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Original Article

DIAGNOSTIC CLINICAL AND LABORATORY PARAMETERS OF PEDIATRIC APPENDICITIS

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ABSTRACT

Objective: To assess the diagnostic value of disease history, clinical presentation, and inflammatory parameters of appendicitis in children in Abbasi Shaheed hospital.

Study Design: cross-sectional study.

Place and Duration of Study: Abbasi Shaheed hospital, Karachi from Jan 2012 to June 2012.

Methodology: Patients admitted with presenting complain of RLQ pain aged <18 years. All relevant features including patient bio data, clinical history, examination, laboratory findings and radiological findings were recorded. Patients with other causes of RLQ pain, and those who havenot given consent were excluded.

Results: A total 50 children of pediatric age group were admitted. Out of 50 patients, 38(76%) patients were diagnosed of appendicitis while 3(6%) patients were found to have complication of appendicitis i-e; peritonitis. Of 50 patients admitted with RLQ, there were 34 male patients and remaining 16 were female patients with male vs female of 2: 1 was found. Mean age of patients admitted with RLQ were 10 years. . The duration of RLQ pain among diagnosed cases was 12 to 24 hours (n= 12).). There was statistical correlation seen between duration of symptoms and appendicitis (p value-0.004).No statistical correlation was found between symptoms and signs of disease itself. The total leukocyte count (TLC) was above 10, 00 and PMNC ratio was above > 85% in most of the cases. There was statistical significant correlation among raised TLC and PMNC count (p value -0.004).

Conclusion Diagnosis of appendicitis in children is complex; however the proper clinical assessment increases the diagnostic accuracy and protects from adverse outcome.

Key words: Appendicectomy, Right lower quadrant pain, White blood count

INTRODUCTION

The standard treatment of Appendicitis, common surgical emergency, is timely Appendicectomy, as risk of progression to advanced pathology may lead to life threatening complications like abscess formation, peritonitis, sepsis, bowel obstruction, and death [1-3].

Despite the development of advance diagnostic tools, diagnosis in children is still difficult in developed countries due to reduced resources with rate of negative explorations reaching 10-20%. While the rate of negative explorations is 3% nationwide [4-6]. Therefore clinicians and surgeons strongly emphasis on the correlation of clinical, laboratory and radiological findings, to avoid unnecessary surgical interventions.

A common clinical symptom of appendicitis, presenting through emergency department and requiring hospitalization is Right lower quadrant (RLQ) pain in children of 5-17years of age [1]. Different other causes that mimic RLQ pain can be due to infectious gastroenteritis, diverticulitis, mesenteric lymphadenitis, intussusceptions, pancreatitis, Meckel's diverticulum, urinary tract infection, pelvic inflammatory disease, renal calculi, and abdominal neoplasms [7, 8]. Differentiation can however be made through clinical history and physical examination [7]. To interpret accurate symptoms relating to correct diagnosis remains to be challenge in young children [8]. The probability of false negative appendicitis falls down to 1% when three parameters i-e; clinical, laboratory and radiological factors are combined [9]. Diagnosis through radiological techniques like ultrasound or computed tomography (CT) has improved the patient outcomes, reflected by a reduction in the frequency of laparotomies revealing normal histopathology, and in decreased perforation rates [2]. The aim of the present study was to assess and compare the diagnostic value of elements of the disease history, the clinical findings, and the laboratory examinations in children admitted due to suspected appendicitis in our locality to reduce burden of disease and its complications.

SUBJECTS AND METHOD:

Data was collected from children aged 5- 17 years presenting through emergency department with RLQ pain. Patients answered a questionnaire about their history of disease (history of appendicitis among first degree relatives, previous experience of similar symptoms, duration of symptoms, fever at home, anorexia, nausea, vomiting, diarrhea, constipation and aggravation of pain on movement or coughing, and progression of the intensity of the pain over the last few hours). Patients with other causes of RLQ pain excluded on the basis of history and examination, and those who have not given consent were excluded.

