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SONOGRAPHIC ASSESSMENT OF ACUTE APPENDICITIS IN PATIENTS WITH ABDOMINAL PAIN:PREVELANCE AND DIAGNOSTIC ACCURACY EVALUATION IN DISTRICT MANSEHRA

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Article Info

Abstract

Background:

Acute appendicitis is a common condition that typically affects individuals with abdominal pain, especially those aged 10 to 19.There is a 7% life time risk of acute appendicitis. Ultrasound is the most commonly used diagnostic tool, offering high sensitivity and specificity for identifying acute appendicitis.

OBJECTIVES:

To diagnose the acute appendicitis by using ultrasound in patients presenting with abdominal pain in District Mansehra.

METHODOLOGY:

This cross-sectional study included 101 patients. This study specifically focused on patient presenting with abdominal pain of age group 10 to 40 years both males and females. Acute appendicitis was measured via ultrasound.

RESULTS:

The peak age for acute appendicitis is between 10 to 19 years. The ultrasound has a sensitivity of 85% and a specificity of 67%.

CONCLUSION:

Ultrasonography is a reliable, non-invasive diagnostic tool for assessing the acute appendicitis. Ultrasound has a high sensitivity of 85% and specificity of 67%, with an overall diagnostic efficacy of 81%.

Keywords:

Acute appendicitis, Prevalence, Diagnostic Accuracy, Sensitivity, Specificity, PPV, NPV

Introduction

The appendix is a pouch with a blind end that is located in the lower right quadrant of the abdomen.(1) The length of appendix ranges from 2-20 cm.(2) When appendix is filled with pus like substance and become inflamed it causes appendicitis. This underscores the importance of timely diagnosis of acute appendicitis to improve patient health.(3)
Ultrasonography (US) is a less expensive, noninvasive and reliable tool for diagnosing the acute appendicitis.(1) Ultrasound, is a widely used imaging modality that uses high-frequency sound waves to create real-time images of internal structures. Ultrasound has high sensitivity and specificity.(4)

The machine employs a curvilinear array transducer, typically operating at a frequency range of 2-5 MHz(5) Sonologists know that the best way to detect appendicitis is by having the patient lie down, then turn 45 degrees to the left, and lie down again. These positions help improve the detection and diagnosis of appendicitis.(6)

Figure 1: ultrasound image of appendix

This study aims to evaluate the diagnostic accuracy of ultrasound in the diagnosis of acute appendicitis among patients presenting with abdominal pain in district Mansehra. Ultrasound is an important tool for diagnosing acute appendicitis, especially in areas where advanced imaging like CT scans may not be available.

METHODS:

This study was designed as the cross-sectional study and conducted at a Radiology Department of King Abdullah Teaching Hospital located in District Mansehra, Khyber Pakhtunkhwa, Pakistan, over a period of six months. Ethical approval for the research was obtained from the institutional review board to ensure adherence to ethical guidelines. Informed consent was secured from all participants after providing them with detailed information about the study's objectives and procedures.

The study included total of 101 participants, comprising 70 confirmed acute appendicitis patients and 30 patients were normal. Participants were selected based on specific inclusion and exclusion criteria. Individuals aged between 10-40 years were eligible for inclusion. Acute appendicitis patients were diagnosed based on established clinical criteria, including evidence of abdominal pain, pain in iliac fossa region along with nausea, fever and vomiting. Exclusion criteria included history of previous appendectomy and Patients with unclear diagnosis of acute appendicitis.

Data collection involved via imaging technique. Acute appendicitis was measured by using high-resolution ultrasonography, performed by experienced radiologists to ensure the diagnostic accuracy of appendix. Data on demographic and clinical characteristics, including age, gender, disease such as abdominal pain, were also collected from questionnaire.

All collected data were entered into SPSS version 22 for statistical analysis. Descriptive statistics, including crosstabs were used to calculate the frequency.

RESULTS:

The descriptive statistics (table1) for age group among 10-40 years were included; most of the participants were from age group 10 to 20 years while minimum participants were from age group 20 to 40. The most commonly affected ages were 10 to 19 years, with a frequency of 57 patients (accounting for 56.4% of the total sample). This was followed by age group 19 to 29 years with 27 patients (24.6%). Younger age groups generally had higher frequencies, while frequencies decreased as age increased with most older age groups showing minimum patients. Patents ages from 29 to 40 years had the lowest frequency (19%)

Table 4.1 age distribution of acute appendicitis:

Age	Frequency	Percentage
10-19	57	56.4%
19-29	27	24.6%
29-40	19	19%
Total	101	100%

Table 4.3 below presents the distribution of patients of acute appendicitis gender wise. Out of n=101 participants, n=60 were male (59.4%), and n=41 were female (40.6%).This indicate that prevalence of acute appendicitis was more prevalent in male than female.

