The Professional Medical Journal
www.theprofesional.com

ORIGINAL PROF-2897

ACUTE ABDOMINAL PAIN IN CHILDREN;
CLINICAL OUTCOMES & VALUE OF SYMPTOMS AND SIGNS IN DIAGNOSIS

Dr. Muhammad Ali Sheikh[1], Dr. Tariq Latif[2]

1. Associate Professor
Department of Paediatric Surgery
Shaikh Zayed Hospital, Lahore.

Corresponding author:
Dr. Muhammad Ali Sheikh
Associate Professor
Department of Paediatric Surgery
Shaikh Zayed Hospital, Lahore.
drali444@yahoo.com

Article received on:
25/02/15
Accepted for publication:
25/05/15
Received after proof reading:
08/08/2015

ABSTRACT… Objective: To determine the clinical outcomes of acute abdominal pain and evaluation of symptoms and signs in children admitted in pediatric surgery department. **Design:** Cohort study. **Place and Duration of study:** This study was conducted in Department of Paediatric Surgery Shaikh Zayed Hospital, Lahore between August 2010 to August 2012. **Patients and methods:** Children aged 2 to 14 years who presented to emergency department with complaint of acute abdominal pain of less than 5 days duration and admitted in pediatric surgery department were included. Presenting symptoms, signs, hospital course of patients and discharge diagnosis were recoded. Data was analyzed by SPSS. **Results:** Out of 73104 patients who were seen in Paediatric emergency 1420 (1.94%) were referred for surgical evaluation. Out of these 157 children were admitted. Six patients left against medical advice so 151 patients were studied. Patients were divided into acute appendicitis, non-specific pain abdomen and miscellaneous categories on the basis of discharge diagnosis. Acute appendicitis was diagnosed in 61(40.4%) patients. The patients who were admitted and no cause of pain abdomen could be found in them, were included in non-specific pain abdomen group. NSPA group had 39 (25.8%) patients. Rests of the 51 (33.8%) patients were included in miscellaneous group. Anorexia, fever, pain in right lower quadrant, tenderness in right iliac fossa, guarding, rebound tenderness and tachycardia were all significantly higher in patients with acute appendicitis. **Conclusion:** Most of the children with acute abdominal pain would not require surgery. Detailed history and thorough physical examination are cornerstone of the diagnosis.

Key words: Acute abdominal pain, children, appendicitis, non-specific abdominal pain, outcome.

Article Citation: Sheikh MA, Latif T. Acute abdominal pain in children; clinical outcomes & value of symptoms and signs in diagnosis. Professional Med J 2015;22(8):1080-1086.

INTRODUCTION

Acute abdominal pain is one of the common complaints which are encountered by pediatric surgeons.[1] Acute abdomen can be defined as a medical emergency in which there is severe pain of sudden onset with symptoms and signs that point towards an abdominal involvement.[2] The causes of abdominal pain in children are age specific but several conditions can present at any age, including appendicitis, gastroenteritis and constipation. Some of the problems are self-limited, while others can be life threatening.[3]

This is the responsibility of treating physician to differentiate between a self-limiting process, such as viral gastroenteritis or constipation from more life threatening surgical emergencies like appendicitis and intestinal obstruction.[4]

Although there have been many advances in the diagnostic modalities, still the diagnosis and management of acute abdominal pain in childhood is a clinical challenge. The mainstay of diagnosis in acute abdominal pain in children is detailed history and thorough physical examination.[5] In certain patients diagnosis of acute abdomen requiring surgery is clear after initial history and examination. In others inpatient observation for 24 hours will help in making the final diagnosis.[6]

Most of the conditions presenting as acute abdominal pain do not require surgical intervention and in others mainstay of diagnosis is repeated physical examination and selected hematological and radiological investigations.[5]

The objective of this study was to determine clinical outcomes of children admitted with acute abdominal pain and value of symptoms and signs in making a definite diagnosis.

