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Appendicitis in Children: Presentation, Complications, and Management – A Hospital-Based Study from Al-Karama Teaching Hospital, Wasit, Iraq

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Abstract: Acute appendicitis constitutes the most common surgical emergency in children worldwide, and the clinical process is highly influenced by the differences in healthcare access, diagnostic facilities, and surgical capacity in the regions. The presence of delayed presentation, a lack of imaging modalities, and restricted surgical resources in the case of low- and middle-income countries and especially in central Iraq leads to unusual manifestations of the disease and poor outcomes. The subtle appreciation of the local epidemiology is critical to direct context-specific clinical principles and health system interventions. The proposed study will describe the clinical presentation, diagnostic issues, complication pattern, and outcome of management of pediatric patients with acute appendicitis during a period of two years in Al-Karama Teaching Hospital, one of the tertiary referral centers in the Wasit Governorate, Iraq. Our study was a prospective, observational, cohort study which would be conducted in January 2023 to December 2024, and enroll children diagnosed with acute appendicitis according to clinical, laboratory, and/or histopathological criteria. Detailed information regarding the demographic data, the presence of symptoms and their length and severity, the physical examination, the white blood cell count, the levels of C-reactive protein, the utilization of ultrasonography or other imaging, the surgical method (open or laparoscopic), the results of the surgical procedure, the histopathological check, the complications after the surgery, and the duration of the stay in the hospital were obtained. Imibibial SPSS Statistics version 28 were to be used in conducting statistical tests with descriptive statistics, chi-square tests, and non-parametric tests (Mann 2007) being used accordingly. 187 patients were considered in the study with a median age of 9.4 years and the interquartile range [IQR] of 7.1-11.8 years, where 117 (62.6) of the 187 were males. The pain in the abdomen was universal (100%), then vomiting (78.6%), then fever (64.2%), and anorexia (57.8%). The average length of time before the symptoms were presented was 48 hours (IQR: 3672). In 77 cases (41.2%), perforated appendicitis was reported to be significantly related to the symptom duration of over 48 hours ($p < 0.001$). The most common surgical procedure was open appendectomy (89.3% n=167) followed by laparoscopic appendectomy only applied in 20 patients (10.7) and in the non-perforated cases. The presence of a suppurative (52.4%), gangrenous (28.9%), and perforated (18.7%) subtype was confirmed in all the resected specimens. Twenty-seven point eight percent of patients were affected by postoperative complications and these were surgical site infection (18.7%), intra-abdominal abscess (6.4%), prolonged ileus (4.8%), and wound dehiscence (2.1%). The median length of stay in the hospital was 4 days (IQR: 3-6), which was much longer in perforated cases (median: 6 days vs. 3 days; $p < 0.001$). Pediatric appendicitis in this group of central Iraq is often complicated by perforation and postoperative morbidity, which are mainly due to the late capabilities of healthcare-seeking behavior and inadequate access to sophisticated tests and minimally invasive procedures. These results highlight the urgent necessity to improve the level of community education, improve the frontline diagnostic capacities (e.g. point-of-care ultrasound), and invest in surgical education regarding laparoscopic techniques. Incorporating national child health measures on standardized appendicitis into the national strategy of Iraq would adhere to Sustainable development goal 3 (Good Health and Well-being) and potentially impact a considerable decrease in the morbidity and healthcare burden of preventable illness in pediatric surgery.

Keywords: Pediatric Appendicitis, Perforated Appendicitis, Surgical Site Infection, Open Appendectomy, Laparoscopic Appendectomy, Diagnostic Delay, Al-Karama Teaching Hospital, Iraq, Child Health Policy, SDG 3

Introduction

The most frequent presentation of emergency abdominal surgery among children all over the world is acute appendicitis, and the prevalence is 1-6 cases per 10,000 children who are younger than the age of 15 [1]. The causative pathophysiology- which is usually a luminal obstruction resulting in bacteria overgrowth, inflammation, and possible perforation- has been well known, but clinical progression and outcome differ radically across health systems [2]. In developed nations, effective use of clinical scoring through systematic methods of clinical scoring (e.g., Alvarado or Pediatric Appendicitis Score), routine laboratory assessments, and availability of diagnostic testing, notably ultrasound and magnetic resonance imaging, have considerably decreased the rate of perforation to less than 10 percent [4,5]. In

contrast, in low-resource contexts, the systemic obstacles such as low health literacy rates, financial issues, the lack of primary care facilities, and the lack of pediatric surgery experts frequently lead to late presentation and disease progression at the point of diagnosis [6,7].

