

Original Research Article

Clinical symptoms, paraclinical tests and histopathological results in children with acute appendicitis in Zabol southeast of Iran: a cross-sectional study

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ABSTRACT

Background: This article aimed to assessment clinical signs and symptoms, paraclinical tests and histopathological results in children with acute appendicitis.

Methods: A cross-sectional study conducted on 100 children with acute appendicitis in an urban hospital in southeast of Iran from January to December 2016. Participants were selected by simple random sampling method. Clinical signs and symptoms, paraclinical tests and histopathological results recorded in checklists. The data were analyzed using SPSS 22.

Results: Mean age of the patients was 10.26 ± 3.25 , fourthly-eight of patients (58.5%) were males and 34 patients (41.5%) were females. The most frequent clinical signs and symptoms were acute suppurative appendicitis with peri appendicitis (45.83%) and acute suppurative appendicitis (39.58%). The most frequent results in ultrasound reports were Intestinal loop thickness greater than 6 mm without peristalsis (positive report) (46.34%) and Invisible appendix (nega Hesaraki tive report) (13.41%).

Conclusions: The results of this study showed that abdominal pain and RLQ tenderness were the most common signs and symptoms and WBC left-shift was the most common laboratory finding. Since the rate of negative appendectomy in this study was consistent with surgical results and other articles, it is concluded that diagnostic accuracy of preoperative appendectomy was acceptable and most children with acute appendicitis underwent appendectomy.

Keywords: Abdominal pain, Appendicitis, Child

INTRODUCTION

Acute appendicitis is one of the most common abdominal pain disorders in children, which requires emergency surgery.¹ Causes of acute appendicitis secondary to obstruction of the appendix lumen are ischemic mucosal damage and bacterial invasion. However, other agents are involved in causing or mimicking appendicitis. Typically, many medical institutions transfer appendix samples to specific laboratories for histopathological assessment.² Early diagnosis of acute appendicitis reduces the risk of such complications such as perforation and peritonitis.³

However, diagnosis of acute appendicitis in children is a huge challenge for surgeon's due to similarity in signs and symptoms of appendicitis and other common diseases in children such as acute gastroenteritis. Atypical presentations of appendicitis in children and inability of children to explain their symptoms also contribute to difficult diagnosis of acute appendicitis in children. This increases the risk of appendicitis complications in children.⁴ In contrast, the rate of negative appendectomy varies from 3% to 54%.⁵ In addition to CT and ultrasound, different scoring systems based on history, physical examination and laboratory data contribute to

diagnosis of acute appendicitis. Previous studies have shown that Alvarado score or Pediatric Appendicitis Score (PAS) is more reliable for diagnosis of acute appendicitis than other methods such as taking history of the patients.^{6,7} These standards have reduced the negative appendectomy rate.⁸ Clinical signs and symptoms, Paraclinical tests and histopathological results were assessed in children with acute appendicitis in an urban hospital in southeast of Iran.

METHODS

This cross-sectional study conducted on 100 children with Acute appendicitis in an urban hospital (Amir Almomenin Medical Teaching Hospital of Zabol city) in southeast of Iran from January to December 2016. Participants were selected by simple random sampling method.

Inclusion criteria were having symptoms of acute appendicitis including abdominal pain, fever, loss of appetite, nausea and vomiting. Having diagnosis of acute appendicitis and underwent an appendectomy. Exclusion criteria were incomplete medical records. A paper-and-pencil questionnaire was developed by the researchers for use in this study.

Following a review of the literature, which included a review of recommendations about appendicitis use from varied international research centers.^{1,9,10} Data was collected from patient records including demographic data (age and gender), signs and symptoms of the disease (main complaint of the patient, abdominal pain, fever, loss of appetite, nausea and vomiting, diarrhea, dysuria, dehydration, rectorrhagia, abdominal tenderness, rebound tenderness, guarding, obturator signs, Rovsing's sign and psoas), ultrasonic report, laboratory findings (CBC, ESR and CRP), pathological reports and complications of appendicitis (perforation, gangrene, peritonitis, intra-abdominal mass, pelvic abscess and rupture of the descending colon and sigmoid).

Descriptive tests of the frequency, mean and standard deviation (SD) were used to describe sample demographics. SPSS version 22.0 for Windows (SPSS Inc., Chicago, IL, USA) was used to analyze the data.

