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Evaluation of Clinical Experience in Diagnosis, Management and Outcome in Patients with Acute Appendicitis from Yemen

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Abstract

Aim of the Study: To analyse the diagnostic and therapeutic management as well as the outcomes of patients with acute appendicitis in Yemen.

Methods: This retrospective observational study was conducted between January 2011 and April 2021. We included medical records of 361 patients with acute appendicitis who had undergone surgery. Baseline data collected included: age, sex, history, laboratory findings, and physical tests upon hospital admission, including right lower quadrant (RLQ) Pain, Blumberg and psoas signs. Active observations, data on concomitant disorders, were collected.

Results: This study recruited 361 patients and the mean age was 25.62+10.74, with 148 females (41%) and 213 males (59%). After surgery: A total of 135 women (91.2 %) and 193 men (90.6 %) were referred to the wards, 33 Patients (9.1%) in critical condition were sent to the intensive care unit, where they stayed for 2.5 days. The average ages of the women and men who participated in the research were 24.45+10.40 and 26.44+10.93, respectively. No statistically significant differences in WBC count or observation hours were found between the sexes using Student's t-test. Intraoperative, the Vermiform appendix was found: Phlegmonous (73.7%), gangrenous (11.3%), perforated (9.1%), normal appendix was found in (5%) patients. Wound infection was the primary postoperative consequence in 18 (5%) patients.

Conclusion: The diagnosis of acute appendicitis relies heavily on physicians' clinical experience. The primary objective of this strategy is to diagnose the condition immediately after symptom onset in order to avoid future complications.

Keywords: Appendicitis, Appendectomy, Negative Appendectomy, Perforated Appendix

1. Introduction

1.1 Background

Appendicitis has a global frequency of 7% and a lifetime risk of 8.6% for men and 6.7% for women. Since the late 1940s, the yearly incidence of acute appendicitis has decreased significantly and now stands at 10 cases per per 100,000 people. Acute appendicitis is probably less common in Asian and African nations because of the dietary patterns of the locals. The production of fecaliths, which predispose people to blockages of the appendicular lumen, is discouraged by a diet high in fibre. Appendicitis strikes approximately 1.4 times more males than females after reaching adulthood. However, several studies have shown that female patients outnumber male ones. According to a recent study, primary appendectomy occurs at a similar frequency in males and females (Humes & Simpson, 2006).

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Appendicitis rates increase from infancy, peak in late adolescence, and decrease in older age. In children, appendicitis often manifests between 6 and 10 y kiears of age. Appendicitis is more common in newborns and young people due to lymphoid hyperplasia, which is also common in this age range. Perforation occurs more often in younger children, with rates ranging from to 50-65%. Appendicitis was most often removed at a median age of 22 years. Appendicitis has been observed in newborns and children, although it is unusual. Thus, it is essential for doctors to maintain a high index of suspicion regarding their life span. The yearly rate (per 10,000 population) of all cases of appendicitis and appendectomy in the USA grew from 7.62 in 1993 to 9.38 in 2008 and has remained consistent at 9.4 instances per 10,000 since then, as reported by Buckius et al. However, at a very old age, the proportion of uncomplicated appendectomy cases relative to difficult appendectomy cases has increased (0–9 years and over 40 years). However, the proportion of difficult cases declined from 33.4% in 1993 to 27% in 2008 (Buckius et al., 2012).

1.2 Problem Statement

Acute appendicitis of unknown origin. Acute appendicitis is thought to originate from blockage of the appendiceal lumen (Wangensteen & Dennis, 1939). Fecaliths, normal stools, and lymphoid hyperplasia are the most common causes of bowel blockage. Evidence suggests that obstruction plays a significant role in the development of appendicitis; however, fecaliths are not the most prevalent cause of simple appendicitis. Fecaliths were present in 18.1% of appendicitis specimens and in 28.6% of negative appendectomies. Fecaliths are more prevalent in children than in adults, regardless of perforation, and fecaliths are more common in children than in adults with appendicitis (Singh & Mariadason, 2013). Acute appendicitis can be diagnosed based on a combination of patient history, physical examination, and laboratory testing (Peterson et al., 1992). According to Graff et al., patients whose first diagnosis was missed by a doctor had fewer symptoms of appendicitis. False-negative diagnoses were more common in individuals older than 40 years, who had a greater risk of perforation and abscess. However, an incorrect diagnosis of appendicitis has been made in individuals with identical symptoms. They also observed that if there was a delay in getting to the hospital or within 20 hours, the risk of perforation or abscess was not significantly higher. With the implementation of the monitoring program, the normal appendix rate decreased from 15% to 1.9%, with no increase in the perforation rate (from 26.7% to 27.5%). Diagnosis of acute appendicitis is highly dependent on physician experience and common sense in the clinic. The primary goal of this strategy is to diagnose the condition as soon as possible after the onset of symptoms to avoid complications such as appendix perforation and peritonitis (Graff et al., 2000).

