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Corresponding Author
Anurag Pateriya,
Department of General surgery, Pacific institute of medical sciences Udaipur Rajasthan, India
dr.anurag1984@gmail.com

Author Designation
[1,3]Associate Professor
[2]Assistant professor

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A Prospective Study to Assess Presentation and Treatment of Acute Appendicitis-An Experience from Tertiary Care Hospital

[1]Mathura Prasad Agrawal, [2]Kaushal Kumar Gupta and [3]Anurag Pateriya

[1-3]Department of General Surgery, Pacific Institute of Medical Sciences, Udaipur, Rajasthan, India

Abstract
Acute appendicitis, a prevalent cause of acute abdomen, often necessitates appendectomy, one of the most common surgeries worldwide. However, accurate diagnosis remains challenging due to its varied clinical presentation, leading to unnecessary appendectomies. This study aims to evaluate the presentation and management of acute appendicitis in a tertiary care hospital in Northwestern India. A prospective observational study was conducted on adult patients aged 18 and above, diagnosed with acute appendicitis at a tertiary care hospital. Data were collected from initial evaluation in the emergency department through to discharge, including clinical assessments, ultrasound findings, intra operative evaluations and postoperative outcomes. Statistical analysis was performed to assess the association between patient variables and complications. Out of 100 patients evaluated, acute appendicitis constituted 46.4% of emergency surgeries, with a male predominance (63.9%). The mean age was 27.62 years. Symptoms averaged 51.34 hours in duration. Right lower quadrant tenderness was observed in 93.4% of patients. Ultrasound confirmed definite acute appendicitis in 73% of cases. Complicated appendicitis was more likely in patients with symptoms lasting 48 hours or more. Post-ap pendectomy complications were observed in 4% of cases, with superficial surgical site infections being the most common. Acute appendicitis was the leading emergency surgical condition. Ultrasound was frequently used for diagnosis, leading to accurate identification of uncomplicated appendicitis in most cases. The complication rate was low, indicating effective management practices.

INTRODUCTION

In 1886, Ringald H Fitz introduced the term acute appendicitis to describe the condition where the vermiform appendix becomes acutely inflamed. Fitz made this association while studying the illness called typhlitis[1]. Appendicitis is characterised by histological inflammation of the mucosa that lines the vermiform appendix. The inflammation can extend to other areas of the appendix as a result of venous stasis, organ ischemia bacterial translocation. These processes result in the emergence of diverse symptoms and indications linked to the disease[2]. Appendicitis is a common and urgent surgical condition affecting the abdomen. As a result, appendicectomy is one of the most commonly performed surgeries worldwide[3]. The West African sub area is highly likely to be the main cause of surgical acute abdomen[4]. Surgeons still encounter challenges in precisely diagnosing appendicitis because of its diverse and unpredictable symptoms. Encountering challenges in making accurate diagnoses is a common occurrence because not all patients exhibit the commonly reported clinical characteristics. An appendicectomy is universally acknowledged as the established procedure for treatment. The lifetime incidence of acute appendicitis in prosperous nations is approximately 6.7% for females and 8.6% for males[5]. However, the likelihood of undergoing an appendicectomy at some point in one's life is considerably higher, with males having a probability of 9.89% and females having a probability of 9.61%[6]. The discrepancy between the frequency of appendectomy procedures and the incidence of appendicitis underscores the prevalence of unnecessary appendectomies. The dominant consensus regarding the timing of the procedure favours early surgery. Nevertheless, this approach of performing semi-urgent surgery for appendicitis poses the potential danger of a considerable amount of unnecessary appendectomies, commonly referred to as negative appendicectomy. Negative appendicectomy is a term used to describe cases where there is no inflammation or the presence of intramural neutrophils in the appendix, as confirmed by histopathology studies, in patients who are suspected to have appendicitis. These could be attributed to systematic errors in the clinical diagnosis that excessively prioritise mutable symptoms and indicators[7]. Improving diagnostic accuracy is essential to prevent unnecessary appendectomies. The aim of this study was to evaluate the way acute appendicitis is presented and treated in a hospital that provides specialised medical care.

