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PATTERN OF ANTIBIOTICS SENSITIVITY AND BACTERIAL PROFILE IN UNCOMPLICATED ACUTE APPENDICITIS

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ABSTRACT
Acute appendicitis is a common cause of urgent abdominal surgery, with bacterial involvement playing a significant role in both obstructive and catarrhal forms; however, limited studies have explored the bacterial profile and antibiotic sensitivity in uncomplicated cases. This study aimed to determine the bacterial profile and antibiotic sensitivity patterns in acute uncomplicated appendicitis in an African community. A cross-sectional study was conducted over 12 months, involving 100 adult patients clinically diagnosed with acute appendicitis who underwent appendectomy. Intraluminal and periappendiceal swabs were collected for bacterial microscopy, culture, and antibiotic sensitivity testing, alongside histological examination of appendiceal specimens; patients with complicated appendicitis were excluded. The predominant aerobic bacteria isolated were *Escherichia coli* (39.1%), Klebsiella spp (15.4%), and Proteus spp (8.3%), while anaerobic isolates included *Bacteroides* spp (14.1%), anaerobic streptococci (10.3%), and *Clostridium welchi* (3.2%). Aerobic bacteria showed high sensitivity to ciprofloxacin (78.8%), ceftriaxone (63.5%), meropenem (62.3%), and piperacillin-tazobactam (55.8%), but resistance to cotrimoxazole and amikacin (88.5%). Anaerobes demonstrated 93.5% sensitivity to metronidazole. In conclusion, *E. coli, Klebsiella* spp, and *Bacteroides* spp were the predominant organisms, with sensitivity to ciprofloxacin, ceftriaxone, and metronidazole, respectively, and no correlation was found between clinical features and bacterial patterns in acute uncomplicated appendicitis.

Keywords: Appendicitis, antibiotics, bacterial profile, patterns, sensitivity, uncomplicated.

INTRODUCTION
Acute appendicitis is one of the most common causes of acute abdomen that necessitates emergency abdominal surgery (Ahmed *et al.*, 2014). Its peak incidence occurs in adolescents and young adults (Rogers *et al.*, 2016). The appendix is a tubular, worm-like (Vermiform) organ of the large intestine arising from the caecum while Appendicitis is an inflammatory disease of the vermiform appendix. While appendicitis can manifest as uncomplicated (non-gangrenous, non-suppurative, without perforation, abscess, or peritonitis) (Ramdass *et al.*, 2015) or complicated, this study focuses on the uncomplicated form. Uncomplicated acute appendicitis can be non-obstructive (catarrhal), caused by bacterial invasion of the appendiceal lymphoid tissue.(Jacobsen *et al.*, 1987) or obstructive. The implicated pathogens are well-established, comprising aerobic and anaerobic enteric organisms, predominantly coliforms and Gram-negative anaerobes (Ramdass *et al.*, 2015).
The primary pathology in appendicitis involves obstruction, commonly by a faecolith (Alatise and Ogunweide, 2008). causing a closed-loop obstruction with bacterial overgrowth, elevated intraluminal pressure, and compromised blood supply (Carr, 2000). In catarrhal appendicitis, the appendiceal lumen remains patent, but inflammatory cells and bacteria infiltrate the appendiceal wall, potentially responding to antibiotics (Abdurrazzaq *et al.*, 2018). Regardless of obstructive or catarrhal aetiology, bacteria play a pivotal role(Guinane *et al.*, 2013). Approximately 70-80% of acute appendicitis cases are uncomplicated, often resolving spontaneously without surgical intervention or perforation (Andersson *et al.*, 2017).

Acute appendicitis incidence has risen in some African countries recently, attributed to the adoption of Western dietary habits (Alegbeleye, 2019a). The hypothesis suggests high-fibre diets in tropical Africa lead to shorter faecal transit times, (Alegbeleye, 2019a, 2019b) reducing fecolithic obstruction as a causative factor (Alegbeleye, 2019a, 2019b). Globally, the reported appendicitis rate is 86 per 100,000 patients (Ahmed *et al.*, 2014). In low-income nations, incidence rates appear lower than high-income countries, with variations by location, gender, age, and seasonality (Jacobsen *et al.*, 1987). Appendicitis predominantly affects males, with peak incidence in adolescents and young adults, and rarity in infancy and adulthood (Craig, 2012).