1.3 Aims

This study aimed to assess the frequency of acute appendicitis in young adults in Yemen. To investigate whether negative appendectomy is more frequent in women than in men.

1.4 Questions of the Study

The following questions were addressed in this Study: Is acute appendicitis more frequent in young adults in Yemen? Is negative appendectomy more common in women than men?.

Significance of the Study Acute appendicitis is a frequent gastrointestinal condition that mostly affects children and adolescents, with an annual incidence of 5.7 to 57/per 100.000 (Graff et al., 2000). Ethnicity, sex, age, body mass index, and disease duration play a role in the observed differences in occurrence (Graff et al., 2000, Gauderer et al., 2001). In the conventional approach, appendicitis is a progressive and fatal condition that can be cured only by removing the appendix. Since Fitz's first report in 1886 (Ergul, 2007), the medical community has learned a great deal about the treatment of acute appendicitis. However, existing international, European, and national standards for the diagnosis and management of acute appendicitis vary widely. To avoid unnecessary negative appendectomies, preoperative imaging investigations are advocated for and even required at certain levels (Shperber et al., 1986), although this is not the case in all cases. Ultrasonography is a reliable method for confirming the presence of appendicitis; however, it cannot be ruled out. In addition, the quality of an ultrasonography scan greatly depends on the technician’s skill. When an appendix cannot be seen on an ultrasonogram, more imaging is required to reach a conclusion (Alari et al., 2017).

1.5 Literature Review

In cases where acute appendicitis is suspected but not proven, it is best practice for the doctor to analyse the patient based on the anatomical location of the pain or tenderness, rather than assuming a single cause. In this scenario, the stomach can be seen in four separate areas (Hardy et al., 1953). Acute appendicitis may be correctly diagnosed in approximately 80% of cases, with only 20% of appendectomies performed unnecessarily. Male patients had a diagnostic accuracy of 78%-92%, whereas female patients had a range of 58%-85%. Since 1962, there has been a declining trend in appendectomy-related morbidities. Since then, morbidity rates have increased dramatically, reaching as high as 29%, although they are much higher in poor populations. According to data gathered by Kong et al. (2015) the total death rate

was 1% and the median time to diagnosis was 4 days. Perforation occurs more often in younger children, with reported rates ranging from 50-80% (Alfredo, 2018).

According to the results of a study conducted by Papaziogas et al. (2009) the risk of appendicitis perforation increases when surgery is performed for a long duration. The "time-table approach" was used to determine the relative risk of perforation. Initially, 12 hour periods were used, and eventually, 24 hour periods became the standard. Only 18 of 169 individuals were found to have perforated appendicitis. Patients with perforation had a longer median time between symptom onset and the initial assessment than those without perforation ($p = 0.047$). However, there was no statistically significant difference between patients with and without appendix ruptures at the time it took them to go from the emergency room to the operating room. Without treatment, the risk of perforation was almost zero during the first 12 h but increased to 8% by the end of the first 24 h (Papaziogas et al., 2009).

After 36 h of untreated symptoms, Bickell et al. observed that the probability of rupture increased to 5% for each subsequent 12-hour period. The duration of surgery was also significantly longer in individuals referred for a CT scan (Papandria et al., 2023). Therefore, it is crucial to identify and treat perforated appendicitis immediately. When a diagnosis is uncertain, active observation is a tried-and-true, risk-free, and easy-to-implement treatment strategy that increases the diagnostic precision. A European consensus development meeting on the diagnosis and treatment of acute appendicitis was called for because of this variation (Andersson, 2016).

