,18] The peak incidence in young adults aged 20-39 years (48%) corroborates findings from across the African continent and beyond, including studies from Ethiopia by Selassie et al and Nigeria by Tony et al.[16,19] This age distribution is likely influenced by lifestyle factors more prevalent in this demographic, such as dietary changes, increased rates of constipation, and alterations in the gut microbiome potentially linked to antibiotic use.[8]

A notable finding in our cohort was the high prevalence of HIV as the most common comorbidity. This directly mirrors the high regional burden of HIV in Mbarara and is significantly higher than what is typically reported in appendicitis cohorts from non-endemic regions, underscoring the unique patient population served by our

hospital and the necessity of considering endemic diseases in the diagnostic framework.[20]

The symptomatic presentation of our patients showed both consistencies and critical divergences from established patterns. The frequent presentation with fever (58.3%) and vomiting (51.9%) aligns closely with findings from Saudi Arabia by Alhamdani et al (55.8%, 35.8%, respectively).[21] A significant departure from the classic clinical picture was the low documentation rate of migratory periumbilical pain in only 26.0% of cases. This contrasts sharply with the 70% and 52% rates reported in South Africa and India, respectively.[22] This discrepancy is unlikely to represent a true difference in disease pathology and more probably reflects variations in diagnostic thoroughness, patient recall, and documentation practices, highlighting a potential diagnostic challenge in our setting where reliance on this specific symptom may be misleading.

On clinical examination, right lower quadrant (RLQ) tenderness was the most sensitive sign (86.9%). This finding is remarkably consistent with the 85.5% rate reported by Nshuti et al in a similar South African setting and other regional studies, suggesting its reliability in our patient population.[16,23] However, it is higher than rates reported in some Asian and Nigerian studies but lower than in centers utilizing rigorous scoring systems, underscoring how systematic examination protocols can influence the documented prevalence of this crucial sign.[22] Laboratory findings further revealed a complex picture; leukocytosis was present in 62.1% of cases, a rate lower than that reported in Brazil and the U. S. but higher than the 30.9% in Ethiopia.[19] This wide variation may partly be attributable to the limited availability of testing, as data were only accessible for 26.7% of our patients, introducing a potential selection bias.

The limited use of standardized diagnostic scoring systems like Alvarado and RIPASA, which are increasingly supported by evidence, may be a significant contributor to the observed diagnostic delays and variability in clinical presentation at our institution.[13,22,24]

Intraoperative findings

Our intraoperative findings reflect the consequences of delayed presentation. The subumbilical midline incision (SUMI) was the most common surgical approach (54.6%), a choice that starkly contrasts with the preference for Lanz incisions in neighboring Ethiopia and the routine use of laparoscopy in high-resource settings.[12] This preference for a broader incision at our center is a pragmatic response to the high rate of late-stage disease, which necessitates greater exposure to manage extensive inflammation, abscesses, and adhesions.[25] The fact that 1.9% of cases required conversion from a Lanz/Gridiron to a midline incision further suggests that preoperative assessment may not always accurately predict the extent of intra-abdominal pathology.

The spectrum of intraoperative pathology was dominated by advanced disease. An inflamed appendix (38.9%) and localized abscess (34.3%) were the most frequent findings, with a notably high rate of ruptured appendices (27.7%). This rate of complicated appendicitis is substantially higher than the 10-20% perforation rates typically reported in historical studies and the 6.7% abscess rate reported by Melese Ayele in a neighboring Ethiopian region.[12] However, it closely mirrors the 32.4% found in the multinational study by Sartelli et al.[26] This situates our institution's experience firmly within a global context of significant late-stage disease, driven by delayed presentation.[6]

