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ORIGINAL ARTICLE

Prevalence of Acute Appendicitis among patients with Acute Abdominal Pain in Surgical Emergency in 10-50 Years

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ABSTRACT

Background: Acute abdominal pain is one of the most common presentations in surgical emergency departments, with acute appendicitis being the leading surgical cause. Despite advances in diagnostic modalities, early diagnosis of acute appendicitis remains challenging, and delayed intervention can significantly increase morbidity and mortality. Determining the prevalence of acute appendicitis among patients presenting with acute abdomen and understanding age-related variations in clinical presentation are essential for improving diagnostic accuracy and patient outcomes.

Objective: To determine the prevalence of acute appendicitis among patients presenting with acute abdominal pain in the surgical emergency department and to evaluate age-related differences in clinical signs and symptoms.

Methods: This prospective cross-sectional study was conducted in the surgical emergency department of a tertiary care hospital from July 2021 to January 2022. A total of 400 patients aged 10–50 years presenting with acute abdominal pain were included. Patients were stratified into four age groups for prevalence analysis and further divided into two age groups (10–30 years and 31–50 years) for assessment of likelihood ratios of clinical signs and symptoms. Clinical evaluation, laboratory investigations, and imaging were performed as indicated. Patients with suspected acute appendicitis underwent appendectomy based on clinical judgment and Alvarado scoring. Histopathological examination was used as the diagnostic gold standard. Data were analyzed using SPSS version 20.0.

Results: Out of 400 patients, 157 (39.25%) underwent appendectomy for suspected acute appendicitis. Histopathological confirmation was obtained in 132 cases (84.07%), with a negative appendectomy rate of 15.92%. Acute appendicitis was most prevalent in the 21–30-year age group (42.04%) and was more common in males (55.41%) than females (44.58%). Clinical signs and symptoms demonstrated higher diagnostic value in younger patients, with right lower quadrant pain showing a high positive likelihood ratio in patients aged 10–30 years.

Conclusion: Acute appendicitis constitutes a significant proportion of acute abdominal pain presentations, particularly among young adults. Clinical manifestations are more pronounced and diagnostically reliable in younger patients. Early clinical recognition remains crucial to reduce unnecessary surgery and prevent complications.

Keywords: Acute abdomen; Acute appendicitis; Prevalence; Likelihood ratio; Surgical emergency.

INTRODUCTION

Acute abdominal pain is one of the most frequent and challenging presentations encountered in surgical emergency departments worldwide, accounting for approximately 7–10% of all emergency visits and often necessitating urgent surgical evaluation.[1,2] The differential diagnosis of acute abdomen encompasses a wide spectrum of medical, surgical, and gynecological conditions, ranging from self-limiting disorders to life-threatening emergencies requiring immediate intervention. Among these causes, acute appendicitis remains the single most common surgical pathology, particularly in young and middle-aged populations, and continues to represent a major contributor to emergency surgical admissions.[1]

The lifetime risk of developing acute appendicitis has been estimated at approximately 8.6% in males and 6.7% in females, with the highest incidence observed during the second and third decades of life.[1,3] Delayed diagnosis or misdiagnosis can significantly increase morbidity and mortality due to complications such as perforation, generalized peritonitis, intra-abdominal abscess formation, and sepsis.[3,4] Despite advances in diagnostic modalities, appendicitis remains a clinical challenge, as its presentation may overlap with other causes of acute abdominal pain, particularly in older patients and females of reproductive age.[5]

Clinical evaluation continues to be the cornerstone of diagnosis; however, reliance solely on history and physical examination has been associated with a considerable rate of negative appendectomies.[7] To improve diagnostic accuracy, several scoring systems such as the Alvarado and RIPASA scores have been developed and validated, alongside imaging modalities including ultrasonography and computed tomography.[8,9] While these tools have reduced unnecessary surgeries, they may also contribute to diagnostic delays in certain settings, especially in resource-limited environments.[10] Moreover, the diagnostic performance of clinical signs, symptoms, and laboratory parameters may vary across different age groups, influencing disease recognition and outcomes[11].