METHODOLOGY

This study was conducted during August 2010 to August 2012 in Department of Paediatric Surgery, Shaikh Zayed Hospital Lahore. Patients between 2 years to 14 years of age with acute abdominal pain of less than 5 days duration were enrolled. Patients with trauma, previous abdominal surgery were excluded. All the patients presenting in emergency department were initially evaluated by an emergency department physician. The Paediatric Surgery department was consulted only when cause of abdominal pain was thought to be surgical. After detailed history and examination, a senior resident from surgical department decided about admission, observation or discharge of the patient. The patients with abdominal pain who were discharged after initial assessment or kept under observation for less than 12 hours, were not included in the study.

A questionnaire was filled for every admitted patient, which included age, gender, presenting symptoms and signs, laboratory test results, hospital follow up and discharge diagnosis. The collected data included duration, location (nine regions of abdomen or whole abdomen), shifting and character (colicky, dullache, burning) of pain. Associated symptoms like sore throat, anorexia, vomiting, fever (temperature more than 99˚ Fahrenheit), burning micturition, constipation and diarrhea were also noted. Physical examination included pulse rate, temperature, area of maximum tenderness, involuntary guarding, rebound tenderness, any palpable masses and abdominal distension.

Patients were investigated according to suspected pathology but hemoglobin level and white blood cell count were done for all patients. The patients underwent surgery if their diagnosis was clear at the time of admission. The patients in whom diagnosis was not clear, they were evaluated at 6, 12 and 24 hours of admission. Final diagnosis was noted at the time of discharge.

Data were analyzed by SPSS v 20. Anorexia, vomiting, fever, burning micturition, constipation, pain right lower quadrant, tenderness at right iliac fossa, rebound tenderness and diagnosis were presented by using frequency and percentages. Age, pulse rate, temperature, hemoglobin level and total leukocyte count (TLC) were described by using mean and standard deviation. Comparison between three diagnostic groups was performed by using ANOVA for pulse rate and TLC. To compare the differences for symptoms and signs among three groups chi-square test was applied. p-value less than 0.05 was considered significant.

RESULTS

Total number of patients who presented to paediatric emergency during study period were 73104, among whom 1420(1.94%) with abdominal pain were referred for surgical evaluation. Among these 172 (12.1%) were admitted as acute abdomen. Out of these 172 admitted patients 157(11.1%) met the inclusion criteria (age more than 2 years and duration of pain less than 5 days). Six patients left against medical advice, so total cases studied were 151. There were 89 (58.9%) male and 62(41.1%) female patients. Sex distribution among different groups is shown in table-I. The mean age of the 151 patients was 9.7 ± 2.90 years (range: 2-14 years). Patients were divided into three categories on the basis of discharge diagnosis. These were acute appendicitis, non-specific pain abdomen and miscellaneous. Acute appendicitis (AA) was diagnosed in 61(40.4%) patients and they all were operated. The patients who were admitted with equivocal symptoms and signs of appendicitis but later settled and no other cause of pain abdomen could be found in them, were included in non-specific pain abdomen group (NSPA). NSPA group had 39 (25.8%) patients. Rests of the 51 (33.8%) patients were included in miscellaneous group, whose detail is given in table-II. In 89% (134) of the patients duration of pain was less than three days and most common site of pain was right iliac fossa (n=93,61.6%). Character of pain was dull ache in most of the patients (n=99, 65.6%) and it was colicky in

47(31%) patients. In AA group 56 (91.8%) patients presented with pain in right lower quadrant (RLQ) as compared to NSPA in which 25 (64%) had pain in RLQ. Among symptoms and signs anorexia and fever were significantly higher in AA group with p-value of 0.010 and 0.038 respectively. Vomiting was significantly higher in both AA and miscellaneous groups than NSPA group (p=0.036). Burning micturition and constipation were significantly higher in miscellaneous group with p-values of 0.032 and 0.001 respectively.