The location of the pain at the beginning of symptoms and at the time of the examination was marked on a drawing. The pain migration, from a central location to the right half of the abdomen, was assessed from this drawing. The patients had marked the intensity of the perceived pain on a visual analog scale (VAS), from none (0) to insupportable (10) (attached in Performa). The surgeon has recorded the results of the physical examination (direct, indirect, and rebound tenderness; guarding; signs of peritoneal irritation; deterioration of the general condition) on a Performa. The pain intensity findings were recorded on a four-grade scale (none, slight, moderate, strong). The signs of abdominal tenderness and the presence of rebound tenderness were also recorded. Decision of operation was made by the surgeon. Factors showing the inflammatory reaction like body temperature, white blood cell (WBC) count and the percentage of polymorphonuclear cells (PMNC rate) were measured. The polymorphonuclear cells (PMNC count) were derived from the product of the WBC count and the PMNC rate. Patients were re-examined after 6 hours of observation. Preoperative findings were also recorded on Performa. Operated specimen was sent for histopathology. Histopathologic diagnosis of appendicitis was made by transmural infiltration of PMNs. While complicated cases of appendicitis may show preoperatively perforation or a localized abscess.

Data was analyzed by statistical software package SPSS version 20.0 and chi square was used. Continuous variable that was patient's age and duration of symptoms was expressed as Mean +_SD. Qualitative variables were

TABLE 1
Demographic variables & Patients presented with RLQ pain in emergency

Variables	Frequency (n= 50)
Age (Mean ± SD)	10.5 ± 3.052
Gender (M: F)	2:1(34: 16)
Appendicitis	38 (76%)
Perforated appendix	03 (6%)
Others	09

TABLE 2
Clinical symptoms of appendicitis and diagnostic accuracy

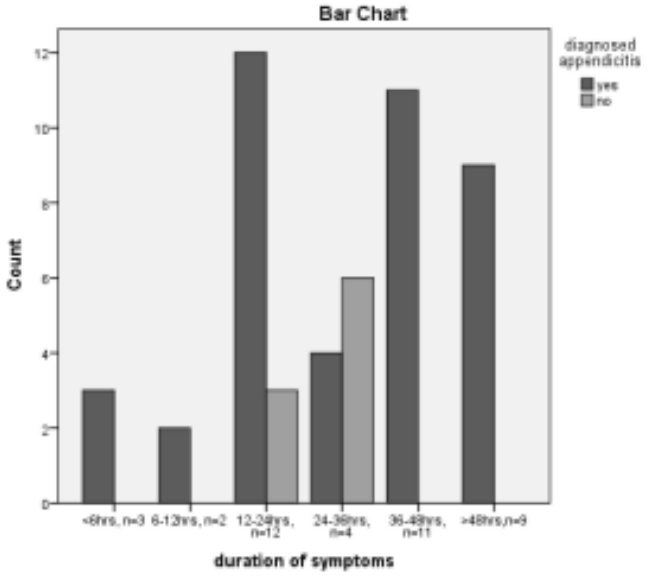
Variables	Suspected appendicitis (n=50)	Diagnosed cases of appendicitis (n=41)	P value
1. Anorexia	35 (70%)	26	0.030
2. Nausea	27(54%)	22	0.918
3. Vomiting	29(58%)	23	0.561
4. Radiation of pain	19(38%)	12	0.007
5. Fever	42(82%)	34	0.569
6. Diarrhea	17(34%)	14	0.963

expressed as frequencies and percentages. The two variables with suspected appendicitis and diagnosed cases of appendicitis with regard to duration and symptoms and signs of appendicitis were compared and p value <0.05 was taken as significant.

RESULTS

Among 50 patients that were admitted with right lower quadrant pain (RLQ), 38(76%) patients were diagnosed of appendicitis while 3(6%) patients were found to have complication of appendicitis i-e; peritonitis (table 1). Of 50 patients admitted with RLQ, there were 34 male patients and remaining 16 were female patients with male vs female of 2: 1 was found (table 1). The same ratio was found in patients diagnosed of appendicitis, male female i-e; 2:1 (28: 13). Mean age of patients admitted with RLQ were 10 years Mean age of patients admitted with RLQ were 10 years with an average age among males was 10 years and among females was 11. The duration of RLQ pain among diagnosed cases was 12 to 24 hours (n= 12) (fig.1). There was statistical correlation seen between duration of symptoms and appendicitis (p value-0.004). Most of the patients presented with symptoms of fever (n=34), anorexia (n=26), nausea (n=22), vomiting (n=23) (table 2). Abdominal tenderness and rebound tenderness was of slight to moderate intensity, in most patients (table 3). While very few patients presented with muscular guarding (table 3). Localization of pain in RIF was most commonly found (n=23) (table 3). No statistical significant correlation was found among signs of appendicitis alone. Peritoneal inflammation was found in n=3 cases, due to late presentation and increased duration of RLQ pain. The total leukocyte count (TLC) was above 10,00 and PMNC ratio was above > 85% in most of the cases (table 3). There was statistical significant correlation among raised TLC and PMNC count.