MATERIALS AND METHODS

This study was conducted in Pacific Institute of medical sciences, Umarda, Udaipur, duration of study was March 2021-March 2023 and patients were observed from the time they were evaluated at the adult emergency department until the day they were discharged from the hospital. The inclusion criteria for this study consisted of adult patients who were 18 years of age or older and underwent surgery for acute appendicitis. However, paediatric patients were not included in the study. Trained surgical residents originally assessed patients at the adult emergency department using predetermined clinical characteristics, which included a review of the patient's medical history and a physical examination. The physical examination involves assessing the vital signs, which include temperature, blood pressure, pulse rate respiration rate, as well as conducting an examination of the abdomen. The parameters used to establish normal vital signs were as follows: The temperature should be measured in the morning and should be below 37.2°C, or in the afternoon and should be below 37.7°C, using an axillary method. The blood pressure should be between 90 and 130 mm Hg for systolic pressure between 60 and 85 mm Hg for diastolic pressure. The pulse rate should be between 60 and 100 beats per minute the respiratory rate should be between 14 and 22 breaths per minute. The abdominal examination focused on identifying specific abnormalities such as direct and rebound discomfort, guarding the presence of a palpable lump in the right lower quadrant. Abdominal ultrasound is used to diagnose acute appendicitis by assessing specific parameters. These parameters include the measurement of the oedematous appendiceal wall, which should be greater than 6 mm, the presence of a peristaltic appendix, a non-compressible appendix, appendiceal fat stranding, the presence of free fluid in the right lower quadrant, tenderness at McBurney's point during sonography visualisation of an appendicolith. The visualisation of appendicolith was the only definitive indication, while the presence of one parameter indicated probable acute appendicitis and the presence of two or more parameters indicated definite acute appendicitis. If none of the aforementioned characteristics are present and no other possible diagnoses are available, a normal or unremarkable result was documented. The elements of the AIR score, including right lower quadrant pain, intensity of rebound tenderness or muscle defence, CRP concentration, WBC count, proportion of neutrophils, body temperature history of vomiting, were recorded in advance. The duration of symptoms and the level of experience of the physician attending to the patient upon arrival were recorded. At discharge, we recorded the utilisation of diagnostic imaging techniques such as ultrasound (US) and computerised tomography (CT), any surgical

procedures performed, per-operative and discharge diagnoses, as well as the administration of antibiotics.

Intra Operative Assessment: The surgeon performed a thorough evaluation of the appendix during the surgery. The metrics utilised were as follows: the existence of erythema, dimensions of the appendix, qualities of the appendix wall, such as edoema, compressibility, any greyish or black discoloration, fragility, presence of perforation presence of fecalith. Upon thorough evaluation of the aforementioned factors, the appendix was classified into the subsequent categories: grossly normal, inflamed, exhibiting phlegm on, presenting as a mass, displaying signs of gangrene perforated with or without an abscess. Appendicitis can be classified as simple or uncomplicated if the intra operative examination reveals inflammation or the presence of a phlegm on in the appendix. On the other hand, severe appendicitis refers to a more advanced stage where the appendix is discovered to be gangrenous, perforated, or accompanied with an abscess and peritonitis, either localised or generalised. Gangrenous appendix is characterised by the presence of a darker, aperistaltic weak appendiceal wall without perforation. The aforementioned definitions were derived from comparable literature pertaining to the topic matter.

Post Appendectomy Outcome Assessment: The assessment of the outcome focused on the occurrence of complications and mortality. The intra-operative complications that were monitored for included profuse haemorrhaging and iatrogenic damage to the bowel or bladder. On the other hand, the post-operative complications encompassed surgical site infections, post-operative accumulation of fluid in the abdomen, wound separation respiratory issues.

Data Analysis and Presentation: Data coding and analysis were conducted via Microsoft Excel and freely accessible web software. The data is displayed in both frequency and percentage for discrete variables as a mean and standard deviation for continuous variables. A chi-square analysis was conducted to determine if there was a relationship between many independent patient factors and the occurrence of problems. A confidence interval of 95% was used a significance level of <0.05 was considered statistically significant in all calculations.

