Radiological Evaluation of Acute Abdomen in Paediatric Population of Southern Rajasthan

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ABSTRACT

Aims & Objective: The highest incidence among pediatric cases reporting to emergency is due to nonspecific acute abdominal pain and ultrasound are commonly the first investigative tool used. Our study is to identify the most common cause of abdominal pain by using ultrasound. **Material and Methods:** Paediatric patients presenting to the emergency department with acute abdominal pain were analyzed using ultrasound imaging technique and the correlation of ultrasound findings was matched with the final diagnosis of the treating doctor. **Results:** Ultrasound showed a positive diagnosis for the detection of gynecological disease, gastrointestinal infection and acute appendicitis. **Conclusion:** The most common cause of acute abdominal pain in pediatric presenting at emergency department was gynecological disease, gastrointestinal infection and acute appendicitis. These causative factors are easily diagnosed by a simple screening by the ultrasound imaging technique.

Keywords: Acute abdominal pain, paediatric, emergency department, ultrasound

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INTRODUCTION

Most of the pediatric cases visiting the emergency department (ED) are due to acute abdominal pain. This can be associated with both surgical as well as nonsurgical causes. The most common medical cause is gastroenteritis while surgical cause is appendicitis.[1,2,3,4,5] Appropriate evaluation of the child relies on the history, signs and symptoms, and competently performed a physical examination. The pediatrician should be able to give the differential diagnosis, and can experience an error in judgement. To avoid which subsequent testing is taken up such as a complete blood count, urine and stool analysis, and use of one or more of the various imaging modalities. The appropriate use of the subsequent test relies on a careful initial history and physical examination. Unfortunately, in pediatric cases specifically the history, symptom complex and physical examination is difficult and sometimes nonspecific.[5,6] Radiologic evaluation using ultrasound is considered as a reliable technique in differential diagnosis for acute abdomen. The aim of this study is to relate the importance of radiological evaluation in pediatrics with acute abdominal pain in the ED.

MATERIAL AND METHODS:

The research was conducted at the Medical College, Udaipur from January 01, 2015 to December 31st 2015. The sample size was 667. Ethical clearance by the Institutional Ethical Committee has been taken. Informed written consent was

taken by the guardian of the patients. The ultrasound studies were performed using the commercially available, a real-time scanner with a 5-MHz linear transducer (TITAN; Sonosite Inc, Bothell, WA. USA). Demographic data obtained included age, sex, clinical presentation, abdominal ultrasound, laboratory tests, and final diagnosis. The final diagnoses were recorded by reviewing the chart entries made by the pediatrician after clinical history, laboratory data, and treatment with positive results. This diagnosis was correlated with the findings of ultrasound findings.

Inclusion Criteria:

1. Compliant patients
2. Aged < 18 years
3. Symptoms of Acute abdominal pain
4. Time period - Jan 01 2015 to December 31 2015

Exclusion Criteria:

1. Old known cases (before Jan 01 2015)
2. Patients with trauma

OBSERVATIONS AND RESULTS:

In the 1 year period, there were 667 (361 males and 306 females) pediatric cases of ED with a history of acute abdominal pain and ultrasound done as an investigation tool. The mean age group was, 10 ± 4.5 Years. The patients were divided into two groups based on the ultrasound findings: the positive group and the negative group. The results are summarized in Table 1. Our study revealed that the most common cause of acute abdominal pain in pediatric population presenting in the emergency department was gynecological disease followed by gastrointestinal infection and appendicitis. These diseases have been easily identified by the screening ultrasound imaging technique. Our study also revealed that the cases with nonspecific abdominal pain and pain due to extra abdominal disease were not diagnosed by ultrasound as depicted in Table-1.

Table 1: Co-relation of Final diagnoses and Ultrasound findings

Sr No.	Final Diagnosis	Number of Cases	Ultrasound findings	
			Positive	Negative
1	Gynaecologic disease	262	246	16
2	Gastro-Intestinal infection	198	186	12
3	Appendicitis	162	156	6
4	Non specific abdominal pain (abdominal pain of unknown origin)	42	0	42 3
5	Extra-abdominal disease	3	0	
	Total	**667**	**588**	**79**

DISCUSSION:

In pediatric patients, acute abdominal pain is a frequent complaint and is an important issue due to having both medical and surgical causes in its etiology. In acute abdominal pain, acute appendicitis is the most frequent one that needs surgical intervention [4,5,6] Although radiography is considered as the first line for the diagnosis of children being referred with acute abdominal pain, but due to its low sensitivity it gives nonspecific diagnosis and is preferred only where provisional diagnosis is intestinal obstruction or perforation.[7,8] Computed Tomography Scan (CT Scan) is rarely used in pediatric cases because of its radiation factor and need for contrast material. CT is preferred in complicated situations or in cases where ultrasound cannot be used, as in case of obesity.[6] Ultrasound is widely used in pediatric patients, because of the advantages like non-invasive radiation free diagnostic test.[6,9,10] In our study group,

88.16% of all our cases were diagnosed by ultrasound. Gastrointestinal infection, appendicitis, urinary tract infection, gynecological disease and pelvic inflammatory disease were the pathologies diagnosed by ultrasound in our study. The negative laporatomy case numbers have reduced by usage of ultrasound.[11]