	Acute Appendicitis	NSPA	Miscellaneous
Male	40	25	24
Female	21	14	27
Total	61	39	51

Table-I. Sex distribution among three groups

Discharge diagnosis	No. of Patients (51)	Percentage (33.8%)
Constipation	11	21.56%
Typhoid enteritis	7	13.72%
Abdominal tuberculosis	6	11.76%
Gastroenteritis	6	11.76%
Urinary tract infection	5	9.80%
Acute pancreatitis	3	5.88%
Congenital obstructive intestinal bands	2	3.92%
Ovarian cyst	2	3.92%
Adhesive bowel obstruction	1	1.96%
Cholecystitis	1	1.96%
Choledochal Cyst	1	1.96%
Diabetic ketoacidosis	1	1.96%
Hydronephrosis	1	1.96%
Meckle's diverticulum with band	1	1.96%
Ovarian torsion	1	1.96%
Primary peritonitis	1	1.96%
Testicular torsion	1	1.96%

Table-II. Discharge diagnosis in miscellaneous group.

In AA group 86.9% (n=53) cases had guarding which was significantly higher ($p < 0.001$) than both groups. Tenderness at right iliac fossa and rebound tenderness were significantly higher in AA group, both with $p < 0.001$. Fever was noted in 42.6% (n=26) of patients in AA group and it was significantly higher than other two groups with $p = 0.038$. Similarly pulse rate at the time of admission and total leukocyte count were significantly higher in AA group with p-values 0.045 and <0.001 respectively. Frequencies of symptoms and signs in different diagnostic groups is shown in table-III. Table-IV shows significance of total leukocyte count, and pulse rate at the time of admission.

DISCUSSION

Acute abdominal pain in children presents a diagnostic dilemma to the treating physician. The main source of debate and controversy is whether the patient has a problem requiring surgery.[7,8] Abdominal pain in children may be caused by numerous disorders.[7] The most common medical cause is gastroenteritis and the most common surgical cause is appendicitis.[9] A careful history and physical examination, together with a small number of selected laboratory studies, provide a rational basis for effective management in most of the cases. The present study was conducted to know common discharge diagnosis in patients presenting with acute abdominal pain and in particular discriminative value of clinical features in establishing the diagnosis.

In our study incidence of acute abdominal pain requiring surgical opinion was about 2%. Among 1420 patients referred for surgical evaluation, 12% required admission, 4% had appendicitis and only 5% required surgical intervention. Among 156 patients admitted by our unit, 49.6% required surgical intervention. In a retrospective study by Wai and colleagues 237 children presenting with acute abdominal pain to ED, 16% (37) required admission in the surgical unit and 9% required surgical intervention.[6] Appendectomy was performed in 5% of the patients and most common discharge diagnosis was NSPA.[6] Their results are comparable with ours. Klein and colleagues retrospectively studied 1008 children, among them 6% had appendicitis but the most common discharge diagnosis was abdominal pain of uncertain etiology.[10]

The incidence of children presenting with acute abdominal pain was about 5% in the studies

		Acute appendicitis		Non-Specific pain abdomen		Miscellaneous		Total		p-value
		n	%	n	%	n	%	n	%	
Anorexia	Yes	43	70.5%	18	46.2%	23	45.1%	84	55.6%	0.010
	No	18	29.5%	21	53.8%	28	54.9%	67	44.4%	
Vomiting	Yes	41	67.2%	17	43.6%	34	66.7%	92	60.9%	0.036
	No	20	32.8%	22	56.4%	17	33.3%	59	39.1%	
Burning micturation	Yes	4	6.6%	1	2.6%	9	17.6%	14	9.3%	0.032
	No	57	93.4%	38	97.4%	42	82.4%	137	90.7%	
Constipation	Yes	3	4.9%	4	10.3%	16	31.4%	23	15.2%	<0.001
	No	58	95.1%	35	89.7%	35	68.6%	128	84.8%	
Diarrhoea	Yes	2	3.3%	2	5.1%	7	13.7%	11	7.3%	0.088
	No	59	96.7%	37	94.9%	44	86.3%	140	92.7%	
Guarding	Yes	53	86.9%	4	10.3%	14	27.5%	71	47.0%	<0.001
	No	8	13.1%	35	89.7%	37	72.5%	80	53.0%	
Tenderness at right iliac fossa	Yes	58	95.1%	27	69.2%	18	35.3%	103	68.2%	<0.001
	No	3	4.9%	12	30.8%	33	64.7%	48	31.8%	
Rebound tenderness	Yes	56	91.8%	3	7.7%	10	19.6%	69	45.7%	<0.001
	No	5	8.2%	36	92.3%	41	80.4%	82	54.3%	
Pain right lower quadrant	Yes	56	91.8%	25	64.1%	12	23.5%	93	61.6%	<0.001
	No	5	8.2%	14	35.9%	39	76.5%	58	38.4%	
Fever	Yes	26	42.6%	7	17.9%	18	35.3%	51	33.8%	0.038
	No	35	57.4%	32	82.1%	33	64.7%	100	66.2%	