Our negative appendectomy rate of 3.7% is lower than many reports in the literature, which often range from 10% to 20%.[16,27] While this may suggest accurate diagnosis, it warrants caution. The absence of routine histopathological confirmation at our institution likely leads to a significant underestimation of the true rate, as normal or inflamed appendices may be misclassified.[28] Conservative, non-operative management was employed for 5.6% of patients presenting with appendicular masses, a strategy reflecting the late stage of inflammation and aligns with recommendations from other studies.[13] This approach, followed by elective interval appendectomy, has been shown to reduce complications in selected patients.[29]

Short-term outcomes

The postoperative outcomes in our cohort reveal a significant burden of morbidity. The overall complication rate of 23.6% is considerably higher than the 3.8% reported in Ethiopia by Selassie et al but is comparable to the 28.7% reported by Patel et al and the 31.7% found in a large Chinese study, placing our results at the higher end of the global spectrum and confirming the morbidity associated with delayed presentation.[19,30,31] The strong association between ruptured appendices and poor outcomes is a critical finding and is consistent with extensive literature.

Delayed presentation, with a median symptom duration of five days, was a primary driver of these complications. This delay directly contributed to high rates of surgical site infections (SSIs) (20.3%) and postoperative ileus (21.3%). The SSI rate of 20.3% is consistent with reports from India (23.82%) and is more than double the 10% rate reported for laparoscopic appendectomies in a systematic review by Fayraq et al.[32,33] This discrepancy highlights the compounded risk of open surgery in a contaminated field and the potential impact of resource limitations on sterility and postoperative care.[14] The rate of postoperative ileus is also notably high, exceeding figures from centers with enhanced recovery after surgery (ERAS) protocols, where rates are often below 10%.[34]

Our multivariate analysis identified several independent predictors of unfavorable outcomes, providing valuable

local data to guide clinical decision-making. The association with older age (>40 years) (aOR=9.66) aligns with global data showing reduced physiological reserve in this group.[23,35] The link between a symptom duration greater than five days and complications (aOR=6.14) is a powerful argument for community-wide education and strengthening referral systems. The most striking predictors were the presence of a ruptured abscess (aOR=23.96; p=0.04) and the use of peritoneal lavage (aOR=7.72; p=0.008). These quantifiable risks provide compelling local data to guide clinical decision-making and underscore the need for early intervention and a re-evaluation of intraoperative practices. The finding regarding peritoneal lavage is particularly important. While some studies have advocated for its use in contaminated cases, our results align with a growing body of evidence suggesting it offers no benefit and may even increase the risk of complications by spreading contamination.[1,36,37]

The need for relaparotomy in 12.9% of patients, primarily due to intra-abdominal abscesses and enterocutaneous fistulas, indicates significant morbidity.[38] While this rate is lower than the 27% reported by Abebe et al from another Ethiopian center, it remains unacceptably high.[40] Preventive measures must focus on meticulous drainage, appropriate antibiotic coverage and earlier identification of high-risk patients who may benefit from more intensive postoperative monitoring or care in a higher-level facility.[5,30]

Finally, the absence of in-hospital mortality is encouraging, but as noted in our limitations, this must be interpreted with caution due to the lack of long-term follow-up and a relatively young patient population. Mortality rates in sub-Saharan Africa can be as high as 5.6% in settings with delayed presentation and limited resources, highlighting that our zero-mortality finding may not reflect the complete picture.[40]

Limitations

The study was limited by incomplete records and lack of long term follow up data on the patients.

CONCLUSION

Appendicitis at MRRH affects mainly young adults but is often diagnosed late, resulting in severe complications and unfavorable postoperative outcomes. Poor outcomes were more common in older patients, those with delayed presentation, those with ruptured appendices, and those for whom peritoneal lavage was used.

Increasing awareness among health workers and communities about the nonspecific presentation and risks of late diagnosis is essential. Early referral, adoption of diagnostic tools such as the Alvarado score and imaging, accurate documentation, rational antibiotic use, and interval appendectomy in selected cases could improve outcomes. Furthermore, this study highlights the need for better management strategies and further research on the use of peritoneal lavage and long-term outcomes of patients to guide safer surgical care.

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