RESULTS

In total, 82 children were diagnosed with acute abdomen and underwent an appendectomy in Amir Almomenin Hospital in Zabol in 2014. Mean age of the patients was 10.26 ± 3.25 (median = 11, $1 < \text{range} < 14$). In addition, 48 patients (58.5%) were males and 34 patients (41.5%) were females. Frequency distribution of clinical symptoms, clinical examination, laboratory results and complications of appendectomy in children are shown in Table 1.

Table 1: Symptoms, laboratory, physical examination findings and complication of the patients.

Symptoms (%)	
Abdominal pain	97/56
Nausea and vomiting	78/05
Loss of appetite	39/02
Diarrhea	7/32
Laboratory (%)	
Leukocytosis ≥ 10000	92/68
Fever $\geq 37.3^\circ\text{C}$	29/27
ESR	41/46
CRP	37/80
Physical examination (%)	
Right lower quadrant tenderness	79/27
Guarding	6/09
Local rebound	36/58
Obturator	1/22
Psoas	1/22
Rowsing	4/88
Complication	
Perforation	12.19
Peritonint	7.31

Table 2: Abnormal findings encountered in the appendectomy.

Gender pathology	Male		Female		Total	
	N	%	N	%	N	%
Acute suppurative appendicitis with periappendicitis	22	45.83	21	61.76	43	52.43
Acute suppurative appendicitis	19	39.58	8	23.53	27	32.92
Congestive appendix	1	2.08	3	8.82	4	4.87
Vermiform appendix with vascular congestion	3	6.25	1	2.94	4	4.87
Vermiform appendix with mucosal lymphoid hyperplasia	0	0	1	2.94	1	1.21
Gangrenous appendicitis	1	2.08	0	0	1	1.21
Oxyuriasis	1	2.08	0	0	1	1.21
Fecolith	1	2.08	0	0	1	1.21
Total	48	100	34	100	82	100

Most frequent Symptoms were abdominal pain, Nausea and vomiting and Loss of appetite, the most frequent Laboratory signs was Leukocytosis \geq 10000, The most frequent Physical examination result was Right lower quadrant tenderness, the most frequent complication was Perforation. (Table 1).

Frequency distribution of pathological diagnoses in children undergoing an appendectomy based on gender and age are shown in Table 2. Ultrasonic results in children undergoing appendectomy are shown in Table 3.

Table 3: Results of ultrasound reports on children undergoing appendectomy.

Ultrasound report	N	%
Intestinal loop thickness greater than 6 mm without peristalsis (positive report)	38	46.34
Invisible appendix (negative report)	11	13.41
Intussusception	2	2.4
Fluid-filled intestinal loops with increased peristalsis and wall thickness	1	1.22
Decreased intestinal peristalsis in RLQ	1	1.11
Larger right ovary and hyper echogenicity behind the uterus (rotation of ovarian cysts)	1	1.22
No ultrasound	28	34.15
Total	82	100

DISCUSSION

Acute appendicitis in children is caused by obstruction of appendix lumen that result in congestion. Obstruction of the appendix lumen in children is primarily due to bacterial and viral infections and secondary due to fecality and external objects. Obstruction of appendix lumen and resulting congestion are followed by swelling and stiffness of the appendix. At this stage, visceral abdominal pain is felt around the belly button.¹¹ Then, the pain is felt in the right lower quadrant of the abdomen. Congestion leads to vascular thrombosis and mucosal damage, which ultimately causes microbial invasion into the appendix wall followed by inflammation.^{12,13} As the disease progresses, necrosis and gangrene develop in the appendix that cause perforation and greatly induce peritoneal irritation. At this stage, the pain may radiate and intensify over a diffuse area of the abdomen. Guarding and rebound tenderness are intensified in clinical examinations.¹¹ Infection may be transmitted to the liver through blood with abscess formation or peritonitis that causes vascular infections. All surgeons emphasized early diagnosis of the disease due to rapid progression of the disease in children to avoid adverse side effects. Therefore, it recommended to use paraclinical tests including ultrasound, radiology and CT scan for diagnosis of appendicitis.¹⁴ Such symptoms as pain, vomiting, guarding, tenderness and rebound tenderness in physical examination contribute to

diagnosis, prediction of progress in the disease in an effective manner.^{11,15} Clinical symptoms and abdominal examination findings will change with progress of the disease and its pathology. Rebound tenderness represents gangrenous or perforation in acute appendicitis. In this study, 82 children undergoing appendectomy were examined. The results showed that generalized abdominal pain and pain in RLQ are the most common complaints of patients on admission to hospital. Abdominal pain, nausea and vomiting are also the most common clinical symptoms of the patients with acute appendicitis.