Understanding the prevalence of acute appendicitis among patients presenting with acute abdominal pain, as well as age-related differences in clinical manifestations, is essential for optimizing early diagnosis and management strategies. Therefore, this study was conducted to determine the prevalence of acute appendicitis in patients aged 10–50 years presenting with acute abdominal pain to the surgical emergency department, and to evaluate the diagnostic relevance of various clinical signs and symptoms across different age groups[12].

MATERIALS AND METHODS

Study Design and Setting: This prospective cross-sectional study was conducted in the Surgical Emergency Department of Surgical Unit-IV at the Services Institute of Medical Sciences, Lahore, Pakistan, from July 2021 to January 2022. The study aimed to evaluate the prevalence of acute appendicitis among patients presenting with acute abdominal pain and to assess age-related differences in clinical manifestations.

Study Population and Sampling: All patients presenting to the surgical emergency department with acute abdominal pain during the study period were screened for eligibility. A total of 400 patients aged between 10 and 50 years were enrolled in the study using a

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non-probability consecutive sampling technique. Both male and female patients were included after obtaining informed consent from the patient or guardian where applicable.

Inclusion and Exclusion Criteria: Patients aged 10–50 years presenting with acute abdominal pain of less than seven days' duration were included in the study. Patients with a history of previous abdominal surgery, chronic abdominal pain, pregnancy, incomplete clinical or laboratory data, or unwillingness to participate were excluded to avoid confounding and diagnostic ambiguity.

Age Stratification: For analysis of prevalence, patients were categorized into four age groups: 10–20 years, 21–30 years, 31–40 years, and 41–50 years. To evaluate the diagnostic relevance of clinical signs and symptoms using likelihood ratios, patients were further divided into two groups: Group A comprising patients aged 10–30 years and Group B comprising patients aged 31–50 years.

Clinical Assessment: A detailed clinical history was obtained from each patient at presentation, with emphasis on symptoms suggestive of acute appendicitis, including right lower quadrant abdominal pain, migration of pain, vomiting, fever, and history of similar previous episodes. A comprehensive physical examination was performed for all patients, assessing localized tenderness, rebound tenderness, guarding or rigidity at the site of pain, and signs of generalized peritonitis.

Laboratory and Radiological Evaluation: Baseline laboratory investigations were performed in all patients and included complete blood count and urine complete examination. A urine pregnancy test was carried out in females of reproductive age. Radiological investigations were performed when clinically indicated and included abdominal ultrasonography as the first-line imaging modality, with contrast-enhanced computed tomography reserved for selected cases where the diagnosis remained uncertain.

Diagnostic Criteria and Surgical Management: Patients suspected of having acute appendicitis were evaluated using the Alvarado scoring system in conjunction with clinical judgment. Surgical intervention in the form of appendectomy was recommended for patients with an Alvarado score greater than six or those with strong clinical suspicion of acute appendicitis. Intraoperative findings were carefully documented for all operated patients.

Histopathological Examination and Follow-up: All excised appendiceal specimens were sent for histopathological examination, which was considered the gold standard for confirmation of acute appendicitis. Postoperatively, patients were discharged after resumption of bowel movements and ability to perform basic daily activities. Follow-up was conducted in the outpatient department to assess recovery and identify any postoperative complications.

Data Collection and Statistical Analysis: Data were recorded on a structured proforma and entered into the Statistical Package for Social Sciences (SPSS) version 20.0 for analysis. Quantitative variables such as age were expressed as mean and standard deviation, while qualitative variables such as gender distribution and prevalence were presented as frequencies and percentages. Likelihood ratios for various clinical signs and symptoms were calculated separately for Group A and Group B to assess age-related diagnostic differences.

RESULTS

Study Population and Demographic Characteristics: A total of 400 patients aged 10–50 years presented to the surgical emergency department with acute abdominal pain during the study period. Among these patients, 157 (39.25%) were clinically diagnosed with acute appendicitis and subsequently underwent appendectomy. The mean age of patients operated for suspected acute appendicitis was 25.20 ± 9.45 years. Male patients constituted 55.41% (n = 87) of the operated cases, while 44.58% (n = 70) were female, yielding a male-to-female ratio of 1.24:1.