Table 4.3 gender wise distribution of acute appendicitis:

Male	60	59.4%
Female	41	40.6%
Total	101	100.0%

The diagnostic accuracy of ultrasound in detecting acute appendicitis was calculated and presented in table 4.7 a and b. Sensitivity of Ultrasound was 85%. While specificity is 67%. The Positive Predictive Value was found to be 85% and Negative Predictive Value was found to be 67%. Based on these values,

the diagnostic accuracy of the ultrasound was calculated to be 81%. This value represents the overall accuracy of the test in correctly identifying both positive and negative cases of appendicitis. These results suggest that the USG abdomen/pelvis test has relatively high sensitivity and specificity for diagnosing acute appendicitis. However, the positive and negative predictive values indicates the test may have some limitations in accurately identifying true positives and true negatives.

Table 4.7a Accuracy of USG in diagnosis of acute appendicitis

USG Abd/pelvis		
True Positive (a)	False Positive (b)	a+b
60	10	70
False Negative (c)	True Negative (d)	c+d
10	21	31
a+c 70	b+d 31	a+ b+c+ d 101

Table 4.7b Diagnostic accuracy of USG abdomen/pelvis

Diagnostic accuracy	Calculation based Upon 2x2 table	Percentage
Sensitivity	a/a+c x100	85%
Specificity	d/b+d x100	67%
Positive Predictive Value	a/a+b x100	85%
Negative Predictive Value	d/c+d x100	67%
Diagnostic Efficacy	a+d/a+b+c+d x100	81%

DISCUSSION:

Our study examines the prevalence and diagnostic accuracy of sonographic assessment for acute appendicitis in patients presenting with abdominal pain in District Mansehra. The studies performed by Al-Ajerami (2012), Celik et al., (2019), Menifee et al., and Xharra et al., (2012) also has male proportion higher than female (40, 38-41). The age included in our study was 10 to 40 y having mean age 19y almost same with the findings of Al-Ajerami in 2012 having age range 5 to 59y (mean age 19.7y). Xharra et al In 2012 performed a study having mean age 20 y (40,41).The study in Combined Military Hospital Rawalpindi highlighted a high prevalence of appendicitis in males (60%) and primarily in the 20-29 age group, consistent with your study, which found a 59.4% prevalence in males.(7)

Sharma et al. conducted a retrospective study in Nepal's Gandaki Medical College, with findings indicating a strong correlation between ultrasound findings and histopathological results in diagnosing acute appendicitis. The sensitivity in their study reached similar levels to our study, though your specificity was slightly lower. This difference could be attributed to sample variation or operator expertise. In your study, the emphasis on using ultrasound as a first-line diagnostic tool in resource-limited settings echoes Sharma et al.'s conclusion, highlighting ultrasound's role as a rapid diagnostic tool.(8)

Al-Wageeh et al. conducted study in Yemen analyzed the diagnostic accuracy of both the Alvarado Score and abdominal ultrasound. Their findings showed ultrasound sensitivity at 98.46% and specificity at 82.93%. This variance may result from Yemen's study combining clinical assessments with ultrasound, whereas our study focused solely on ultrasound. Al-Wageeh et al.'s findings support our study's conclusion that ultrasound is valuable in reducing unnecessary surgeries and costs, especially in low-resource settings.(9)

Austin-Page et al. study analyzed the impact of an ultrasound-first protocol over five years in a pediatric department, with results showing improved diagnostic accuracy over time, reaching 80.7% sensitivity and 77.6% specificity. These findings are closer to our results.(10)

Fu et al. meta-analysis reported a sensitivity of 77.2% and specificity of 60% for abdominal ultrasound, both lower than in our study. This could be due to varying patient conditions, sample sizes, and operator skill levels across studies. The findings support the practical use of ultrasound in diagnosing appendicitis but suggest that combining it with CT may enhance accuracy, particularly in complex cases. Our study's findings indicate that ultrasound alone provides reliable diagnostic value in a resource-constrained setting, although a multi-modal approach may benefit more complex cases if resources are available.(11)

Daga et al. evaluated ultrasound's effectiveness in detecting complications like perforation, abscesses, and peritonitis, reporting high sensitivity for identifying these complications, these findings align with our results regarding ultrasound's reliability in detecting signs of inflammation and changes in the appendix's diameter. This finding emphasizes ultrasound's role in managing complications.(12)

CONCLUSION:

The conclusion of our study is that ultrasound is a valuable tool in the diagnosis of acute appendicitis in patients presenting with abdominal pain. Our study found that ultrasound has a high sensitivity of 85%, meaning it correctly identifies most patients with acute appendicitis, and a specificity of 67%, indicating it effectively rules out the condition in many patients without appendicitis. The positive predictive value (PPV) of 85% and negative predictive value (NPV) of 67% further support the reliability of ultrasound in diagnosing acute appendicitis. With an overall diagnostic efficacy of 81%. The results of our study shows that ultrasound is an effective, cost-efficient diagnostic method for managing acute appendicitis in District Mansehra, contributing to better patient outcomes and resource management in the healthcare system.

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