Tenderness in RLQ area and rebound tenderness are the most common clinical symptoms of appendicitis in children. The most common laboratory findings were left-shift WBC and PMN preference. Perforation was the most common complication of appendicitis. Comorbidities and intussusception were the most frequent cases in appendicitis. Ultrasound reports on the children referring to the hospital showed that increased thickness of intestinal loop without peristalsis can be used as for diagnostic of acute appendicitis in half of the patients.

However, appendicitis was not reported in ultrasound results in the patients and negative reports were given. Results of pathological records of the patients undergoing appendectomy indicated that acute suppurative appendicitis with preappendicitis was the most common pathological findings in studied children (52.4%). In this study, there were no pathological report on normal appendix. There were seventy cases (85.36%) of acute appendicitis based on pathological reports including acute suppurative appendicitis with priappendicitis and acute suppurative appendicitis.

Nemeth et al. detected a subset of appendix with histological changes but with evidence of inflammation at molecular level.¹⁶ A subset of pathological reports not representing acute appendicitis and just indicating an evidence of inflammation was detected in this study (prevalence=14.64%). This was a negative appendectomy, which was more prevalent in females than males. Negative appendectomy was also more prevalent in females than males in other studies.¹⁷⁻¹⁹

This indicates difficulty of diagnosis of acute appendicitis in children and females since symptoms of female disorders are similar to clinical symptoms of acute appendicitis.²⁰ The most common pathology of the appendix that mimics acute appendicitis in children are mesenteric adenitis, ovarian cysts, ovarian and torsion cysts, urinary tract infection and complications of Meckel's diverticulum.²¹

The rate of perforation in the study was close to other studies.^{22,23} However, there was a large difference in rate of perforation in this study and other studies,²⁴ which may be due to aggressive surgical approach for fear of perforation (to avoid perforation).

Alemayehu et al studied the incidence and outcomes of unexpected pathology findings after appendectomy and showed that 3.1% of the patients had normal appendices and 2.4% of the patients had unexpected findings, including carcinoid tumor, pinworm, granuloma, eosinophilic infiltrates and other.²⁵ However, an evidence of normal appendix was not detected in the present study and pinworm was only found out in 1.2% of the samples. Charfi et al studied histopathologic findings in appendectomy specimens and showed development of acute appendicitis in 79.5% of the patients.²⁴ Neoplastic lesions were also detected in 171 cases (0.7%) including carcinoid tumors, adenocarcinomas and mucinous neoplasms.²⁴ In the present study, acute appendicitis was detected in 85.36% of the patients based on pathology, which was consistent with the results of the above study. No case of neoplastic lesions was reported in this study, which was not consistent with the results of the above-mentioned study. Delshad and Yousefi studied the relationship between clinical findings and pathological findings in children with acute appendicitis and showed that clinical symptoms and examination findings are consistent with pathological results. In other words, progress in pathology of appendicitis is consistent with progress and severity of symptoms.²⁶ However, this was purely a descriptive study and the relationship between clinical symptoms and pathological findings was not studied.

Hashemi et al studied the prevalence of fungi in lesions with suspected appendicitis. They found out fungi in 5% of lesions with suspected appendicitis.²⁷ However, no case of fungal infection causing appendicitis was found in the present study.

On the other hand, Vakili and Sayah studied pathologic lesions of appendix and showed that 79.2% of the patients had positive appendectomy and 20.8% of the patients had negative appendectomy. Acute suppurative appendicitis was the most prevalent diagnostic finding in pathological lesion (63.2%), respectively. An incidence of follicular hyperplasia was detected in 25% of the cases (23). Generalized pain radiating over right lower quadrant of the abdomen was the most common complaints of patients on admission to hospital in this study. Abdominal pain, nausea and vomiting were the most common clinical symptoms of patients with acute appendicitis. The most common pathology was acute suppurative appendicitis with preappendicitis.²⁸ The rate of this pathology in this study was 1.5 times (85.35%) the rate in the above-mentioned study. Mucosal lymphoid hyperplasia was reported in only one case.

CONCLUSION

The results of this study showed that abdominal pain and RLQ tenderness were the most common signs and symptoms and WBC left-shift was the most common laboratory finding. Ultrasound report in half of the patients was positive and diagnostic. Acute suppurative

appendicitis with preappendicitis was the most common pathological finding and perforation was the most common complication of appendicitis. The results showed that clinical symptoms and laboratory and ultrasound results contribute to diagnosis of appendicitis. These tools also contributed to pathological diagnosis of acute appendicitis.

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