In Nigeria, acute appendicitis is a leading cause of acute abdomen necessitating surgery (Agboola *et al.*, 2014). Reported incidence rates vary widely, from 2.6 per 100,000 per annum in northern Nigeria (Ahmed *et al.*, 2014), to 15-40% in the western region (Rogers *et al.*, 2016). A nationwide study estimated the annual incidence at 22.1-49.8 new cases per 100,000 (Duduyemi, 2015). These disparities may reflect regional, demographic, and methodological differences in data collection and analysis.
Appendectomy has been the standard treatment for acute appendicitis for over a century to prevent complications like perforation and pelvic sepsis (Livingston and Vons, 2015). However, advancements in diagnostic imaging and antibiotics have enabled a more selective approach. Abdominal computed tomography (CT) effectively diagnoses appendicitis and determines its severity. Improved diagnostics have led to trials exploring antibiotic therapy as an alternative to surgery, with a

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recent study showing 73.0% of patients treated with antibiotics alone did not require surgery at one year(Liu and Fogg, 2011). Appendicitis is typically diagnosed based on migratory abdominal pain, right lower quadrant tenderness, nausea/vomiting, leucocytosis, and low-grade fever (Jones *et al.*, 2015), supported by CT or ultrasonography to minimize missed diagnoses and unnecessary appendectomies (Pinto *et al.*, 2013).
Bacterial infection contributes to both obstructive and catarrhal appendicitis, with varying bacterial patterns and antibiotic sensitivity across medical centres (Oguntola *et al.*, 2010). This study examines the bacterial profile and antibiotic susceptibility in uncomplicated acute appendicitis, addressing a research gap. Given the geographic variations in bacterial patterns and antibiotic sensitivity, this study aims to provide local clinical insights and expand current knowledge. By identifying the predominant bacteria associated with acute appendicitis and the most effective antibiotics, this research offers valuable information for clinicians managing these cases. Considering the prevalence of acute appendicitis and its significance as a surgical emergency in our region, this study has potential benefits for clinicians and patients.

MATERIALS AND METHODS

This cross-sectional study was conducted on 100 consented patients presenting with symptoms of uncomplicated acute appendicitis at the Ladoke Akintola University Technology (LAUTECH) Teaching Hospital (now Osun State University Teaching Hospital (UNIOSUNTH)) between December 2020 and December 2021. Osun State, located in southwestern Nigeria, the state has a population of approximately 3.8 million (NPC, 2006), divided into three senatorial districts and 30 Local Government Areas (LGAs). The state's healthcare infrastructure includes two teaching hospitals, nine general hospitals, Primary Health Care Centres, and private hospitals (Adeyemi *et al.*, 2022).

Sample Size and Sampling.

The sample size was calculated using the formula for estimating a single proportion: $n = Z\alpha^2 P(1-P)/d^2$ (Torwaneand Dayma, 2021). With a 4.0% appendicitis prevalence from a prior study (Alatise and Ogunweide, 2008) and adjusting for a finite population (<10,000) using $nf = n/(1+n/N)$, the minimum sample size was 89. After accounting for a 10% non-response rate, the final sample size was approximately 100. The annual adult general surgery patient volume ranged between 2500 and 3000, according to medical statistics records.

Ethical Considerations

Ethical approval was sought and obtained from the Research and Ethics Committee of LAUTECH now UNIOSUN Teaching Hospital, Osogbo. Permission was received from the Consultant General Surgeon under whose supervision these patients were registered, as well as the relevant staff from the employed departments. Prior to recruitment into the trial, the patient provided written informed consent. The study method was presented to them in the language that they understood best, and they were asked to sign or mark the consent form if they could write. Eligible patients were advised that their participation in the study was optional. Patients provided informed consent for surgery, anaesthesia, and the study. Patients were free to withdraw at any time, and it had no effect on their treatment. Aside from the regular cost of service, no additional fees were placed on patients. All materials required for this study were given by the researchers. The patients' privacy was respected throughout the trial. All information gathered from patients was totally secret.

Data Collection and Operation Details

Ethical approval was obtained from the Research and Ethics Committee of LAUTECH (now UNIOSUN) Teaching Hospital, Osogbo. Permission was received from the supervising Consultant General Surgeon and relevant departmental staff. Eligible patients provided written informed consent after being counselled in their preferred language. Participation was voluntary, and patients could withdraw without affecting their treatment. No additional fees were imposed beyond regular service costs; all study materials were provided by the researchers. Patient privacy and confidentiality were maintained throughout the study.
Appendectomies were performed under regional (subarachnoid block) anaesthesia with patients in the supine position, following unit protocol. Prophylactic antibiotics (ciprofloxacin and metronidazole) were administered. After routine cleansing and draping, a Lanz incision was made, and layers dissected to expose the peritoneum. The cecum was identified, and the appendix was located by following the taeniae coli. The appendix was controlled using appropriate instruments without damage. The mesoappendix was divided, and the appendicular vessels were ligated. The appendix base was crushed, ligated, and divided. The stump was cleaned, and the wound was closed in layers.