FIGURE 1
Duration of symptoms in Diagnosed cases of appendicitis



P value- 0.004

DISCUSSION

Appendicitis among children is one of the commonest causes of hospitalizations and emergency department visit especially in 5-17years of children [10, 11]. Nearly 70,000 pediatric cases are added every year in U.S [10]. The overall rate of complication of perforation is 10-20% in 10-17yrs, while the mortality rate is 0.1-1% [10].In Pakistan, according to audit of 663 patients, 53.7% of patients were children [12]. While International database of U.S in 2004 found 397,990 patients are affected from appendicitis every year [13].

Due to global burden of disease, numerous studies have been conducted, to control this major health problem. The literature on the clinical assessment also doesn't entirely show that children with RLQ pain should undergo radiological or ultrasonographic evaluation. The imaging has added a great to diagnosis and management of cases but unnecessary use of tools are associated with exposure to ionizing radiations , unavailability of expertise in ultrasonography at all the

TABLE 3
Clinical signs of appendicitis and diagnostic accuracy

Signs	Suspected RLQ patients (n=50)	Diagnosed appendicitis (n=41)	P value
1. Abdominal tenderness			
None	10(20%)	9	
Slight	25(50%)	18	**0.583**
Moderate	13(26%)	11	
Severe	02(4%)	3	
2. Rebound tenderness			
None	11 (22%)	9	
Slight	21 (42%)	18	**0.857**
Moderate	16 (32%)	13	
Severe	2 (4%)	1	
3. Muscular guarding			
None	30 (60%)	24	
Slight	8 (16%)	6	**0.748**
Moderate	10 (20%)	9	
Severe	2 (4%)	2	
4. Localization of tenderness			
Over Mc Burneys point	11 (22%)	8	
In RIF	27 (54%)9	23	**0.657**
Outside RIF	12(24%)	10	
5. Peritoneal inflammation			
Yes	3 (6%)	3	
No	47 (94%)	38	**0.403**
6. TLC count (*10^9/ L)			
8 - <10	4(8%)	4	
10-12	24 (48%)	21	**0.002**
12-15	17(34%)	15	
>15	5(10%)	1	
7. PMNC rate (%)			
<70%	9(18%)	2	
70-80%	5(10%)	3	**0.000**
80-85%	13(26%)	13	
>85%	23(46%)	23	

times and cost has lead clinicians and surgeons to emphasis more on clinical sign and symptoms for diagnosis.

Our study aimed to identify and correlate the different symptoms and signs of disease in children to avoid complications and negative explorations in suspected cases of appendicitis. Different studies conducted and logistic analysis carried out but none variables of disease showed independent relations [14]. A systemic Meta analysis has shown that combining all the clinical and laboratory parameters

increases the likelihood ratio of true positives of appendicitis.

In our study out of 50 patients admitted with RLQ pain, 38 showed appendiceal inflammation confirmed histopathologically while 3 cases reported with complication of appendiceal perforation, while the remainder had nonspecific findings correlating with other causes of RLQ pain. The results were consistent with the findings of previous studies. Medline and Cochrane database in 2007 also found combined benefit of signs and symptoms in identification of children who do not require further evaluation or intervention [6]. Male children as evident from previous studies were more affected by the disease compared to females; the reason appears to be unclear. Our study also showed the male preponderance of disease[10, 12.]

Although the clinical examination does not alone showed significant statistical correlation with the patients diagnosed of appendicitis in our study, but the factors when combined were predictors of appendiceal inflammation. Anderson et al in his Meta analysis on clinical parameters, found that gender, peritoneal inflammation, rising WBC (white blood count) are independent predictors of appendicitis [14]. Our study showed raised WBC (white blood count) and PMNC ratio to be strong independent predictors of appendicitis with statistical significant value. Kheo et al also found TLC and PMNC to be important determinants of acute appendicitis [14]. Another cross-sectional review in 2009 by Nasir et al also found positive predictive value of total leucocyte count to be 90.6% [15]. Another strong predictor was duration of symptom with statistical correlation was found with appendicitis, as late presentations and delay in diagnosis is responsible for increasing rate of complication. In summary, clinical history and examination are key factors in children with RLQ pain when combined with laboratory parameters. Patients should undergo imaging in suspected and doubtful cases, while the use in patients with low probability should be eluded.

CONCLUSION

Diagnosis of appendicitis in children is complex, however the proper clinical assessment increases the diagnostic accuracy and protects from adverse outcome.