Our study is to identify the most common cause of abdominal pain using ultrasound. In our study on 667 children with abdominal pain who underwent ultrasound, the three most frequent diagnoses were gynecological disease (39.3%), gastrointestinal infection (29.7%) and appendicitis (24.3%). Siegel et al in their study of 178 children with abdominal pain who underwent ultrasound revealed, the three most frequent diagnoses to be non-specific abdominal pain (30-38%), medical conditions (20-26%), and surgical emergencies (10-18%).[2]

Gynecological disease: In our study, the most of the cases were ovarian cysts, pelvic inflammation disease or urinary tract infection. Ultrasound can be used to differentiate between ovarian cysts, which presents as a large, complex, cystic mass with septations, and pelvic inflammatory disease which has no specific sonography findings, although some may show up with thickening of the tubal wall, incomplete septa within the dilated tube, hyper-echoic mural nodules, free fluid cul-de-sac, hydrosalpinx, or tubo-ovarian abscess. The ability of the Ultrasound and the ultrasound specialist is to detect gynaecologic disease and rule out other causes that require surgical intervention.

Several studies have showed that ovarian torsion is seen in all age groups but on average, it most frequently occurs at age 10, which is similar to our study.[12,13] Although on ultrasound, the torsioned ovary is observed as markedly enlarged but the diagnosis is established based on the absence of arterial blood flow in the ovarian parenchyma.[14] In cases where necrosis has not developed in ovaries, both peripheral and central arterial-venous flow forms can be observed.[15] Ultrasound only plays a screening tool in the diagnosis of ovarian torsion and it is not a definitive diagnostic tool.[13] Lang et al in their study ahs showed that ultrasound is a valuable primary imaging technique in the case of pelvic masses or pain in children, but CT is useful in the staging and follow-up of tumors that may be present.[16]

Gastrointestinal tract infection: Patients with gastroenteritis clinically present with acute abdominal pain, fever, vomiting, and nausea, which can easily be misdiagnosed as appendicitis. As such, acute gastroenteritis is the most common diagnosis in cases of missed appendicitis.[17,18] Ultrasound works as an excellent tool to differentiate between GI infection and appendicitis. Abdominal pain of unknown origin, or non-specific abdominal pain, is the most frequent diagnosis in children with abdominal pain in an emergency department in the study by Reynolds and Jaffe.[19]

Gastrointestinal abnormalities include developmental obstructive defects of the duodenum and the small intestine, anomalies of rotation and fixation, intestinal duplications, and anomalies of the colon and rectum. CT has proven more reliable as it provides better anatomic details for correct diagnosis.[20]

Appendicitis: Appendicitis is the most common pediatric surgical emergency and should be ruled out for all children with abdominal pain. Shimkin et al in their study has shown that 50–84% of acute appendicitis cases are positive in Abdominal X-rays, while our study has revealed that 96.9% positive on ultrasound.[21] Several studies have revealed a detection rate of an enlarged appendix to be 80–84%.[22,23] This could be due to the performance based on experience of

ultrasound assistants. Although CT is considered as the most sensitive and specific (94–99%) for the diagnosis of acute appendicitis in children, it is rarely used because of its disadvantages.[10]

Although ultrasound and CT scan are not always indicated in cases with typical clinical presentations of appendicitis, ultrasound as a screening tool can be used for patients with suspected appendicitis with or without typical presentation as it has almost no contraindications and has the advantage of cost-effective, quick, painless, and non-invasive investigation with no radiation hazards or parental contrast reaction.

Nonspecifc Abdominal Pain and Extra-abdominal disease: Some children do present with nonspecific abdominal pain and some with extra-abdominal disease because of the simple effects of referred pain which results from shared central pathways for afferent neurons from different sites. Studies have shown that patient suffering with pneumonia presents with acute abdominal pain because of T9 dermatome involvement in the lungs as well as the abdomen and patients with myocarditis may show gastrointestinal symptoms like abdominal pain and vomiting.[24,25,26] Thus, abdominal pain may be a manifestation of pneumonia, myocarditis, or other systemic diseases.

Disadvantage of ultrasound: Ultrasound with its advantages also has some of the disadvantages. One of the common ones being its operator dependency and limited diagnostic value in cases of obesity, overlying gas, or perforation and its inability to penetrate bone.[10] Although several studies have revealed that the accuracy of ultrasound in upper abdominal pain is not precise because of its limitations in diagnosing gastrointestinal problems, mild urinary tract infections, and some pathologies above the diaphragm, it still remains one of the screening investigations in patients with upper abdominal pain, after history and clinical examination.[2,19,27,28,29,30,31,32] Our study showed that ultrasound would be the first diagnostic method in pediatric populations with right lower quadrant or colicky pain, no additional examination is needed for detecting gynecological disease, gastrointestinal infection and acute appendicitis.

Limitations: Since our study has been done only in a single hospital, a prospective study at multiple centers with an ultrasound evaluation of abdominal pain in children is required.

CONCLUSION:

Acute abdominal pain is a common complaint in children in the pediatric emergency cases. The most common cause of acute abdominal pain in pediatric populations is gynecological disease, gastrointestinal infection and acute appendicitis. Apart from history taking and detailed physical examination, ultrasound is a very effective, complementary, non-invasive method for evaluating children with acute abdominal pain, especially those with unexplained lower abdominal pain or those with suspected gynecological disease, gastrointestinal infection and acute appendicitis.

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