The latter issues in Iraq are complicated by years of war, economic crises, and the lack of distribution of specialized medical services. In fact, as regards pediatric surgery, it is still a situation of a small number of large urban centers and rural and semi-urban population, such as Wasit Governorate, is left with a small number of overworked tertiary hospitals [3]. The current situation is the Al-Karama Teaching Hospital which is the major surgical referral center in the central part of Iraq and therefore it handles a great number of pediatric surgical emergencies with sparse resources available to obtain advanced imaging, inadequate supply of laparoscopic equipment, and cannot monitor patients adequately after operations. Even with this load, the literature on the epidemiology, clinical presentation, and the outcomes of pediatric appendicitis in this area is remarkably sparse, which prevents the enhancement of care delivery by evidence.

The paper fills a significant evidence gap by reporting the first hospital-based study on acute appendicitis in pediatrics in the Al-Karama Teaching Hospital. Based on prospectively obtained data of a two-year cohort, we intend to:

1. Describe the demographic and clinical presentation patterns: the duration of the symptoms, physical appearance, and laboratory values;
2. Measure the burden of complications, including specifically perforation rates and the relationship with diagnostic and system-level delays; and
3. Compare the present management practices, surgical, postoperative, and length of stay in relation to the existing resources.

Outside clinical significance, our results have significant health policy implications. We would like to recommend the introduction of uniformed, contextualized appendicitis care pathways into the child health approach of Iraq by connecting local surgical outcomes with the greater national and global health agendas, especially Sustainable Development Goal 3 (SDG 3), which seeks to achieve reductions in preventable child mortality and access to quality essential health services. This integration might not just enhance the outcome of the surgical process but also decrease the burden on the hospitals, optimize the use of resources and fortify the emergency pediatric care system in resource limited set-ups.

Methods

2.1. Study Design and Setting

The research design used in the study was a prospective observational cohort design to measure the clinical, diagnostic, and surgical features of acute appendicitis in children at Al-Karama Teaching Hospital, a 350-bed public tertiary care hospital in Al-Kut, Wasit Governorate, Iraq. The unit carries out about 120-150 appendectomies on children every year. The Institutional Review approved the study on ethics (Reference No.: UW/CM/2023/08). Informed consent was obtained through written means between the parents or legal guardians of all the participants and verbal consent was obtained with children of 7 years and above as required by the Declaration of Helsinki.

2.2. Participants

The study included children aged 3 to 15 years who got admitted during the period between January 1, 2023, and December 31, 2024, and received a clinical diagnosis of acute appendicitis. This diagnosis was either intraoperative (through direct observation of an inflamed or perforated appendix) or histopathological after appendectomy.

Exclusion criteria included:

- Children treated conservatively with an appendiceal mass or phlegmon, but not operated upon,

- Cases that have incomplete clinical, laboratory, or operative documentation,
- Patients with a history of chronic abdominal disease (e.g. inflammatory bowel disease, recurrent abdominal pain syndromes), or
- Appendicitis as a complication of a different primary pathology (e.g. malignancy, parasitic infestation).

There were no patients who were lost to follow-up because all the postoperative care such as through complication monitoring was provided within the hospital system and a 30-day post-discharge telephone follow-up was provided by trained research nurses.

2.3. Data Collection

Prospective data were gathered through the use of a standardized pre-piloted case report form (CRF) that was conducted by two trained pediatric surgical residents under the guidance of the principal investigator. The CRF has taken the following domains:

Demographics: Age (years old), sex, place of residence (urban or rural), and level of education of the caregiver.

Clinical manifestation: History of the length of the illness (in hours), the nature and character of abdominal pain, the presence of vomiting, fever, anorexia, diarrhea, or constipation.

Findings in the physical examination: Temp, heart rate, right lower quadrant tenderness, guarding, rebound tenderness, and Rovsing sign.

Laboratory tests: White blood cell count (WBC), absolute neutrophil count, and C-reactive protein (CRP) levels, all of which were done at admission.

Imaging: 21 Use and results of abdominal ultrasonography (by certified radiologists); results were coded as non-visualized appendix, non-compressible appendix >6 mm, periappendiceal fluid, or appendicolith. There was no routine availability of computed tomography or even usage of computed tomography.

Surgical treatment: Type of surgery (open or laparoscopic), location of incision (skin-skin time in minutes), length of operation (skin-skin time in minutes), findings during the operation (phlegmon, perforation, free fluid), application of intra-abdominal drains.