2. Materials and Methods

This retrospective observational study was conducted between January 2011 and April 2021 in Taiz, Republic of Yemen, in agreement with the Medical Ethics Council of the Surgical Department of Al Resalah Hospital. We examined the medical records of all 4000 individuals with acute appendicitis. Patients with acute appendicitis underwent surgery and were hospitalised. Patients with limited clinical information and those with inadvertent appendectomies were excluded. Data were gathered from each patient's medical records, including baseline information such as age, sex, surgery date, prehospital time, preoperative time (hours), and diagnostic methods. The following data were collected: clinical diagnosis, medical history, physical examination, laboratory testing, and urine analysis. Clinical signs and symptoms, such as pain localization, pain migration, nausea, and vomiting following pain, as well as the initial attack and other similar attacks, were also recorded. Physical examinations, such as RLQ tenderness, Psoas signs, guarding signs, coughing test results, and indicators present at the time of patient admission to the hospital were noted. The blood test results and urine analyses were also reviewed. It was determined that the white cell count (WCC) was more than 10.0 109/L. Furthermore, CT scan and ultrasound results were examined. Active observation, often known as Ao, is a time frame recommended for unusual presentations. Data on coexisting diseases and other diagnostic techniques as well as active observations and repeated examinations of patients were gathered. Preoperative states were graded on a scale of 0 to IV: phase 0 represented a normal appendix; phase I represented appendix hyperaemia and oedema; phase II represented an appendix with fibrinous exudate; phase III represented an appendix with necrosis and abscess; and phase IV represented a perforated appendix. Diagnoses of complex appendicitis (III and IV) and non-complicated appendicitis (I and II) were obtained from the hospital records of the patients and entered into Performa. Once admitted, the surgical resident performed an initial evaluation of each patient using clinical history and physical, haematological, and urine tests. The senior consultant then assessed the patients and made a choice regarding radiological investigation, surgery, active observation, or release. All patients with acute appendicitis received preoperative antibiotics, often a first-generation combination of IV metronidazole for less complex cases and IV ampicillin or cephalosporin for more complicated cases with IV fluid infusion (Ringer lactate or Normal saline) with the addition of IV Gentamycin for s cases, the antibiotics were maintained for 5 days. Perforated appendices with localized See Abscesses in the right iliac fossa or pelvis were treated with intraperitoneal drains. They were extracted after 48–72 h from different stab wounds. In the perforated example, the wounds were only lightly patched. Following surgery, patients were sent to the ward for observation or to the intensive care unit before being transferred to the ward for patients with diffuse peritonitis and renal impairment.

3. Results

Between January 2011 and March 2021, 361 patients with a tentative diagnosis of acute appendicitis were included. These patients underwent surgery at Al Resalah Hospital in Taiz, Yemen. A total of 148 women (41%) and 213 men (59%) made up this group, and the reported mean age was 25.62+10.74 years. A total of 25.5% of the patients had abnormal urine test results, and 29.1% of the patients were female. After surgery, ward stays were observed in 135 females (91.2%) and 193 men (90.6%) for at least two days, patients in serious condition were transferred to the ICU, they were (9.1%) patients , expected a two-day ICU stay, then referred at the Word stay for 2,5 days . Out of 361 patients, 272 (75.3%) had ultrasounds, 16 (4.4%) had X-ray, and 24 (6.6%) had CT scans (Table 1).

Table 1 Clinical details of study participants

n=361			Male (213)		Female (148)	
n=361	**Frequency**	**Percent (%)**	**Frequency**	**Percent (%)**	**Frequency**	**Percent (%)**
Urine Report						
Normal	269	74.5	164	77.0	105	70.9
Abnormal	92	25.5	49	23.0	43	29.1
Stay in Ward (Days)						
2	66	18.3	41	19.2	25	16.9
3	278	77.0	163	76.5	115	77.7
ICU Stay (Days)						
1	9	2.5	4	1.9	5	3.4
2	13	3.6	7	3.3	6	4.1
Ultrasound (US)						
US Done	272	75.3	159	74.6	113	76.4
US not done	89	24.7	54	25.4	35	23.6
X-ray						
X-Ray done	16	4.4	10	4.7	6	4.1
X-Ray not done	345	95.6	203	95.3	142	95.9
CT (Computed Tomography)Scan						
CT Scan done	24	6.6	15	7.0	9	6.1
CT Scan not done	337	93.4	198	93.0	139	93.9
Clinical Presentation						
Typical	236	65.4	169	79.3	106	71.6
Atypical	92	25.5	29	13.6	23	15
Complicated	33	9.1	15	7	19	12.8

The average ages of the study's respondents —females and males— were 24.45+10.40 and 26.44+10.93 years, respectively. White Blood Cell Counts (109/L) were 12.43+1.90 and 12.93+3.09, respectively. Males had a total of 2.31+2.87 hours of active observation, while females had 2.67+0.46 hours an active observations. Student's t-test was used to examine the WBC count and observation hours between the sexes, but it did not reveal any significant differences. On the other hand, the mean age was statistically different between males and females, with a p-value of 0.008 (Table 2).