Laboratory Methods

Swab specimens were collected from periappendiceal fluids and intraluminal surfaces of the amputated appendix. Two sets of specimens were obtained for each surface: one in sterile peptone water for aerobic culture and the other in Robertson cooked meat broth for anaerobic culture. Specimens were promptly transported to the laboratory within 30 minutes. We utilized two distinct culture methods to comprehensively characterize the microbial population in appendiceal specimens. The 'all culture' group captured the total microbial diversity, including mixed and polymicrobial cultures, which provides a comprehensive overview of the bacterial ecosystem. The 'pure culture' group, in contrast, focused on isolates growing as a single, uncontaminated bacterial species.
For aerobic culture, specimens were incubated in peptone water, then sub cultured on 5% sheep blood agar and MacConkey agar (Oxoid, England) and incubated aerobically at 37°C for 24 hours. Anaerobic specimens were cultured in Robertson cooked meat broth (Oxoid, England) for 24-48 hours, then sub cultured on anaerobic basal agar (Oxoid, England) with/without kanamycin and vancomycin, and incubated anaerobically for 48-96 hours using anaerobic gas generation kits. Aerotolerance tests excluded facultative anaerobes
Isolates were identified by colonial morphology, Gram staining, and standard biochemical tests. Gram-negative bacilli were further identified using Microbact™ GNB 24E (Oxoid, England), a standardized micro-substrate system for Enterobacteriaceae and common Gram-negative bacilli. Gram-positive cocci were identified through catalase, coagulase, mannitol salt agar, and DNAse tests. Obligate anaerobes were identified with RapID™ ANA II system (Oxoid, England), an enzyme-based rapid identification system for medically important anaerobes within 4 hours, without anaerobic incubation.

Antibiotic Susceptibility Test

Antibiotic susceptibility testing for aerobic and facultative anaerobic

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bacteria followed the modified Kirby-Bauer disk diffusion technique, as recommended by the Clinical Laboratory Standard Institute (CLSI). Gram-positive isolates were tested against penicillin, cefuroxime, ceftriaxone, cefepime, co-amoxiclav, ciprofloxacin, chloramphenicol, gentamicin, amikacin, cotrimoxazole, cefoxitin, erythromycin, ampicillin-sulbactam, piperacillin-tazobactam, and vancomycin (Oxoid, England)
Gram-negative isolates were tested against ceftriaxone, ceftazidime, cefotaxime, cefepime, co-amoxiclav, ciprofloxacin, gentamicin, amikacin, aztreonam, cotrimoxazole, ampicillin-sulbactam, piperacillin-tazobactam, cefoxitin, meropenem, and ertapenem (Oxoid, England). Results were interpreted according to CLSI guidelines, using Escherichia coli ATCC 25922, Staphylococcus aureus ATCC 25923, and Staphylococcus aureus ATCC 43300 as controls.

The pure isolates of the cultures were used to prepare the inocula for antibiotics susceptibility testing. Isolates from cultures less than 24 hours old were selected as discrete colonies and mixed with 5mls of sterile saline solution in tubes to achieve the 0.5% McFarland turbidity standard. Inocula were applied using sterile cotton swabs, which were then dried after excess fluid was removed by pressing firmly against the tube's side. Lawns of inocula were created on Mueller-Hinton agar (MHA) by swabbing in three directions. Each MHA Petri dish was evenly distributed with a set of six antibiotics discs using sterile forceps, followed by an 18-hour incubation period. The diameter of the zone of inhibition around each antibiotic disc was measured and documented in mm. Interpretation of antibiotic inhibition zones followed CLSI guidelines, categorizing them as 'sensitive' or 'resistant'. The selection of antibiotics for testing was based on commonly available options in both hospital and environmental settings. All preoperative, intraoperative, and culture data were collected and recorded in the study proforma.

Data Analysis
Data were computed and analysed using IBM SPSS version 22.0. Univariate analyses of the patients' sociodemographic data were done with frequency and percentages. frequency distribution using tables, charts and graphs. Numerical variables were analysed using T-test while the Chi-square test was used in the analysis of the association between categorical variables in determining the statistical significance, the confidence level was set at 95% and the P-value was taken as less than 0.05.

RESULTS
Patient recruitment for this research took place from December 2020 to December 2021. One hundred patients were enrolled and completed the survey within this timeframe. The emergency department saw a total of 5,763 patients during the study period, with 691 admissions related to lower abdominal conditions like appendicitis, diverticulitis, and peptic ulcers. 'The CONSORT flow diagram for this study is displayed below (Figure 1).

