Original Research Article

Pediatric appendicitis- five year experience at tertiary care pediatric surgery department: a cohort study

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ABSTRACT

Background: Acute appendicitis is one of the most common abdominal surgical condition in pediatric population. It accounts for 1-8% of children presenting in pediatric surgical emergency. The aim of this study was to evaluate pediatric appendectomy in our department.

Methods: It was a hospital based prospective cohort study spanning over a period of 5 years, where all diagnosed cases of pediatric appendicitis were enrolled. Demographic profile, clinical features and operative findings were analyzed. Patients were kept on regular follow-up and complications were noted.

Results: During the study period 146 patients were enrolled for the study. Male: female ratio was 1:1. Maximum patients belonged to age group of 11-15 years (42%). Pain in abdomen and fever were the most common presenting symptoms. Tenderness in right iliac fossa was the most common clinical sign (89.72%) and inflamed appendix was the most common operative finding in the study (83.91%).

Conclusions: The diagnosis of acute appendicitis is based on clinical examination. Atypical symptoms may lead to delay in the diagnosis and management. Imaging and lab investigations are supportive. Early recognition of symptoms, access to healthcare facility with a surgeon can significantly reduce the morbidity and complication rates in pediatric age group.

Keywords: Acute appendicitis, Appendectomy, Pediatric appendectomy

INTRODUCTION

Acute appendicitis is the most common surgical condition in children, with a lifetime risk of around 8%.¹ The incidence of appendicitis is approximately 1 per 1000 with a slight male predominance.^{2,3} Although once considered as a vestigial organ, with its importance in surgery only due to its inflammation leading to acute appendicitis, it is now a recognised organ with reservoir for normal intestinal flora with highest concentration of gut-associated lymphoid tissue (GALT).^{4,5}

Obstructive inflammatory process due to stool, fecaliths, lymphoid hyperplasia or neoplasm consist only about half of the cases of appendicitis.³ Recently other causes like variation in barometric pressure, summer season, genetics, environmental, racial/geographic features along with some bacteria and viruses also account for appendicitis.⁶⁻⁸ In spite of extraordinary advances in imaging and laboratory technology, the diagnosis of appendicitis remains clinical. Various appendicitis risk scores like pediatric appendicitis score, Alvarado score, appendicitis inflammatory response score are developed,

but scoring systems alone should not be used as a single diagnostic tool for all cases of appendicitis.⁹

With an objective to assess the current scenario of appendicitis in our centre we decided to perform a study in our centre.

METHODS

This was a 5-year hospital based descriptive cohort study done at NKP Salve Institute of Medical Sciences and research centre, Nagpur. The study was done to analyze the incidence, prevalence, demographic profile, clinical features and complications of pediatric appendicitis.

Inclusion criteria

All children under 18 years of age during January 2015 to December 2019, who were admitted to pediatric surgery inpatient department who with diagnosis as appendicitis by clinical evaluation, confirmed by ultrasonography and laboratory findings, were included in the study.

Exclusion criteria

Patients more than 18 years of age, associated morbidity or malformation, with any concurrent disease were excluded in the study.

Demographic profile, clinical signs and symptoms, intraoperative findings were recorded. Data related to the complications of appendectomy was also collected.

Descriptive statistics were presented in tabular format with mean, standard deviation, percentage. For analytical statistics, categorical variables were expressed in actual numbers. Appropriate statistical tests were applied wherever necessary.

RESULTS

Out of 146 patients enrolled for the study, 74 (50.68%) patients were males and 72 (49.31%) patients were females. 61 (41.78%) patients belonged to the age group of 11-15 years, whereas 44 (30.13%) patients belonged to age group of 6-10 years. Age distribution was shown in Table 1.

Table 1: Age distribution.

Age (years)	Male	Female	Total	Percentage
0-5	5	2	7	4.79
6-10	22	22	44	30.13
11-15	32	29	61	41.78
16-18	15	19	34	23.28
Total	74	72	146	100

All 146 patients, that is 100%, had pain in abdomen. About 117 (80.13%) had fever and 84 (57.53%) had

vomiting. Burning micturition was a complaint in 10 (6.84%) patients and 2 (1.36%) patient presented with menorrhagia as shown in the Table 2.

Table 2: Presenting symptoms.

Clinical feature	No. of patients	Percentage
Pain in abdomen	146	100.00
Fever	117	80.13
Vomiting	84	57.53
Burning micturition	10	6.84
Menorrhagia	2	1.36

On examination, tenderness was found in 131 (89.72%) patients, rebound tenderness was found in 46 (31.50%) patients. Guarding was elicited in 20 (13.69%) patients and rigidity was found in 7 (4.79%) patients. Appendicular lump was found in 7 (4.79%) patients as shown in Table 3.

Table 3: Presenting clinical signs.

Clinical sign	No. of patients	Percentage
Tenderness	131	89.72
Rebound tenderness	46	31.50
Guarding	20	13.69
Rigidity	7	4.79
Appendicular lump	7	4.79

Of 146, seven patients had lump, for which conservative line of management was provided. Of those 7 patients, 4 patients came for elective appendectomy, while remaining 3 patients were lost to follow up. Thus overall we operated 143 patients where, majority 120 (83.91%) patients had intra-operatively an inflamed appendix, while 18 (12.85%) patients had perforated appendix. Only 5 (3.49%) had a gangrenous appendix intra-operatively, as shown in Table 4.