RESULTS AND DISCUSSIONS

(Table 2) presents the correlation between abdominal ultrasound findings and the intra-operative stages of appendicitis, as well as conservative management. Out of 100 cases, 73 were diagnosed with definite acute appendicitis via ultrasound, with 54 classified as simple/uncomplicated, 16 as complicated 3 managed conservatively. For probable acute appendicitis, 4 were categorized as simple/uncomplicated and 2 as complicated. Among the 7 cases with normal (unremarkable) ultrasound findings, 6 were found to be simple/uncomplicated and 1 was managed conservatively. Ultrasound was not performed in 11 cases, of which 8 were simple/uncomplicated and 3 were complicated. Additionally, 3 cases with other pathologies were identified, with one each falling into the categories of simple/uncomplicated, complicated conservatively managed. This table underscores the utility of ultrasound in diagnosing appendicitis and highlights the variability in disease presentation and management approaches.

(Table 3) Illustrates the relationship between the duration of symptoms and the stage of appendicitis. Among the 100 cases examined, 59 patients experienced symptoms for less than 48 hours, with 52 of these classified as simple/uncomplicated appendicitis, 6 as complicated 1 as non-inflamed. In contrast, 41 patients had symptoms for 48 hours or

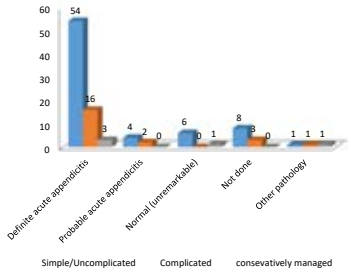

Fig. 1: Simple/Uncomplicated, Complicated and consevatively managed

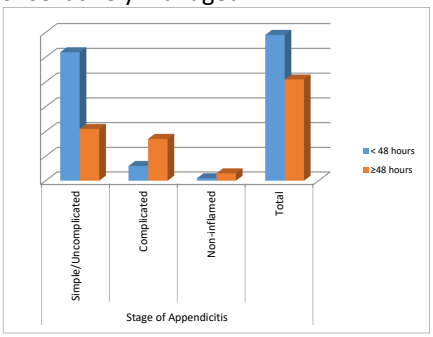

Fig. 2: Stage of Appendicitis

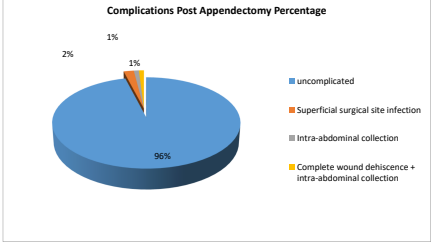

Fig. 3: Complications Post Appendectomy Percentage

Table 1: Appendicitis Inflammatory Response (AIR) score, 0-12 points

Item	Scoring point
Vomiting	1
Pain in right inferior fossa	1
Rebound tenderness or muscular defence	
Light	1
Medium	2
Strong	3
Body temperature C38.5 °C	1
White blood cell count	
10.0-14.9 * 109/L	1
C15.0 * 109/L	2
Proportion polymorphonuclear leucocytes	
70-84%	1
C85%	2
C-reactive protein concentration	
10-49 mg/L	1
C50 mg/L	2

Table 2 Abdominal Ultrasound Report versus Intra-operative Stage of Appendicitis/conservative mangement

	Stage of Acute Appendicitis Intra-operative			
Abdominal Ultrasound Finding	**Simple/Uncomplicated**	**Complicated**	**Conservatively Managed**	**Total**
Definite acute appendicitis	54	16	3	73
Probable acute appendicitis	4	2	0	6
Normal (unremarkable)	6	0	1	7
Not done	8	3	0	11
Other pathology	1	1	1	3
Total	73	22	5	100

Table 3: Stage of Appendicitis versus Duration of Symptoms

Duration of Symptoms	Stage of Appendicitis			
	Simple/Uncomplicated	**Complicated**	**Non-inflamed**	**Total**
< 48 hours	52	6	1	59
≥48 hours	21	17	3	41
Total	73	23	4	100

Table 4: Complications Post Appendectomy

Complication	Frequency	Percentage
Uncomplicated	96	96
Superficial surgical site infection	2	2
Intra-abdominal collection	1	1
Complete wound dehiscence + intra-abdominal collection	1	1
Total	4	4

more, with 21 categorized as simple/uncomplicated, 17 as complicated 3 as non-inflamed. This data indicates that a longer duration of symptoms is associated with a higher likelihood of complicated appendicitis, highlighting the importance of prompt medical attention for symptom resolution and effective management.