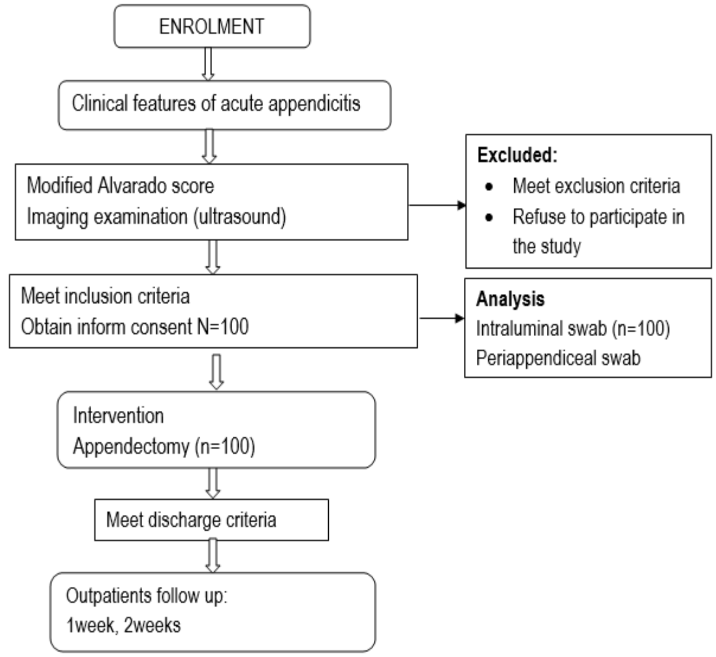

Fig 1: CONSORT Flow Diagram

The sociodemographic characteristics of the patients are presented in Table 1. The majority of the patients were males (55.0%), with a male-to-female ratio of 1.2:1. The mean age of the patients was 28.40 ± 7.66 years, with more than half (54.0%) falling within the 21-30 years age group. The patients were predominantly of the Yoruba tribe (92.0%), and the most common occupation was trading (46.0%)

Table 1: Sociodemographic Data of patients with acute uncomplicated appendicitis

Variable	Frequency	Percentage
Age group		
≤20yrs	14	14.0
21-30yrs	54	54.0
31-40yrs	28	28.0
>40yrs	4	4.0
Mean ± SD	28.40± 7.66	
Sex		
Male	55	55.0
Female	45	45.0
Tribe		
Yoruba	92	92.0
Igbo	2	2.0
Others	6	6.0
Occupation		
Civil servant	24	24.0
Trader	46	46.0
Unemployed	28	28.0
Artisan	2	2.0

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Table 2 summarizes the clinical data of the respondents. All patients presented with right iliac fossa pain (100.0%), while 75.0% reported anorexia and 72.0% experienced nausea/vomiting. Elevated temperature was observed in 52.0% of the patients, and 86.0% exhibited rebound tenderness in the right iliac fossa. Additionally, most (76.0%) of the patients had previously been treated with antibiotics before presentation

Table 2: Clinical Data of the Respondents

Variable	Yes (%)	No (%)
Symptoms		
Right iliac fossa pain	100 (100.0)	0 (0.0)
Anorexia	75 (25.0)	25(25.0)
Nausea/Vomiting	72 (72.0)	28(28.0)
Fever	52 (52.0)	48(48.0)
History of care and past medical history		
Treatment with antibiotics	76 (76.0)	24 (24.0)
Similar illness in the past	24 (24.0)	76 (76.0)
Hypertension	20 (20.0)	80 (80.0)
Diabetes	0 (0.0)	100 (100.0
Others	0 (0.0)	100 (100.0
Examination of findings		
Elevated Temperature	61(61.0)	39 (39.0)
Right iliac fossa tenderness	100(100.0)	0 (0.0)
Rigidity /rebound tenderness RIF	86 (86.0)	14 (14.0)
Extra sign e.g. Rovsing sign Psoas sign	74 (74.0)	26 (26.0)

The results of the bacterial culture from intraluminal and peri-appendiceal swabs are presented in Table 3. A total of 200 swabs were collected, with bacterial isolates identified in 156 (78.0%) of the samples. The most common aerobic bacteria isolated were *Escherichia coli* (39.1%) and *Klebsiella spp* (15.4%), while the predominant anaerobic bacteria were *Bacteroides* spp (14.1%) and anaerobic streptococci (10.3%). Pure bacterial growth was observed in 81 (40.5%) of the samples, while 44 (22.0%) showed no growth.