CONFLICT OF INTEREST

There is no conflict of interest

REFERENCES

1. Ladd MR, Pajewski NM, Becher RD, Swanson JM, Gallaher JR, Pranikoff T, et al. Delays in treatment of pediatric appendicitis: a more accurate variable for measuring pediatric healthcare inequalities. Am J Surg 2013;79(9):875-81.
2. Narsule CK, Kahle EJ, Kim DS, Anderson AC, Luks FI. Effect of delay in presentation on rate of perforation in children with appendicitis. Am J Emerg Med 2011;29(8):890–893.
3. Bates MF, Khander A, Steigman SA, Tracy TF Jr, Luks FI. Use of white blood cell count and negative appendectomy rate. Peds 2014;133(1):39-44.
4. Kontopodis N, Kouraki A, Panagiotakis G, Chatziioannou M, Spiridakis K. Efficacy of preoperative computed tomography imaging to reduce negative appendectomies in patients undergoing surgery for left lower quadrant abdominal pain. G Chir. 2014;35(9-10):223-8.
5. Seetahal SA, Bolorunduro OB, Sookdeo TC, Oyetunji TA, Greene WR, Frederick W, et al. Negative appendectomy: a 10-year review of a nationally representative sample. Am J Surg.2011;201(4):433–7.
6. Hornby ST, Shahtahmassebi G, Lynch S, Ladwa N, Stell DA. Delay to surgery does not influence the pathological outcome of acute appendicitis. Scand J Surg 2014;103(1):5-11.
7. Yildiz T, Bozdag Z, Erkorkmaz U, Emre A, Turgut T, Ilçe Z. Analysis of risk factors for the development of pediatric appendicitis. Ulus Travma Acil Cerrahi Derg. 2013;19(6):554-8.
8. Ma KW, Chia NH, Yeung HW, Cheung MT. If not appendicitis, then what else can it be? A retrospective review of 1492 appendectomies. Hong Kong Med J. 2010;16(1):12-7.
9. Gendel I, Gutermacher M, Buklan G, Lazar L, Kidron D, Paran H, Erez I. Relative value of clinical, laboratory and imaging tools in diagnosing pediatric acute appendicitis. Eur J Pediatr Surg. 2011;21(4):229-33.
   Van den Bogaard VA, Euser SM, van der Ploeg T, de Korte N, Sanders DG, de Winter D. Diagnosing perforated appendicitis in pediatric patients: a new model. J Pediatr Surg. 2015;30: S0022-3468(15)00665-X.
11. Drake FT, Flum DR. Improvement in the diagnosis of appendicitis. Adv Surg. 2013;47:299-328.
12. Khattak S, Aslam S, Kamal A. Acute appendicitis: an audit of 663 cases Gomal J Med Sci 2010;8(2):209-11.
13. Cheong LH, Emil S.Outcomes of pediatric appendicitis: an international comparison of the United States and Canada. JAMA Surg. 2014;149(1):50-5.
14. Bullapur HM, Deshpande AV, Phin SJ, Cohen RC. Adjunct ultrasonography in children with suspected acute appendicitis: identifying the optimal target group. ANZ J Surg 2014;84(5):326-30.
15. Teixeira PG, Demetriades D. Appendicitis: changing perspectives. Adv Surg 2013;47:119-40.
16. Dholia KR, Baloch I, Shaikh SA, Soomro SH, Abro A. Total and differential leucocyte count (TLC and DLC) in cases of acute appendicitis. a study of 200 cases at Chandka Medical College Hospital Larkana. Med Channel 2010;16(2):284-6.
17. Gendel I, Gutermacher M, Buklan G, Lazar L, Kidron D, Paran H, et al. Relative value of clinical, laboratory and imaging tools in diagnosing pediatric acute appendicitis. Eur J Pediatr Surg 2011; 21(4):229-33.

AUTHORS CONTRIBUTION

* MKZ: entire choice of article, scheming , operating patients and dealing with complication and writing of manuscript.
** MSU: Manuscript arrangement description, data compilation, operated cases and concluding evaluation of publication.
*** AS: comprehensive Manuscript writing, data gathering, statistical analysis, complete formatting after all reviews and in helping procedure of study.
**** KUU: reviewing of statistical analysis, reviewing in regard to formatting in manuscript.
***** AEM: publication conclusion, proof reading of manuscript.

MKZ is answerable to all the questions concerning study and is responsible for ensuring all the methods regarding study are accurate.