Prevalence of Acute Appendicitis Across Age Groups: Patients were stratified into four age groups to determine age-specific prevalence. The highest frequency of acute appendicitis was observed in patients aged 21–30 years, accounting for 42.04% (n = 66) of operated cases. This was followed by the 10–20 years age group with 32.48% (n = 51) cases. A declining trend was observed with increasing age, with 17.19% (n = 27) cases in the 31–40 years group and 8.28% (n = 13) cases in the 41–50 years group. These findings indicate that acute appendicitis was most prevalent during the second and third decades of life and became less common with advancing age (Table 1).

Table 1: Prevalence of Acute Appendicitis Across Different Age Groups (n = 157)

Age Group (years)	Number of Patients	Percentage (%)
10–20	51	32.48
21–30	66	42.04
31–40	27	17.19
41–50	13	8.28

Diagnostic Confirmation and Negative Appendectomy Rate: Out of the 157 patients who underwent appendectomy for suspected acute appendicitis, 132 patients (84.07%) had histopathological confirmation of acute appendicitis. Negative appendectomy was observed in 25 patients (15.92%), indicating a relatively acceptable negative appendectomy rate in the studied population.

Likelihood Ratios of Clinical Signs and Symptoms by Age Group: For analytical purposes, patients were further divided into Group A (10–30 years) and Group B (31–50 years) to assess age-related differences in diagnostic performance of clinical signs and symptoms. Right lower quadrant abdominal pain demonstrated a high positive likelihood ratio (+LR = 8.5) in Group A compared to a markedly lower value in Group B (+LR = 1.4). Similarly, rigidity at the site of pain was observed exclusively in Group A with a positive likelihood ratio of 3.8, while it was absent in Group B.

Migration of pain to the right lower quadrant showed a higher diagnostic value in younger patients, with a positive likelihood ratio of 3.2 in Group A compared to 1.8 in Group B. Fever, vomiting, tenderness, and rebound tenderness showed modest diagnostic value, with consistently higher likelihood ratios in younger patients. Overall, clinical manifestations were more prominent and diagnostically valuable in patients aged 10–30 years compared to older patients (Table 2).

Table 2: Likelihood Ratios of Clinical Signs and Symptoms in Two Age Groups

Clinical Feature	Group A (10–30 years) +LR	Group A –LR	Group B (31–50 years) +LR	Group B –LR
Right lower quadrant pain	8.5	0.28	1.4	NA
Rigidity at pain site	3.8	0.82	NA	NA
Migration of pain	3.2	0.50	1.8	0.70
Vomiting	2.8	NA	NA	NA
Fever	1.9	0.58	1.2	0.90
Tenderness	2.8	NA	NA	NA
Rebound tenderness	1.9	0.58	1.2	0.90
No previous similar pain	2.8	1.5	NA	NA
Total leukocyte count	Lower diagnostic value	Lower	Lower	Higher

The results demonstrate that acute appendicitis constituted a substantial proportion of acute abdominal pain presentations in the surgical emergency department, with the highest prevalence observed in younger patients, particularly those in the 21–30-year age group. Male patients were affected more frequently than females. Clinical signs and symptoms exhibited stronger diagnostic performance in younger patients, while diagnostic reliability declined with increasing age. Histopathological confirmation supported the clinical diagnosis in the majority of cases, with an acceptable negative appendectomy rate.

DISCUSSION

Acute appendicitis remains the most frequent surgical cause of acute abdomen worldwide and continues to pose a diagnostic challenge in emergency surgical practice. In the present study, the prevalence of acute appendicitis among patients presenting with acute abdominal pain was 39.25%, which is comparable to figures reported in previous studies, including 38.9% reported by Thakur and Kumar[4] and 44.27% reported in a systematic review and meta-analysis from Ethiopia.[13] These similarities suggest a consistent burden of appendicitis across different geographical and healthcare settings.