(Table 4) details the complications observed post-appendectomy. Out of 100 cases, 96% were uncomplicated. However, there were a few complications: superficial surgical site infections occurred in 2% of cases, intra-abdominal collection in 1% complete wound dehiscence with intra-abdominal collection also in 1%. This indicates a low overall complication rate of 4%, reflecting generally favorable outcomes following appendectomy in the studied population.

Acute appendicitis mainly impacts young individuals, particularly those in their twenties and thirties. This phenomenon was similarly noted in our study, wherein 50% of the participants fell within the age bracket of 18-25 years. Additional research conducted in Africa revealed similar patterns[8,9-10]. Our study, in addition to other reports, also noted a widely documented male dominance[17-20,21-23]. In this study, the average duration of symptoms was more than 2 days, which aligns with similar studies conducted in both local and South African settings[8-23]. Most patients experienced abdominal pain, which aligns with the results of previous studies conducted in Ethiopia, Nigeria South Africa[8-15]. The study found that a large proportion of patients (81.9%) reported experiencing the typical migratory form of abdominal pain. The prevalence of this type of pain is greater than that observed in a study conducted in South Africa, where only 33% of the patients experienced it in a study in India, where it was reported in 52% of the patients[21,22].

The predominant physical observation was tenderness in the right lower quadrant, which was observed in 93.4% of patients. This finding is in line with previous studies[19,9,15,22]. Leucocytosis was present in a mere 33% of our patients, a significantly lower proportion compared to the rates reported in studies

conducted at Zewditu Memorial Hospital in Ethiopia and India. In those studies, leucocytosis was observed in 50.7% and 70% of patients, respectively[19,22].

In 81% of our patients, a further imaging investigation using abdominal ultrasonography was carried out. Comparable local studies did not state the precise percentage of patients who received imaging to diagnose acute appendicitis, however, our observations indicate that this number might be somewhat high. This is partly explained by the fact that our hospital acts as a referral hospital, receiving most of its patients from primary healthcare facilities after they have been evaluated and deemed fit for referral to our hospital. As a result, the majority of patients have ultrasounds when they first arrive at our hospital's emergency room. One additional noteworthy conclusion is the increasing trend of doctors using imaging modalities, which is in line with other research findings[23,24]. According to some publications, the number of needless appendectomies has decreased as a result of increased preoperative imaging use this approach ought to be encouraged[24,25]. The most common appendectomy technique used in this study was the right lower quadrant transverse incision, which was used in 75% of instances involving patients with uncomplicated appendicitis. A diagnosis of complex appendicitis was made for 23% of the patients, which is consistent with certain studies[19,26,11,15], although it turned out to be less than some accounts suggested[9,21]. According to the operating surgeon's assessment, 1.8% of the patients had an appendix that looked normal. There is disagreement over the relationship between histopathological reports and intra operative findings, reports of similarities in different literature sources range from 46.6% to 93.5%[27-31].

The study found that the complication rate was 3.8%, which was much lower than in prior trials[11,21,23]. The most common consequence found after surgery was a superficial surgical site infection, which is in line with prior research, albeit the incidence was substantially lower[9,15,21]. The emergence of an intra-abdominal collection was the second most common complication, requiring re-exploration. The relaparotomy rate seen in this study is 1.85%, which is comparable to the findings reported in Sweden, but notably lower than the results obtained from a study conducted in a rural region of South Africa. The reduced occurrence of post-operative intra-abdominal collections can be related to the fact that the majority of patients have simple appendicitis. The death rate seen in this study was somewhat lower than that reported in prior local studies, potentially suggesting an improved health-seeking behaviour within the populace or superior surgical care[19,9,31]. The mean length of hospital stay was shown to be shorter in comparison to prior research[9,11,16,21,32,33].

CONCLUSION

During the study period, acute appendicitis was the most common emergency surgical procedure. Most patients received abdominal ultrasound as an additional imaging method to diagnose acute appendicitis. The main observation during the surgery was the presence of simple appendicitis, which had a substantial impact on the morbidity and death rates that were considered acceptable.

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