Table 3: Swab cultures from intraluminal and peri-appendiceal specimen

Variable	All culture	Pure growth
Gram Negative		
Escherichia. coli	61(39.1)	46(57.0)
Kleibsiella spp	24(15.4)	10(12.0)
Pseudomonas spp	2(1.3)	-
Proteus spp	13(8.3)	-
Gram Positive		
Streptococcus faecalis	11(7.2)	
Streptococcus spp	3(1.9)	
Staphylococcus aureus	3(1.9)	
Staphylococcus albus	2(1.3)	
Anaerobic organism		
Bacteroides spp	22(14.1)	14(17.0)
Ananerobic streptocci	16(10.3)	3(5.0)
Clostridium welchi	5(3.2)	
Anaerobic coryne bacterium	3(1.9)	

Bacterial isolated =156 (78%) Pure growth 81(40.5%) No growth 44(22%)

Table 4 shows the relationship between clinical features and pure bacterial isolates. A significant association was found between the duration of illness and the presence of *Escherichia coli* (p = 0.026) and *Klebsiella* spp (p = 0.022). However, no significant correlations were observed between other clinical features such as right iliac fossa pain, anorexia, or fever and the bacterial isolates.

Table 4: Relationship between the Clinical features of the Respondents and *pure bacteria isolates*

Variable	***E. coli*** **(%)**	***Klebsiella*** **(%)**	*Bacteroides* spp	*Anaerobic streptococci*
Duration of Illness				
<6hrs	3 (6.5)	1 (10.0)	2 (14.3)	1 (33.3)
6-12 Hours	8 (17.4)	9 (70.0)	4 (28.6)	2 (66.7)
13-24hrs Hours	14 (30.4)	0 (0.0)	8 (57.1)	0 (0.0)
>24hrs	21 (45.7)	0 (0.0)	0 (0.0)	0 (0.0)
x^2	6.18 3	5.429	2.715	2.181
p – **value**	**0.026***	**0.022***	0.288	0.305
Migratory right iliac fossa pain				
Yes	46 (100.0)	10 (100.0)	14 (100.0)	3 (100.0)
No	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
x^2	0.582	0.592	1.204	0.081
p – **value**	0.626	0.621	0.403	0.913
Anorexia				
Yes	36 (78.3)	8 (80.0)	9 (64.3)	1 (33.3)
No	10 (21.7)	2 (20.0)	5 (35.7)	2 (66.7)
x^2	4.303	4.918	1.805	2.193
p – **value**	**0.031***	**0.019***	0.355	0.299
Nausea/Vomiting				
Yes	33 (71.7)	6 (60.0)	10 (71.4)	3 (100.0)
No	13 (28.3)	4 (40.0)	4 (28.6)	0 (0.0)
x^2	2.003	2.311	3.017	0.285
p – **value**	0.093	0.187	0.066	0.605
Fever				

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Yes	28 (60.9)	7 (70.0)	12 (85.7)	2 (66.7)
No	18 (39.1)	3 (30.0)	2 (14.3)	1 (33.3)
x^2	1.214	0.492	2.852	0.094
p – value	0.228	0.571	0.119	0.908
Elevated Temperature				
Yes	24 (52.2)	6 (60.0)	11 (78.6)	2 (66.7)
No	22 (47.8)	4 (40.0)	3 (21.4)	1 (33.3)
x^2	2.283	2.409	2.931	0.194
p – value	0.072	0.302	0.108	0.473
Right illac fossa tenderness				
Yes	24 (52.2)	5 (50.0)	7 (50.0)	2 (66.7)
No	22 (47.8)	5 (50.0)	7 (50.0)	1 (33.3)
x^2	0.844	1.351	2.001	0.157
p – value	0.333	0.411	0.191	0.511
Rigidity /rebound tenderness RIF				
Yes	23 (50.0)	7 (70.0)	12 (85.7)	2 (66.7)
No	23 (50.0)	3 (30.0)	2 (14.3)	1 (33.3)
x^2	0.994	0.602	2.991	0.977
p – value	0.377	0.304	0.102	0.101
Extra sign				
Yes	29 (63.0)	6 (60.0)	11 (78.6)	0 (0.0)
No	17 (37.0)	4 (40.0)	3 (21.4)	3 (100.0)
x^2	2.341	1.928	2.884	0.965
p – value	0.069	0.217	0.137	0.126

*Statistically significant (p<0.05)

The antibiotic sensitivity patterns of the aerobic bacteria are presented in Table 5. The majority of aerobic bacteria were sensitive to ciprofloxacin (78.8%), ceftriaxone (63.5%), and meropenem (62.3%). In contrast, high resistance rates were observed for cotrimoxazole (88.5%) and amikacin (88.5%). Anaerobic bacteria demonstrated high sensitivity to metronidazole (93.5%).