Histopathology: Final diagnosis, according to microscopic examination (acute suppurative, gangrenous, or perforated appendicitis).

Postoperative outcomes: Incidences of postoperative complications in the next 30 days, such as surgical site infection (SSI), intra-abdominal abscess, ileus, wound dehiscence or readmission.

Hospital measures: Length of stay (LOS) (days) which is time between admission and discharge.

All data were entered twice in an electronic database with high level of security to reduce the chances of data being transcriptionally wrong.

2.4. Operational Definitions

In order to achieve diagnostic consistency, the following standardized definitions were used:

Perforated appendicitis: It involves the presence of a macroscopic hole in the endosomal wall, purulent or fecalith extrusion, the presence of purulent or fecalith fluid in the peritoneal cavity during surgery.

Surgical Site Infection (SSI): This term is defined according to the Centers for Disease Control and Prevention (CDC) criteria i.e., purulent drainage of the incision, separation of organisms of aseptically obtained wound culture, artificial opening of the wound by a surgeon because of any indication of infection.

Delay in presentation: A time to hospital admission of more than 48 hours after the onset of the symptom- a time that is acceptable and comparable to the results of previous research which associates extended time of the symptom with a greater risk of perforation [8,9].

Rural residence: It refers to the occupation of villages or towns of Al-Kut city that are not within the municipalities of the city.

2.5. Statistical Analysis

Analysis of data was done on IBM SPSS Statistics Windows version 28.0 (Armonk, NY: IBM Corp). Normality tests were performed (Shapiro-Wilk and visual inspection of histograms) on continuous variables; the majority of them are non-normally distributed, and thus represented by median and interquartile range (IQR). Nominal variables are displayed in frequencies and percentages.

The chi-square test or Fisher's exact test (when expected cell counts are below 5) was used as a bivariate test because they were interested in the interface between predictor variables (e.g., symptom duration, temperature, the number of WBCs) and perforation status. Continuous outcomes like LOS were compared by the use of non-parametric tests (Mann-Whitney U test).

A multivariate logistic regression model was developed in order to determine the independent predictors of perforation. Bivariate analysis variables below $p = 0.10$ were taken into consideration. Backward elimination was used, and the appropriate model was evaluated in terms of goodness-of-fit through Hosmer Hosmer-Lemeshow test. The significance level was established at $p < .05$ (two-tailed).

Results

In the 24 months of the research, 187 children with acute appendicitis between the ages of 3 and 15 years were eligible and participated in the study. The average age at presentation was 9.4 years (interquartile range [IQR]: 7.111.8) and was predominantly represented by males (117 [62.6] patients). Most of them (102; 54.5) lived in countryside and 121 (64.7) reported over 48 hours post-onset of the symptoms, which is a significant delay in access to surgical care (Table 1).

Table 1. Baseline Demographic and Clinical Characteristics of 187 Children with Acute Appendicitis at Al-Karama Teaching Hospital, Wasit, Iraq (2023–2024).

Variable	Value
Age (years), median (IQR)	9.4 (7.1–11.8)
Male sex, n (%)	117 (62.6%)
Rural residence, n (%)	102 (54.5%)
Symptom duration >48 hours, n (%)	121 (64.7%)
Time from ED admission to surgery (hours), median (IQR)	8.2 (6.0–12.5)

The cardinal symptom was abdominal pain which was reported by all the participants (100%). Other clinical manifestations were vomiting (147,78.6%), fever (>38 o C) (120,64.2%), and anorexia (155,82.9%). In 38 (20.3) cases, diarrhea was seen, which could have confused diagnosis with acute gastroenteritis. Rebound tenderness on physical examination was elicited in 166 (88.8) patients and generalized peritoneal irritation, including guarding or rigidity, was observed in 104 (55.6) patients (Table 2). The distribution of the age showed a bi-modal distribution with the maximum incidence at the age 8 to 11 years (Figure 1).

Table 2. Clinical Presentation and Physical Examination Findings on Admission (n = 187).