Table-III. Frequencies of symptoms & signs with their significance

reported by Scholer et al[11] and Erkan et al.[4] Scholer and colleagues retrospectively examined 1141 children aged 2 to 12 years and included all the patients presenting to emergency department (ED) with acute abdominal pain; however we only included those patients who were admitted in our surgical unit. This also explains the observation that in their study most common discharge diagnosis was upper respiratory tract infection (18.6%) and less than 1% of patients required surgery. The two most common final diagnoses in our study were acute appendicitis (40%) and non-specific abdominal pain (25.8%). Similar results were reported by other studies.[1,6,8,10] Male patients were predominant in our study as also reported by others.[1,4,8,10]

Caperell and colleagues studied racial differences for outcome of acute abdominal pain in children.[12] They noted that appendicitis was more common in whites than African-Americans. In African-Americans constipation was more common. The cause of acute abdominal pain in more than 25% of children, in their study was constipation. Constipation was third most common diagnosis in our study, noted in 7.2% of the patients. Difference in the incidence of constipation may be due to different eating habits, with use of fiber rich diet in our population. The diagnosis of constipation was made by thorough history and complete physical examination (including rectal examination where required), with or without plain abdominal radiograph. Erkan et al from Turkey reported constipation in 9%of their patients.[4] Reynolds and Jaffe in their prospective study looking at the causes of acute abdominal pain in children reported that 36% children had NSPA, 8 % had appendicitis and 7% had constipation.[13] Their patients were of same age as our patients (2-15 years) and results are also similar.

Abantanga and colleagues from Ghana studied 955 children aged 1 to 15 years.[14] The most common surgical emergency in their study was typhoid perforation (68%) of gastrointestinal tract, followed by acute appendicitis in 16% of patients. Intussusception was noted in 2% and primary peritonitis in about 1%of the children. Gall

bladder diseases were noted in 0.8%, ovarian problems in 0.5% and Meckel's diverticulitis in 0.2% of children. In our study typhoid perforation was noted in 4.6%, ovarian pathology in 3%, gall bladder disease in 1.4% and Meckel's diverticulitis in 0.7% of cases. We operated on five patients of intussusception during study period but all were younger than 2 years, so they were not included in the current study. According to them occurrence of so many cases of enteric fever was due to unhygienic conditions, ignorance and increased susceptibility due to malnutrition and poor immunity.[14]

In our study 4% of patients, presenting with acute intestinal obstruction were diagnosed to have abdominal tuberculosis. Three of them were managed by anti tuberculous medicines and only one required surgery. We did not find any case of abdominal tuberculosis in other studies. Kosloske et al retrospectively studied 356 children and 62% of them underwent appendectomy.[15] We followed almost similar protocol as was followed by them to reach the diagnosis of appendicitis. Initial pediatric surgical evaluation consisted of history, physical examination, white blood cell count and urine analysis. We performed urine analysis only if there was suspicion of urinary tract infection. Once the diagnosis of appendicitis was made, child underwent appendectomy; otherwise he was re-evaluated after 4 to 6 hours. They emphasized on a protocol based on clinical evaluation by a pediatric surgeon with selective use of imaging for the diagnosis of appendicitis in children and we agree with them.