Table 2 Descriptive Statistics

n=361			Male (213)		Female (148)		*p*-Value
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**	
Age (Years)	25.62	10.74	26.44	10.93	24.45	10.40	0.008
White Blood Cell Count 10^9/L	12.639	2.4731	12.435	1.9079	12.932	3.0955	0.171
Active Observation (hours)	2.46	2.898	2.31	2.871	2.67	2.933	0.117

Overall, 11% of the patients had diffuse abdominal pain. Anorexia was prevalent in 292 patients (89%), nausea in 199 patients (55%). In terms of clinical diagnosis, the following symptoms and signs were the most significant: migratory pain in 199 cases (55%), pain that was followed by vomiting in 162 cases (45%), pain and tenderness in the right lower quadrant in 202 cases (56%), Blumberg signs In 274 cases (76%), psoas sign in 159 cases (44%), Rosenstein's sign in 282 patients (78%), and Heel Drop sign in 238 cases (66%) with strong recommendation (Table 3).

Prior to surgery, as well as for at least five days following surgery, all patients received intravenous fluids, analgesics, and antibiotics. Patients with a characteristic typical presentation, serial exams, and repetitive abdominal palpation were considered under active observation.

Operative findings in patients were: catarrhal appendix, 5 (1.3%); phlegmonous appendix, 266 (73.7 %); gangrenous appendix, 41 (11.3 %); perforated appendix, 33 (9.1 %); and normal appendix, 18 (5%). Fourteen female and 4 male patients reportedly had normal appendices. The most common causes of negative appendectomy results were ureteric stones (33.3%), ruptured ovarian cysts (22.2%), and adnexitis (16.6%). The main postoperative complication was wound infection in 18 (5 %) patients, hospital-acquired pneumonia, and renal impairment in three patients each (Table 4).

The overall frequencies of non-complicated and complicated acute appendicitis were 313 and 30, respectively, with 18 normal appendices. The incision most commonly made were grid iron in 268 patients (74.2%), Lanz in 20 patients (5.5 %). In 41 (11.3%) patients, the grid iron incision was converted to the Rutherford Morrison incision for better exposure. For 32 (8.6%) patients, median laparotomy was performed. Gross appearance of the appendix on visual appendix was normal in 18 patients (5%). When we analysed appendectomy cases between men and women using the

Chi-Square or Fisher's exact test, we found a significant difference between men and women (p = 0.034). In both men and women, postoperative complications were not significantly different (0.267), as shown in Table 4.

Table 3 Clinical Sign and Symptoms of Study Participants

Clinical Sign and Symptoms	Frequency	Percent (%)
Anorexia	292	89
Nausea	199	55
Abdominal Pain	361	100
Migratory Pain	159	55
Pain followed by Vomiting	162	45
Pain in the Right Lower Quadrant	165	56
Periumbilical Pain	21	22
Epigastric Pain	16	12
Fever	159	44
Diffuse Abdominal Pain	40	11
Constipation	25	7
Diarrhea	22	6
Blumberg Sign	274	76
Psoas Sign	159	44
Markle's Sign – Heel Drop Test	238	66
Rosenstein Signs	282	78

Table 4 Operative Findings

Operative Findings	n=361		Male (213)		Female (148)		*p*-Value
	Frequency	Percent	Frequency	Percent	Frequency	Percent	
Stages of Appendicitis (n=343)							
Phlegmonous Appendix	253	73.7	155	45.1	98	28.5	
Catarrhal Appendix	21	6.1	16	4.6	5	1.4	
Gangrenous Appendix	39	11.3	22	6.4	17	4.9	
Perforated Appendix	30	8.7	15	4.3	15	4.3	
Causes of Negative Appendectomy (n=18)							
Ovarian Cyst Ruptured	4	22.2	0	0	4.0	22.2	
Ovarian Cyst Torsion	2	11.1	0	.0	2.0	11.1	
Ectopic Pregnant Ruptured	1	5.5	0	.0	1.0	5.5	0.034
Ureteric Stone	6	33.3	2	11.1	4.0	22.2	
Adnexitis	3	16.6	2	11.1	1.0	5.5	
Perforated Peptic Ulcer	1	5.5	0	.0	1.0	5.5	
Meckel's Diverticulum	1	5.5	0	.0	1.0	5.5	
Post-Operative Complications (n=361)							
Wound infection	18	5.0	12	3.4	6	1.6	
Pneumonia	3	0.8	2	0.5	1	0.3	
Renal Impairment	3	0.8	2	0.5	1	0.3	