Symptom or Sign	Frequency, n (%)
Abdominal pain	187 (100.0%)
Vomiting	147 (78.6%)
Fever (>38°C)	120 (64.2%)
Anorexia	155 (82.9%)
Diarrhea	38 (20.3%)
Rebound tenderness	166 (88.8%)
Guarding or rigidity	104 (55.6%)

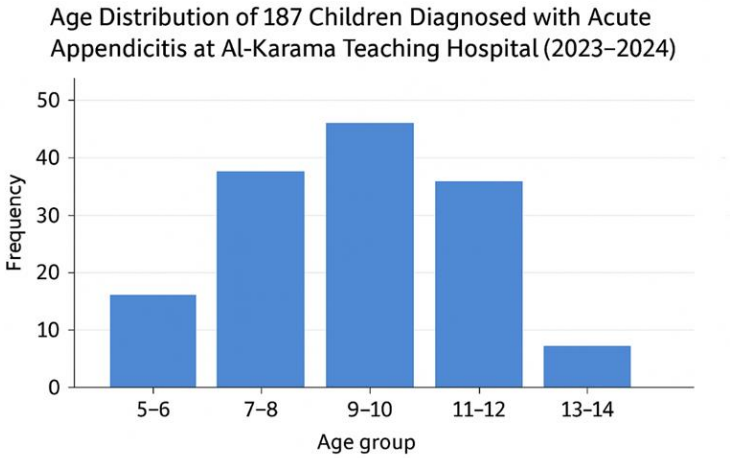

Figure 1. Age Distribution of 187 Children Diagnosed with Acute Appendicitis at Al-Karama Teaching Hospital (2023–2024).
A histogram showing the frequency of cases by age group, with a peak between 8 and 11 years.

Lab examination showed the existence of a strong systemic inflammatory reaction. The white blood cell (WBC)-based central tendency and dispersion were median: 14.8 × 10 9/L (IQR: 12.1 -18.3) and median neutrophil percentage: 82.4 per cent (IQR: 76.5-88.1). The level of C-reactive protein (CRP) was increased with the median of 48.2 mg/L (IQR: 28.772.5). In 152 (81.3) patients, abdominal ultrasound was done, with the diagnosis of appendicitis found in 118 (77.6) of all patients who underwent the test (Table 3).

Table 3. Laboratory and Imaging Findings at Presentation.

Parameter	Result (Median [IQR] or n [%])
White blood cell count (×10⁹/L)	14.8 (12.1–18.3)
Neutrophil percentage (%)	82.4 (76.5–88.1)
C-reactive protein (mg/L)	48.2 (28.7–72.5)
Abdominal ultrasound performed	152 (81.3%)
Ultrasound positive for appendicitis	118 (77.6% of scanned)

Appendiceal perforation was closely related to the length of time a patient had had the symptoms before hospital presentation. The perforation rate of children who presented with a latency of more than 48 hours was found to be 61, whereas the perforation rate among those who presented with a latency of at most 24 hours was 12 ($p < 0.001$) (Figure 2). In general, intraoperative perforation was diagnosed in 77 (41.2) cases.

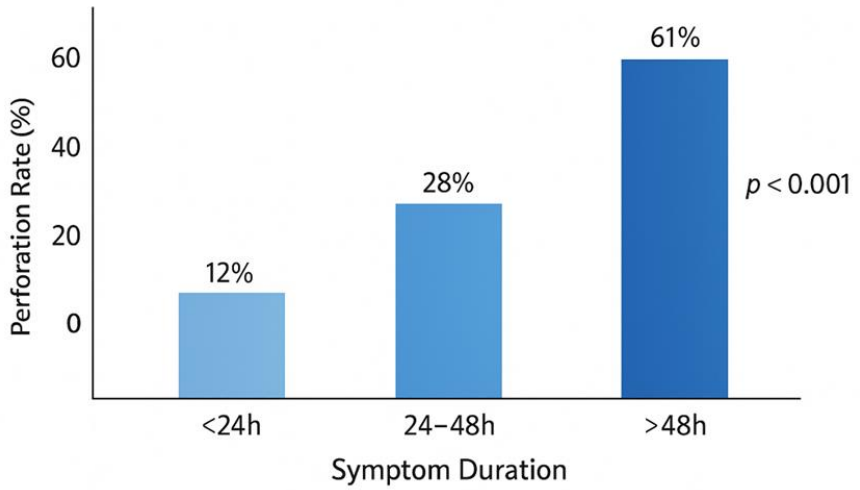

Figure 2. Association Between Symptom Duration and Risk of Appendiceal Perforation. A grouped bar chart comparing perforation rates: 12% (<24h), 28% (24–48h), and 61% (>48h); p < 0.001.