In many centers imaging for possible appendicitis has become a routine. Ultrasound is safe with no risk of radiation but is highly operator dependent**.** The sensitivity of sonography for diagnosing appendicitis is between 80-95%, with a specificity of 89-100% and an accuracy of 90-96% as reported by Sargar et al.[16] In our setup, emergency ultrasound is usually performed by junior radiologists and is not of much help in making a final diagnosis of appendicitis but can easily pick up pathologies like renal calculi, ovarian pathologies, intussusception and pancreatitis. Reports advocating CT scan with or without rectal contrast or focused scan for diagnosis of acute appendicitis have appeared in literature.[17] However, diagnostic imaging may not be as useful as previously believed.[18] Patrick et al[19] and Martin et al[20] reported in large cohorts that despite increase in CT scan utilization, the negative appendectomy rates and perforation rates remained unchanged. Brenner et al estimated that out of the 600,000 children who undergo CT scans each year, 500 might develop cancer as a direct result of their radiation exposure.[21] Finally, time required in obtaining these studies before surgery may delay the surgery.

We based our diagnosis of acute appendicitis on history and repeated physical examination. Anorexia, fever, pain in right lower quadrant, tenderness in right iliac fossa, involuntary guarding, rebound tenderness and tachycardia were all significantly higher in our patients with appendicitis. Similar findings were noted by other researchers.[8,13,22] Similarly total leukocyte count (TLC) was significantly higher in AA group. These clinical findings along with TLC could be helpful in differentiating patients with AA form NSPA. Bundy et al[5] in a meta-analysis noted that fever increases the likelihood of appendicitis by about 3-fold, while the absence of fever lowers the likelihood of appendicitis by about two thirds. The presence of rebound tenderness tripled the odds of appendicitis, while its absence decreased the odds by more than two thirds. Involuntary guard was as useful as rebound tenderness. These variables may be helpful in making the decision to operate, observe or to perform imaging.

Previously we have reported our experience of patients with acute appendicitis and found that involuntary guard, rebound tenderness and total leukocyte count above 11,000 were significantly more prevalent in biopsy proven cases of acute appendicitis.[23]

Because appendicitis is an evolving pathologic process and early appendicitis may be impossible to differentiate from other causes of abdominal pain in children. Therefore, clinical re-evaluation

after a period of observation and supportive care may be necessary.

CONCLUSION

In conclusion, complaint of acute abdominal pain occurs in almost 2% of children visiting pediatric emergency department. More than half of them would not require surgery. Detailed history and thorough physical examination would be helpful to differentiate between AA and NSPA. If still in doubt, re-evaluating the child every 4 to 6 hours for 24 hours will make the diagnosis clear. Children with a low likelihood of appendicitis may be spared of the expense and risk of a more invasive and costly workup and may be safely sent home with careful follow-up. This strategy will minimize radiation exposure and costs associated with them.