Table 5: Antibiotic sensitivity of the Aerobic bacteria

Antibiotics	No	% Sensitivity of bacteria
Ciprofloxacin	123	78.8
Ceftriaxone	99	63.5
Penicillin	24	15.4
Cefepime	76	48.7
Co-amoxiclav	18	11.5
Cefuroxime	53	34.0
Gentamicin	27	17.3
Amikacin	33	21.2
Cotrimoxazole	12	7.7
Cefoxitin	74	47.3
Erythromycin	30	19.2
Ampicillin-sulbactam	47	30.1
Piperacillin-tazobactam	87	55.8
Vancomycin	78	50
Ceftazidime	61	39.1
Meropenem	97	62.3

DISCUSSION

The study examined antibiotic sensitivity and bacterial profile in acute uncomplicated appendicitis among 100 patients aged 20 to 50 (mean age: 28.40± 7.66). Notably, 82% were in their second or third decade, underscoring the disease's impact on economically active individuals and its rarity in infants and the elderly, consistent with Nigerian studies, where peak incidence was identified between 10 and 30 years (Oguntola *et al.*, 2010). Males slightly outnumbered females (male-to-female ratio: 1.2:1), akin to previous finding (Oguntola *et al.*, 2010). This may be due to the function of the underlying pathology and may have to be investigated in a larger study.

Common symptoms included right iliac fossa pain (universal) and anorexia (70%), aligning with previous reports (Sheu *et al.*, 2007; Abdurrazzaq *et al.*, 2018). Rebound tenderness (86%) and elevated temperature (52%) were prevalent, akin to some studies (Abdurrazzaq *et al.*, 2018), which reported 7% but differing from other (Alzahrani *et al.*, 2021) that reported 71.3%. The variance may be due to methodological or demographic differences

Our microbiological findings provide critical insights into the bacterial landscape of acute uncomplicated appendicitis. The bacterial profile revealed a complex microbial ecosystem, with *Escherichia coli* and *Klebsiella* spp emerging as predominant aerobic isolates, while Bacteroides spp represented the most common anaerobic organisms. This aligns with earlier studies in Europe and Asia (Leigh *et al*., 1974; Roberts, 1988; Rasool *et al.*, 1992; Varadhan *et al.*, 2012) but different from a Nigerian study where *E.coli and C.perfringes* were major isolates (Abdurrazzaq *et al.*, 2018), likely due to methodological differences. This composition is intriguing and warrants deeper examination.

The antibiotic susceptibility patterns uncovered in our study offer clinical implications. Most aerobes demonstrated highest sensitivity to ciprofloxacin (78.8%) and ceftriaxone (63.8%), while anaerobes showed remarkable susceptibility to metronidazole. These findings may have immediate clinical relevance for empirical antibiotic selection in acute appendicitis. The sensitivity patterns align with some regional studies as it is similar to prior findings in Abdulrazzaq *et al.*,2018 study in Nigeria and another Libyan study (Mohamed *et al.*, 2021) but also highlight the potential for localized antimicrobial resistance variations.

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This study revealed a significant association between illness duration and specific bacterial isolates. The strong correlation with Escherichia coli (p = 0.026) and Klebsiella spp. (p = 0.022) suggests a potential relationship between bacterial virulence and disease progression. This observation aligns with emerging research indicating that certain bacterial species may influence the clinical trajectory of appendicitis (Sharma *et al.*, 2017). However, this contrasts with the study by Abdulrazzaq *et al*., (2018) which found no such correlation (Abdurrazzaaq *et al.*, 2018). The discrepancy may be due to methodological differences between the studies, such as sample collection techniques or bacterial identification methods. Further research is needed to elucidate the precise relationship between these bacterial species and clinical outcomes in appendicitis.
The variations in bacterial profiles and antibiotic sensitivities observed in our study compared to previous research underscore the importance of localized microbiological surveillance. While our findings resonate with studies from Europe and Asia, they differ from some Nigerian research, potentially due to methodological variations, local ecological factors, or emerging antimicrobial resistance patterns.

Conclusion

Escherichia. coli was the commonest organism isolated in this study, followed closely by Klebsiella spp and *Bacteroides* spp. They were sensitive to ciprofloxacin, ceftriazone and metronidazole respectively. The findings suggest that these antibiotics could be considered as first-line empirical treatments for uncomplicated acute appendicitis in this region, particularly in cases where bacterial cultures are not immediately available. However, there was no correlation between clinical features and bacteria patterns in acute uncomplicated appendicitis except for the duration of illness which showed a significant association with specific bacterial isolates such as *Escherichia coli* and *Klebsiella* spp. This highlights the potential role of bacterial virulence in disease progression and underscores the importance of early intervention to prevent complications. The study also revealed high resistance rates to commonly used antibiotics such as cotrimoxazole and amikacin, which may reflect emerging antimicrobial resistance patterns in the region. This finding emphasizes the need for routine microbiological surveillance and antibiotic sensitivity testing to guide appropriate antibiotic therapy.