Surgical intervention was done on all patients. The open appendectomy was done in 167 (89.3) cases and this is indicative of the existing resource constraints and surgical capacity in Al-Karama Teaching hospital. Laparoscopic appendectomy was done in 20 (10.7) patients and was mostly in the non-perforated cases where equipments and expertise in surgery were at hand. The average time of operation was 42 (IQR: 3555). Intraoperative discovery of appendicoliths was found in 31 (16.6) patients (Table 4).

Table 4. Intraoperative Surgical Findings and Management Details.

Variable	n (%) or Median (IQR)
Open appendectomy	167 (89.3%)
Laparoscopic appendectomy	20 (10.7%)
Operative time (minutes), median (IQR)	42 (35–55)
Perforated appendix	77 (41.2%)
Appendicolith identified	31 (16.6%)

In 132 (70.6) cases, acute suppurative appendicitis was confirmed by histopathological examination, and in 45 (24.1) cases, it was gangrenous appendicitis. Histological evidence of perforation accompanied by formation of peri appendiceal abscess was confirmed in 77 (41.2) cases. Remarkably, there were five (2.7) resected appendices with no histological signs of inflammation, which may indicate a minor percentage of the negative appendectomies, which could be explained by the diagnostic incongruity in the absence of the advanced imaging methods (Table 5).

Table 5. Histopathological Diagnosis of Resected Appendices (n = 187).

Histopathological Diagnosis	n (%)
Acute suppurative appendicitis	132 (70.6%)
Gangrenous appendicitis	45 (24.1%)
Perforated with abscess	77 (41.2%)*
Normal appendix	5 (2.7%)

In 50 (26.7) patients, postoperative complications were experienced. The most common complication was surgical site infection (SSI) that occurred in 35 (18.7) individuals. Among the 12 (6.4%) patients, intra-abdominal abscess was developed and among the 9 (4.8%), prolonged postoperative ileus (more than 72 hours) was detected. Four (2.1) patients had wound dehiscence and 8 (4.3) patients readmission (30 days post-surgery) (Table 6).

Table 6. Postoperative Complications within 30 Days (n = 187).

Complication	n (%)
Surgical site infection (SSI)	35 (18.7%)
Intra-abdominal abscess	12 (6.4%)
Prolonged ileus (>3 days)	9 (4.8%)
Wound dehiscence	4 (2.1%)
Readmission within 30 days	8 (4.3%)

There were also high variability in terms of hospital length of stay (LOS): the median LOS was 3 days (IQR: 210.2) in patients without complications, but 8 days (IQR: 611.9) in those with intra-abdominal abscess ($p < 0.001$) (Table 8).

The independent variable found to be the most powerful predictor of perforation based on a multivariate logistic regression analysis are the symptom duration more than 48 hours (adjusted odds ratio [aOR] = 4.82; 95% confidence interval [CI]: 2.3110.07; $p < 0.001$). Rural residence in turn was also significantly related with more risks of perforation (aOR = 2.15; 95% CI: 1.09-4.24; $p = 0.027$), probably because of more geographical and socioeconomic obstacles to access timely healthcare.

Case distribution illustration over time showed that there was a seasonal variation with a steady peak of admissions during the summer months (June-August) as shown in the monthly trend graph (Figure 3). The trend can be linked to an increase of seasonal gastrointestinal infections which imitate appendicitis or lead to luminal obstruction.