5. Discussion

Acute appendicitis is the most common abdominal emergency. The white blood cell (WBC) count may be useful in the diagnosis of acute appendicitis, although physical examination and medical history remain the pillars of diagnosis. When necessary, a pregnancy test should be used in conjunction with urine sediment analysis to rule out tract infections, urolithiasis, and pregnancy (Er et al., 2018). Out of 361 patients in this research cohort, 245 patients (67.8%) belonged to the young population (25.62+10.74 years), defined as those between the ages of 15 and 30 years. Some studies have also noted that acute appendicitis is more common in young age groups (Humes & Simpson, 2006; Lin et al., 2015).This reinforces the concept that appendicitis affects young female the most often as compare to male. Females were more likely than males to undergo appendectomy with a normal appendix in this research; out of the 18 instances, 14 (77.7%) included females and 4 (22.2%) males. The results of our investigation were comparable to those of Stein et al. (2012) and Khairy (2009). Patients whose diagnosis of acute appendicitis was unclear were hospitalised and underwent serial examinations, including white blood cell count, abdominal ultrasound, and, if possible, CT scan. The probability of an unsuccessful appendectomy decreases as a result of this approach. In such cases, this approach is practiced in different hospital setups.

Pain was migratory in 159 patients (45%) and diffuse in 40 (11%) individuals. The results of our investigation are comparable to those of Alfaredo et al., who also observed migratory and diffuse pain in recruited patients. Vomiting was accompanied by discomfort in 162 patients (46 %), whereas nausea and anorexia occurred in 199 (55%) and 292 (85%)

patients, respectively. In one study, three hundred and thirty five (83.75%) reported anorexia, indicating that anorexia is frequently reported in patients with acute appendicitis (Alfredo, 2018).

This study had an incidence of wound infection of 18 (5%); however, there are no data on the degree of wound infection or the causal organism detected on culture, owing to inadequate follow-up and record management. A catarrhal appendix was observed in 5 (1.3%) patients, a phlegmonous appendix in 266 (73.7%), a gangrenous appendix in 41 (11.3%), a perforated appendix in 33 (9.1%), and a normal appendix in 18 (5%). Simple acute appendicitis, perforated appendicitis, gangrenous appendicitis, and purulent appendicitis accounted for 64.7%, 17.3%, 11.3%, and 23.2% of the total number of cases, respectively, in a multicentre study in the Netherlands (Giesen et al., 2017).

Histological evaluation performed after 433 individuals who underwent appendectomy revealed that 32 74 (17.1%) had uncomplicated acute appendicitis and 318 (73.4%) had complex appendicitis (Koumu et al., 2021). In this study, a variety of preventive antibiotics were administered for acute appendicitis before surgery, but the duration may vary from patient to patient. Contrary to previous studies, such as those by Fitzmaurice and Busuttil with their colleagues which argue that preoperative antibiotics should only be used if they are effective against anaerobes in acute uncomplicated appendicitis as these research studies support the use of several antibiotics (Busuttil et al., 1986 and Fitzmaurice et al., 2011). In our case, postoperative antibiotics don't provide any benefits; instead, they drive up costs and promote drug resistance. In contrast to the results of the Baigrje research, which indicated a postoperative stay of 4.1 days (Baigrie et al., 1995), the average postoperative hospital stay was 2.86+.58 days. This discrepancy could be caused by the study's lower incidence of postoperative complications.

9. Conclusion

The diagnosis of acute appendicitis is heavily reliant on the practitioner's knowledge and clinical expertise as well as their level of clinical sensible judgment. The fundamental objective of this research study is to establish an accurate diagnosis of the acute appendicitis as efficiently as possible following the onset of symptoms. This can be done with the intention of preventing complications such as perforation and peritonitis.

10. Future Directions

When additional preoperative and postoperative considerations are included, the outcome for the patient will be improved, leading to decreased complications, a shorter length of stay in the hospital, and a lower demand on the personnel and resources of the hospital. In addition to the burden of infection assurance that impacts the healthcare system, which was reviewed in this investigation, more research should be conducted into intraoperative and postoperative aspects. It is recommended to include multicentric studies, with prospective components, and with bigger sample sizes.

Ethical Approval

Ethical approval was given for collection of anonymized data from local Institutional Review Boards.

Abbreviations

Aa	Acute Appendicitis
CT	Computed tomography
US	ultrasound
AO	Active observation

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Declaration of Conflict

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