In light of these findings, it is recommended that clinicians consider the local bacterial profile and antibiotic resistance patterns when managing acute appendicitis, particularly in resource-limited settings where access to advanced diagnostic tools may be limited. Further studies may look into the correlation between the clinical features and bacteria pattern in acute uncomplicated appendicitis with a large cohort of patients. Routine peri appendiceal swabs for microscopy, culture and sensitivity in the patients will provide an understanding of specific bacteria isolates and antibiotics to be used post-appendicectomy. This may also reveal the role of antibiotics for prophylactic or treatment of catarrhal appendicitis and determine antibiotic resistance early.

Study Limitation

A potential limitation of our statistical analysis is the approach to multiple comparisons. While we conducted independent chi-square tests to explore associations between bacterial isolates and clinical features, this method increases the potential for Type I error. The multiple independent tests may inflate the probability of detecting statistically significant relationships by chance. Consequently, the reported p-values should be interpreted with measured consideration, focusing on consistent patterns and clinical relevance rather than isolated statistical significance. Future studies could employ more sophisticated statistical approaches, such as multinomial logistic regression or appropriate multiple comparison corrections,

Conflict of Interest: The authors declare that they have no financial or personal relationships which may inappropriately influenced them in writing this paper

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Consent: Informed consent was obtained from all individual participants included in this study.

Ethical Approval: ethical approval was sought and obtained from the ethical committee of UniOsun Teaching Hospital, Osogbo

REFERENCES

Abdurrazzaaq, A., Afuwape, O., Ademola, A. and Fasina, O. (2018) 'Bacterial Pattern in Acute Appendicitis', *Annals of African Surgery*, 15(1). Available at: https://doi.org/10.4314/aas.v15i1.3.

Abdurrazzaq, A., Oludapo, A., Adeyinka, A. and Olusegun, F. (2018) 'Bacterial pattern in acute appendicitis', *Ann Afr Surg*, 15(1).

Adeyemi, N.K., Adepoju, E.G. and Adeyemi, M.A. (2022) 'Distribution Patterns of Primary Health Care Centers in Osun State, Southwestern Nigeria: Implications for Sustainable Development Goals and Containment of COVID-19 Pandemic', *International Journal of Health Services*, 52(4), pp. 512–522. Available at: https://doi.org/10.1177/00207314221114533.

Agboola, J., Olatoke, S. and Rahman, G. (2014) 'Pattern and presentation of acute abdomen in a Nigeria teaching hospital', *Niger Med J*, 55, pp. 266–70.

Ahmed, S., Makama, J., Mohammed, U., Sandra, R., Shehu, S. and Ameh, E. (2014) 'Epidemiology of appendicitis in Northern Nigeria: A 10- year review', *Sub sahara Afr JMed*, 1, pp. 185–90.

Alatise, O. and Ogunweide, T. (2008) 'Acute Appendicitis: Incidence and Management in Nigeria.', *IFEMED Journal*, 14(1), pp. 66–70.

Alegbeleye, B. (2019a) 'Current trends of acute appendicitis in Africa: A clinical review', *J healthcare sci*, 7(2), pp. 63–92.

Alegbeleye, B. (2019b) 'Epidemiologic features of acute appendicitis in a tropical African population', *Worldwide Med*, 1(6), pp. 202–214.

Alzahrani, S., AlOmari, T., Shahwan, W., Alzahrani, A., Alghamdi, O. and Elshambaty, Y. (2021) 'Acute appendicitis: is it a seasonal disease?', *Int J Community Med Public Health*, 8, pp. 5195–201.

Andersson, M., Kolodziej, B., Andersson, R. and Group, S. (2017)

'Randomized clinical trial of appendicitis inflammatory response score –based management of patients with suspected appendicitis', *Br J Sugr*, 104(11), pp. 1451–61.

Carr, N. (2000) 'The Pathology of Acute Appendicitis', *Ann Diagn Pathol.*, 4(1), pp. 46–58.

Craig, S. (2012) 'The incidence of acute appendicitis', *medscape journal CME*, 26(10), p. e773895.

Duduyemi, B. (2015) 'Clinicopathological review of surgically removed appendix in central Nigeria', *Alex J Med*, 51, pp. 207–11.