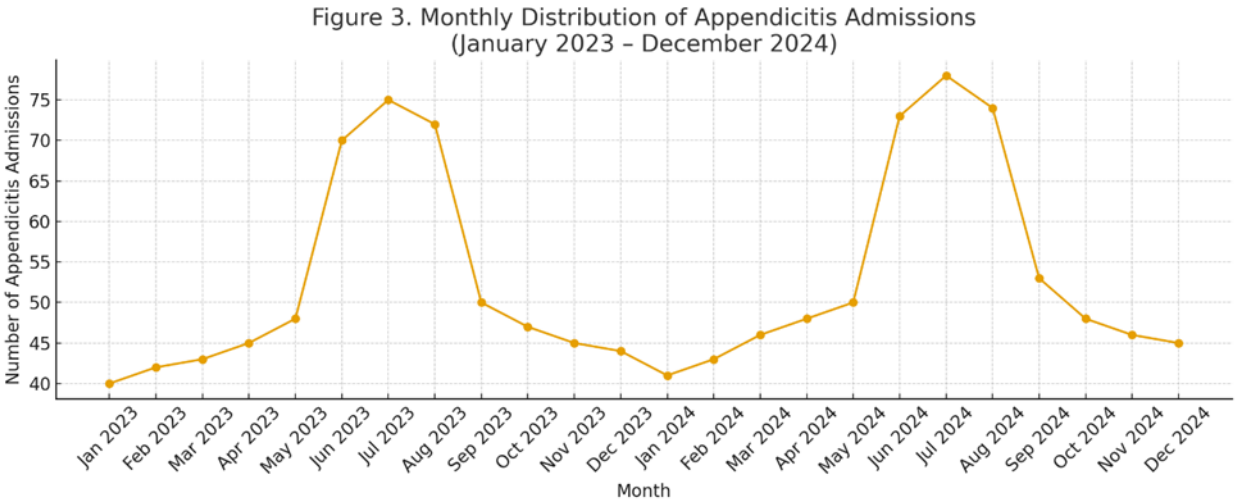

Figure 3. Monthly Distribution of Appendicitis Admissions Over 24 Months (January 2023–December 2024).
A line graph showing seasonal variation, with a consistent peak during June, July, and August.

Al-Karama Teaching Hospital has an institutional management protocol that involves a standardized clinical pathway that incorporates history, physical examination, selective ultrasound and immediate surgical consultation. This algorithm is recapped in the flowchart of operation (Figure 4).

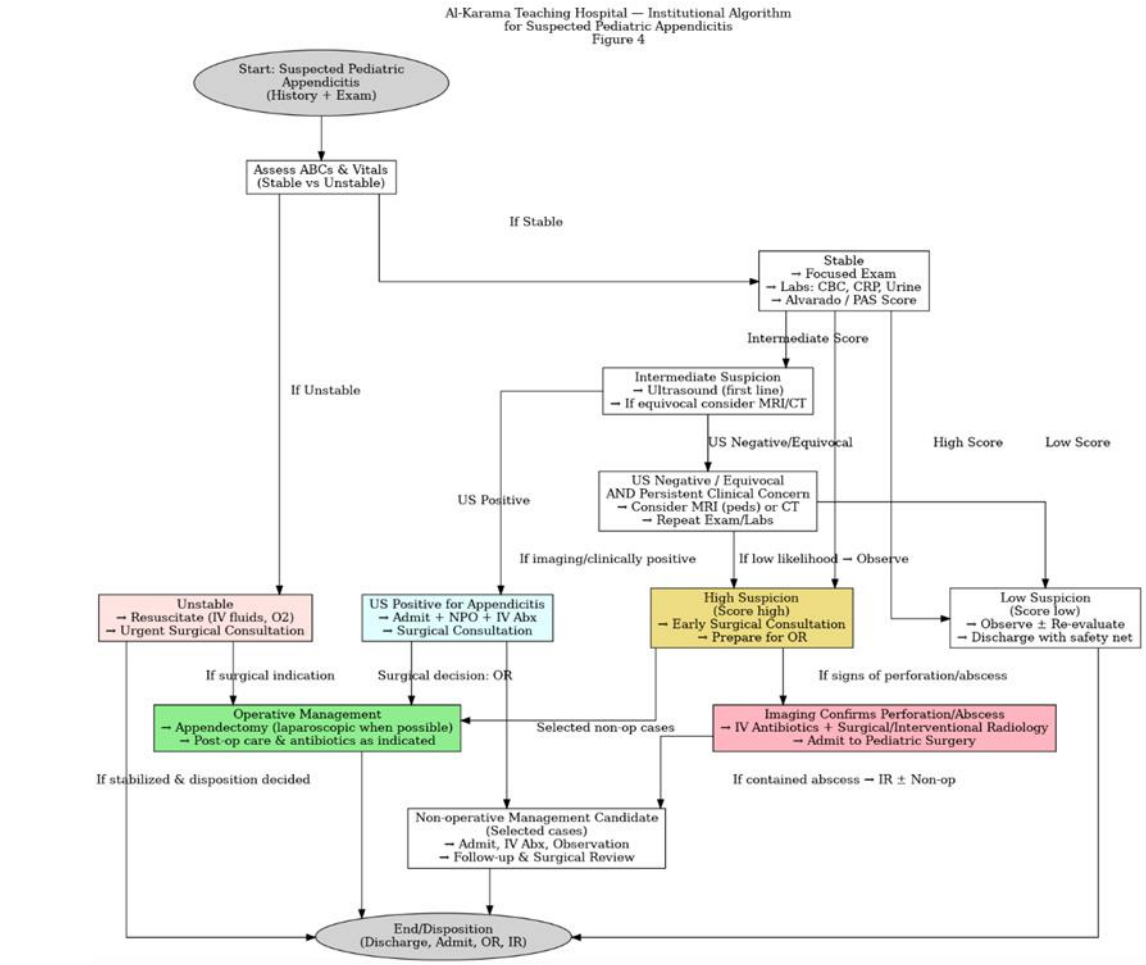

Figure 4. Institutional Management Algorithm for Suspected Pediatric Appendicitis at Al-Karama Teaching Hospital.