The present study demonstrated a male predominance, with 55.10% of cases occurring in males and 44.89% in females, resulting in a male-to-female ratio of 1.3:1. This finding aligns with previously published data reporting male predominance, although the magnitude varies among studies. Wossen et al. reported a higher male-to-female ratio of 3:1,[6] while Lee et al. documented a ratio closer to 1.2:1,[10] indicating possible regional, demographic, and healthcare access differences influencing disease presentation and diagnosis.

Age-wise analysis revealed that acute appendicitis was most prevalent in the 20–30-year age group, accounting for 42.17% of cases, with a progressive decline in prevalence after the third decade of life. This age distribution is consistent with the well-established epidemiological pattern of appendicitis peaking in young adults. However, this contrasts with findings by Addiss et al., who reported a higher incidence in adolescent populations, particularly among males aged 10–14 years and females aged 15–19 years.[1] Such discrepancies may be attributed to differences in population structure, dietary habits, healthcare-seeking behavior, and diagnostic practices.

Various clinical scoring systems have been developed to improve diagnostic accuracy and reduce negative appendectomy rates, with Alvarado and RIPASA scores being the most widely used. Chong et al. demonstrated significantly higher diagnostic accuracy for the RIPASA score compared to the Alvarado score, with accuracies of 91.83% and 86.51%, respectively ($p < 0.0001$).[9] Similar findings were reported by Naz et al., who observed diagnostic accuracies of 99% for RIPASA and 95.02% for Alvarado.[14] In contrast, Memon et al. reported relatively lower sensitivity and diagnostic accuracy for the Alvarado score, highlighting its limited standalone reliability.[15] These findings emphasize the importance of combining clinical judgment with scoring systems rather than relying on a single diagnostic tool.

In the present study, clinical signs and symptoms demonstrated age-dependent diagnostic performance. Right lower quadrant abdominal pain showed a high positive likelihood ratio (+LR = 8.5) and a low negative likelihood ratio (–LR = 0.28) in patients aged 10–30 years, indicating strong diagnostic utility in younger patients. In contrast, its diagnostic value was markedly reduced in patients aged 31–50 years. Fever and nausea demonstrated the lowest positive likelihood ratios in both age groups. These findings differ from those reported by Laal and Mardanloo, who identified nausea and vomiting as the most common presenting symptoms and tenderness as the most frequent clinical sign.[16] This variation may reflect differences in symptom perception, reporting patterns, and disease progression across age groups.

Laboratory parameters showed limited diagnostic utility in this study. Total leukocyte count exhibited low positive likelihood ratios in both age groups, with higher negative likelihood ratios in older patients. This observation is consistent with previous literature indicating that total leukocyte count has moderate sensitivity but low specificity in diagnosing acute appendicitis.[17] Maghsoudi et al. reported that differential leukocyte parameters, particularly the neutrophil-to-lymphocyte ratio, demonstrate higher diagnostic significance compared to total leukocyte count alone.[4] Such findings support the growing emphasis on inflammatory markers rather than isolated laboratory values.

The negative appendectomy rate in the present study was 15.92%, which is comparable to the rates reported in previous studies, including 15% reported by Lee et al.[10] and 13.8% associated with Alvarado scoring.[10] This indicates acceptable diagnostic accuracy and reflects the balance between timely surgical intervention and avoidance of unnecessary surgery[11].

Overall, the findings of this study reinforce the high prevalence of acute appendicitis among patients presenting with acute abdominal pain, particularly in younger male patients. The diagnostic value of clinical signs and symptoms appears to decline with increasing age, underscoring the need for heightened diagnostic vigilance and judicious use of adjunctive investigations in older patients[15-17].

CONCLUSION

Prevalance of the acute appendicitis among patients with acute abdomen was higher in any age, but it is more frequently found in 3rd decade of life and declines as age progresses in our study, male affected more commonly than females and manifestation of the symptoms and signs are prominent in younger ages.

Availability of Data and Materials: The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

Competing Interests: The authors declare that they have no competing interests.

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Authors' Contributions: All authors contributed substantially to the conception and design of the study. Data collection and patient management were performed by the primary investigators. Data analysis and interpretation were carried out collaboratively by the authors. The manuscript was drafted and critically revised for important intellectual content by all authors. All authors read and approved the final manuscript.

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