Guinane, C., Tadrous, A., Fouhy, F., Ryan, C., Dempsey, E., Murphy, B., Andrew, E., Cotter, P., Stanton, C. and Ross, R. (2013) 'Microbial composition of human appendices from patients following appendectomy', *mBio*, (1), pp. e00366-12.

Jacobsen, J., Andersen, J. and Klausen, I. (1987) 'Beta-haemolytic streptococci in acute appendicitis', *Acta Chir Scand*, 154, pp. 29–32.

Jones, R., Jeffrey, R., Shah, B., Desser, T., Rosenberg, J. and Olcott, E. (2015) 'The Alvarado score as a method for reducing the number of CT studies when appendiceal ultrasound fails to visualize the appendix in adults', *AJR Am J Roentgenol*, 204, pp. 519–526.

Lahiri, S. (2016) 'Bacterial Pattern of Appendix in Acute and Chronic Appendicitis with its Clinical Correlation', *J. Evolution Med. Dent*, 5(10), pp. 418–421. Available at: https://doi.org/10.14260/jemds/2016/96.

Leigh, D., Simmon, K. and Norman, E. (1974) 'Bacterial Flora of appendix fossa in appendicitis and post-operative wound infection', *J Clin Path*, 27, pp. 997–9.

Liu, K. and Fogg, L. (2011) 'Use of antibiotics alone for treatment of uncomplicated acute appendicitis: a systematic review and meta-analysis surgery', 150, pp. 673–83.

Livingston, E. and Vons, C. (2015) 'Treating appendicitis without surgery', *JAMA*, 313(23), pp. 2327–2328.

Mohamed, S.S., Musbah, N. and Sergaiwa, M. (2021) 'Prevelance of Common Organisms Involved in Acute Appendicitis in Althowra Hospital, Elbyda, Libya', *Journal of Advances in Medicine and Medical Research*, 33(1), pp. 76–81.

Oguntola, A., Adeoti, M. and Oyemolade, T. (2010) 'Appendicitis: Trends in incidence, Age, Sex, and Seasonal Variations in South-Western Nigeria', *Ann Afr Med*, 9(4), pp. 213–7.

Pinto, F., Pinto, A., Russo, A., Coppolino, F., Bracale, R., Fonio, P., Macarini, L. and Giganti, M. (2013) 'Accuracy of ultrasonography in the diagnosis of acute appendicitis in adult patients: review of the literature', *Crit Ultrasound J*, 5(Suppl 1), p. S2.

Ramdass, M., Young, S., Milne, D., Mooteeram, J. and Barrow, S. (2015) 'Association between the appendix and fecolith in adults', *Can J Surg*, 58(1), pp. 10–14.

Rasool, M.., Iqbal, M., Anwar and Al, E. (1992) 'A study of a single dose of Cotrimoxazole and Clindamycinin preventing appendicectomy wound infection in non-perforated Appendicitis. (A controlled trial)', *Pak J Pathol*, 3, pp. 33–36.

Roberts, J. (1988) 'Quantitative bacterial flora of acute appendicitis', *Arch Dis Child*, 63(5), pp. 536–40. Available at: https://doi.org/10.1136/adc.63.5.536.

Rogers, M., Brower-Sinning, R., Firek, B., Zhong, D. and Morowitz, M. (2016) 'Acute appendicitis in children is associated with a local expansion of fusobacteria', *Clin Infect Dis*, 63, pp. 536–40.

Sharma, A.K., Dhasmana, N., Dubey, N., Kumar, N., Gangwal, A., Gupta, M. and Singh, Y. (2017) 'Bacterial Virulence Factors: Secreted for Survival', *Indian Journal of Microbiology*, 57(1), pp. 1–10. Available at: https://doi.org/10.1007/s12088-016-0625-1.Sheu, B., Chiu, T., Chen, J. and Al, E. (2007) 'Risk Factors Associated with Perforated Appendicitis in Elderly Patients with Signs and Symptoms of Acute Appendicitis.', *ANZ J Surg*, 77(8), pp. 662–8.

Torwane, N.A., Singh, V.R. and Dayma, A. (2021) 'Sample size determination: a review', *International Journal of Oral Care and Research*, 9(3), pp. 90–2. Available at: https://doi.org/10.1111/1467-9884.00082.

Varadhan, K., Neal, K. and Lobo, D. (2012) 'Safety and Efficacy of Antibiotics Compared with Appendicectomy for Treatment of Uncomplicated Acute Appendicitis: Meta-Analysis of Randomized Controlled Trials', *BMJ*, 344, p. e2156