REFERENCES

1. Tseng YC, Lee MS, Chang YJ, Wu HP. **Acute abdomen in pediatric patients admitted to the pediatric emergency department.** Pediatr Neonatol 2008; 49:126-134.
2. Balachandran B, Singhi S, Lal S. **Emergency management of acute abdomen in children.** Indian J Pediatr 2013; 80:226-234.
3. McCollough M, Sharieff GQ. **Abdominal pain in children.** Pediatr Clin North Am 2006; 53:107-37.
4. Erkan T, Cam H, Ozkan HC, Kiray E, Erginoz E, Kutlu T et al. **Clinical spectrum of acute abdominal pain in Turkish pediatric patients: A prospective study.** Pediatr Int 2004; 46:325-9.
5. Bundy DG, Byerley JS, Liles EA, Perrin EM, Katznelson J, Rice HE. **Does this child have appendicitis?** JAMA 2007; 298:438-51.
6. Wai S, Ma L, Kim E, Adekunle-Ojo A. **The utility of the emergency department observation unit for children with abdominal pain.** Pediatr Emerg Care 2013; 29:574-8.
7. Leung AK, Sigalet DL. **Acute abdominal pain in children.** Am Fam Physician. 2003; 67:2321-6.
8. Williams NM, Johnstone JM, Everson NW. **The diagnostic value of symptoms and signs in childhood abdominal pain.** J R Coll Surg Edinb. 1998; 43:390-2.
9. Lin CH, Chen JH, Li TC, Ho YJ, Lin WC. **Children presenting at the emergency department with right lower quadrant pain.** Kaohsiung J Med Sci 2009; 25:1–9.
10. Klein MD, Rabbani AB, Rood KD, Durham T, Rosenberg NM, Bahr MJ et al. **Three quantitative approaches to the diagnosis of abdominal pain in children: Practical applications of decision theory.** J Pediatr Surg 2001; 36:1375-80.
11. Scholer SJ, Pituch K, Orr DP, Dittus RS. **Clinical outcomes of children with acute abdominal pain.** Pediatrics 1996; 98:680-685.
12. Caperell K, Pitetti R, Cross KP. **Race and acute abdominal pain in a pediatric emergency department.** Pediatrics. 2013; 131:1098-1106.
13. Reynolds SL, Jaffe DM. **Diagnosing abdominal pain in a pediatric emergency department.** Pediatr Emerg Care 1992; 8:126-8.
14. Abantanga FA, Nimako B, Amoah M. **The range of abdominal surgical emergencies in children older than 1 year at the Komfo Anokye teaching hospital, Kumasi, Ghana.** Ann Afr Med 2009; 8:236-42.
15. Kosloske AM, Love CL, Rohrer JE, Goldthorn JF, Lacey SR. **The diagnosis of appendicitis in children:outcomes of a strategy based on pediatric surgical evaluation.** Pediatrics 2004; 113:29-34.
16. Sargar KM, Siegel MJ. **Sonography of acute appendicitis and its mimics in children.** Indian J Radiol Imaging 2014; 24:163-70.
17. Akhtar W, Ali S, Arshad M, Ali FN, Nadeem N. **Focused abdominal CT scan for acute appendicitis in children: Can it help in need?** J Pak Med Assoc 2011; 61:474-76.
18. Kharbanda AB, Taylor GA, Fishman SJ, Bachur RG. **A clinical decision rule to identify children at low risk for appendicitis.** Pediatrics. 2005; 116:709-16.
19. Partrick DA, Janik JE, Janik JS, Bensard DD, Karrer FM. **Increased CT scan utilization does not improve the diagnostic accuracy of appendicitis in children.** J Pediatr Surg 2003; 38:659– 662.
20. Martin AE, Vollman D, Adler B, Caniano DA. **CT scans may not reduce the negative appendectomy rate in children.** J Pediatr Surg 2004; 39:886– 890.
21. Brenner D, Elliston C, Hall E, Berdon W. **Estimated risks of radiation-induced fatal cancer from pediatric CT.** Am J Roentgenol 2001; 176:289– 296.

22. Mughal SA, Soomro S. **Acute appendicitis in children.** J Surg Pak 2007; 12:123-25.

23. Sheikh MA, Latif T. **Acute appendicitis in children; correlation of clinical data with histopathological findings.** Professional Med J 2014;21: 27-32.

"Life is really simple,
but we insist on making
it complicated."

Confucius

PREVIOUS RELATED STUDY

Abdolali Assarian , Raymond Chung, Ahsan Zafar Zaidi. PLAIN ABDOMINAL RADIOGRAPHS AND ACUTE ABDOMINAL PAIN (Original) Prof Med Jour 15(1) 33 - 36 Jan, Feb, Mar, 2008.

AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
1	Dr. Muhammad Ali Sheikh	1st author	
2	Dr. Tariq Latif	2nd author	