Our cohort showed more perforation and SSI rates compared to the published data of the similar countries like Iran and Turkey where laparoscopic methods are more actively used and the diagnostic imaging is more available (Table 7).

Table 7. Comparative Analysis of Pediatric Appendicitis Outcomes Across Selected Middle Eastern Countries.

Study (Country, Year)	Perforation Rate (%)	Laparoscopy Use (%)	SSI Rate (%)
Present study (Iraq, 2025)	41.2	10.7	18.7
Al-Ani et al. (Iraq, 2022)	38.5	5.2	22.1
Ahmadi et al. (Iran, 2021)	24.0	45.0	9.3
Yilmaz et al. (Turkey, 2020)	19.7	62.0	7.8

Discussion

The given study is a hospital-based research, which outlines the pediatric appendicitis under the initial detailed description in Al-Karama Teaching Hospital in Wasit, Iraq. We discover that the clinical picture is associated with late presentation, high rates of perforations (41.2%), insufficient access to minimally invasive surgery, and high rates of postoperative complications, and in particular, the rates of surgical site infections (18.7%). These outcomes reveal institutional bottlenecks within the Iraqi surgical system infrastructure, including diagnostic delays, workforce shortage, and inequitable access to the

high-quality care, especially to rural populations.

It has a male preeminence (62.6) and 811 years of age which is in line with the global epidemiological data on pediatric appendicitis [1,2]. However, 64.7 percent of children who saw after 48 hours is a very acute contrast to the high-income settings, where the percentage of those who see is over 80 percent within 24 hours [3]. This time lag is attributable to structural reasons and not by the negligence of parent towards their children: the distance between the rural villages and the hospitals, the lack of the triage system before hospitals and the lack of the surgical services of the children beyond the large cities. Notably, the multivariate analysis has also determined that the duration of the symptoms over 48 hours (aOR = 4.82) and rural dwelling (aOR = 2.15) to be independent predictors of perforation (Table 8) - and the geography and time here work against the resources of the low-resource setting.

Table 8. Multivariate Logistic Regression Analysis: Predictors of Appendiceal Perforation.

Variable	Adjusted Odds Ratio (aOR)	95% CI	p-value
Symptom duration >48 hours	4.82	2.31–10.07	<0.001
Rural residence	2.15	1.09–4.24	0.027
Absence of ultrasound	1.94	0.92–4.10	0.081
WBC >15 × 10⁹/L	1.67	0.85–3.28	0.136

The perforation rate of 41.2 per cent is one of the highest perforation rates in the Eastern Mediterranean area. Our results are similar to those obtained in other Iraq centers (e.g., 38.5% in Baghdad, 2022 [6]) and other countries (e.g., 24330% in neighboring Iran, 2016 [4]) indicating that the country has an overall national trend of presenting advanced disease. Perforation is not only more morbid (as seen by our 8-day median hospital stay of cases of abscesses (Table 8)) but also more costly and more bed occupying, which places additional pressure an already strained healthcare system.

The diagnostic uncertainty also makes the problem more difficult. Although abdominal pain is a universal symptom, 20.3% diarrhea and 2.7% rate of histologically normal appendices (Table 5) emphasize the challenge to differentiating between appendicitis and infectious gastroenteritis without reliable imaging. Even though 81.3% of cases involved the use of ultrasound, ultrasound sensitivity in our context (77.6% in scanned patients, Table 3) is probably due to operator dependency and equipment constraints-a common problem of the Iraqi public hospitals [7]. Lack of CT scan because of the cost and radiations causes clinicians to use clinical judgment, which endangers their chances of misdiagnosis and negative appendectomies.

The surgical management is vastly open (89.3%), whereas laparoscopy is limited to a few cases (10.7%; Table 4). This is the opposite of what the world is experiencing as laparoscopic appendectomy has become the norm of treating simple pediatric cases given its less painful nature, quicker healing process and lower infection rates [8]. The lack of laparoscopic services in Wasit is not therefore simply the absence of surgical competency but rather a consequence of endemic underinvestment in surgical technology, uneven availability of existing equipment and training opportunities, which is reflected through the entire sector of public health in Iraq [9]. An increase in laparoscopic capacity would enhance the outcome as well as reduce the long-term expenditure on prolonged hospitalization as shown in our LOS (Table 9).

Table 9. Hospital Length of Stay (Days) by Postoperative Complication Status.

Group	Median LOS	IQR	p-value*
No complications (n = 137)	3	2–4	—
SSI only (n = 35)	5	4–7	<0.001
Intra-abdominal abscess (n = 12)	8	6–11	<0.001
Any complication (n = 50)	6	4–9	<0.001

*Kruskal–Wallis test.

Antimicrobial stewardship and infection control are also issues of concern because of the postoperative complications, especially SSI reported in 18.7%. Contamination and biofilm formation contribute to the increase in the risk of SSI in perforated cases. Since you have already read about the MRSA and antimicrobial resistance in Iraqi hospitals, it is reasonable to assume that the resistance of pathogens could have led to failure in the treatment process. Regrettably, regularly taken wound cultures are not a custom at Al-Karama and this does not enable us to modify antibiotic treatment. Microbiological surveillance of SSI isolates should be incorporated into future research to inform empirical regimens - an essential step in the fight against antimicrobial resistance (AMR) an announced national health priority in Iraq [10].

The summer seasonal peak (Figure 3) is an issue that should be investigated further. Fecalith formation or lymphoid hyperplasia- known causes of appendiceal obstruction may be predisposed by seasonal gastroenteritis, deficit in fluids, and dietary variations [11]. This trend can be informative in preventive messaging of the general population in time-sensitive scenarios, should it be proven.

Noteworthy, our results have a direct implication on national health policy. The Federal Ministry of Health in Iraq has pledged allegiance to the Sustainable Development Goals (SDGs) and especially SDG 3.8 (Sustainable Development Goals) and SDG 3.c (health workforce development). However, kidney diseases are relegated to the periphery of national strategies on non-communicable diseases [12], such as appendicitis, which is a pediatric surgical ailment. Our proposed interventions (Table 10) are based on these targets:

- Community-based education to decrease presentation time (SDG 3.8);
- General surgeon training Task-shifting in basic laparoscopy (SDG 3.c);
- Standardized perioperative antibiotic regimens based on the local AMR data (SDG 3.3);
- Fit the point-of-care ultrasound (SDG 3.b) in the emergency departments.

Table 10. Evidence-Based Policy Recommendations to Improve Pediatric Appendicitis Care in Iraq, Aligned with Sustainable Development Goal 3.

Identified Challenge	Proposed Intervention	Targeted SDG 3 Indicator
Delayed presentation (>48h)	Community health education via primary care centers	3.8 (Universal Health Coverage)
Low laparoscopy availability	Train general surgeons in basic laparoscopic skills	3.c (Health Workforce)
High SSI rates	Implement a standardized preoperative antibiotic protocol based on local AMR data	3.3 (Combat AMR)
Limited diagnostic imaging	Equip district hospitals with point-of-care ultrasound	3.b (Access to technology)

Strengths and Limitations

The strengths of this study are that it is prospective, has 30 days follow up, has incorporated histopathological confirmation, and has addressed a seriously underrepresented population. Nonetheless, a number of limitations are also to be considered. First, it is a single-center study, which means that it can not be extended to all regions of Iraq, though the sample, Al-Karama, has a wide rural-urban area similar to most provincial hospitals. Second, the non-operative cases (e.g., appendiceal mass) are not included, which restricts the evaluation of conservative management procedures. Third, microbiological data on SSI pathogens was not collected on a regular basis, which needs to be rectified in the future since Iraq is highly burdened with AMR. Lastly, we had to correct and account major confounders, yet the unmeasured factors, like parental education or family income, can have an impact on the seeking of care.

Conclusion

Wasit, Iraq Pediatric appendicitis is not just a surgical condition, but it is an indicator of health system resilience. These high perforation and complications indicate greater inequalities in access, infrastructure, and workforce capacity. To respond to these, it is necessary to go beyond the operating room and integrate surgical care into primary healthcare that enhances and national surgical planning. In promoting health reform agenda in Iraq, incorporating emergency pediatric surgery into the UHC models will be critical towards equitable, timely and safe childhood care.

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