Table 4: Intraoperative findings.

Intra-operative finding	No. of patients	Percentage
Inflamed appendix	120	83.91
Perforated appendix	18	12.58
Gangrenous appendix	5	3.49
Total	143	100

Table 5: Complications.

Complications	No. of patients	Percentage
Wound infection	18	12.58
Prolonged ileus	4	2.79
No complications	121	84.61
Total	143	100

The mean hospital stay was 8.67 ± 3.41 days. Looking at the complications observed, surgical site wound infection was the commonest complication observed in 18

(12.58%) patients, while prolonged ileus was found in 4 (2.79%). No complications were seen in 121 (84.61%) of patients as shown in Table 5.

DISCUSSION

Appendicitis is a version of diverticulitis in true sense, where the appendix represents a long true diverticulum with a narrow lumen. The incidence peaks around 12-18 years of age and is extremely low in neonatal age. Young children are unable to articulate their symptoms, or may present with atypical features, which might lead to misdiagnosis or perforation. In such cases perforation rates have been reported to be as high as 82% in children younger than 5 years and nearly 100% in 1-year-old children Which is common in children below 5 years.^{10,11}

Position of appendicitis, location of caecum, presence of any anomalies of rotation may also affect clinical presentation in children. Classically, appendicitis presents with vague pain in abdomen (visceral) which later localizes to right lower quadrant (somatic). This pain is of visceral nerve origin (common dermatome of the 8th-10th thoracic dorsal ganglia) which later localises. A wide variety of signs are seen in acute appendicitis. Classically Murphy's triad (pain, vomiting, fever) is seen. Many times it is accompanied with nausea and vomiting however it may present with a wide variety of symptoms (diarrhoea, gastroenteritis, dysuria, UTI). Presence of high grade fever at times suggests perforated/ruptured appendix (inflammatory response of peritoneal contamination). Children often present with wide deviation from classic picture.¹²

Ultrasonography is the commonest non-invasive technique used to confirm clinical diagnosis with 95-98% accuracy. MRI is another modality which may be used to obtain diagnosis in doubtful cases. Laboratory investigations have a supportive role and help in predicting the severity.¹²

In present study, pain in abdomen was present in all cases (100%), while nausea and vomiting (57.53%) and fever (80.13%) also was seen in majority of patients. Burning micturition (7%) and menorrhagia was seen in two case. Present findings were similar to the study by Ngim et al.¹³ Burning micturition, dysuria or other urological symptoms may be present in appendicitis.¹⁴ Study by Rothrock et al showed dysuria (7%), diarrhoea (15%).¹⁵

Tenderness (89.72%) in the abdomen was the commonest sign, while rebound tenderness was seen in 31.5% of cases. Appendicular lump formation was seen in 4.79% of patients for which the Ochsner Sherren regimen was used. These cases were later called in for interval appendectomy. Of the 7 patients called in for interval appendectomy, 4 turned up for elective surgery, while 3 patients were lost to follow up.

Most of the appendix were inflamed (83.91%), while perforated appendix was seen in 12.58% cases. We believe longer duration symptoms prior to presentation increases the risk of perforation. This delay may be because of lack of recognition of symptoms by family, presentation to a physician and difficult access to medical care.

In present study, 22 patients developed complications. The commonest one was surgical site wound infection (12.58%). Four patients had prolonged ileus which presented like subacute bowel obstruction. These cases were managed conservatively. Majority (84.61%) of the patients had no complications and had perioperative period. There were no complaints.

CONCLUSION

The diagnosis of acute appendicitis is still very much based on clinical examination for signs and symptoms supported by imaging techniques and lab investigations. Atypical symptoms may lead to delay in the diagnosis and management, thereby increasing the rates of complication. Educating parents/family (who are the best observer) to listen & understand child's complain so that early advice can be sought. Hence, early recognition of symptoms, timely access to healthcare facility and a quick referral to surgeon can significantly reduce the morbidity and complication rates in pediatric age group.

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REFERENCES

1. Sekar AS, Andappan A. Comparative study on laparoscopic appendectomy versus open appendectomy in a tertiary hospital at Chennai. IAIM J. 1995;169:9-19.
2. Sivit CJ, Siegel MJ, Applegate KE, Newman KD. When appendicitis is suspected in children. Radiographics. 2001;21(1):247-62.
3. Bhangu A, Søreide K, Di Saverio S, Assarsson JH, Drake FT. Acute appendicitis: modern understanding of pathogenesis, diagnosis, and management. Lancet. 2015;386(10000):1278-87.
4. Addiss DG, Shaffer N, Fowler BS, Tauxe RV. The epidemiology of appendicitis and appendectomy in the United States. Am J Epidemiol. 1990;132(5):910-25.
5. Buckius MT, McGrath B, Monk J, Grim R, Bell T, Ahuja V. Changing epidemiology of acute appendicitis in the United States: study period 1993-2008. J Surg Res. 2012;175(2):185-90.
6. Deng Y, Chang DC, Zhang Y, Webb J, Gabre-Kidan A, Abdullah F. Seasonal and day of the week variations of perforated appendicitis in US children. Pediatr Surg Int. 2010;26(7):691-6.

7. Sato Y, Kojimahara N, Kiyohara K, Endo M, Yamaguchi N, Sato Y, et al. Association between climatic elements and acute appendicitis in Japan. J Surg Res. 2017;211:64-9.
8. Arda IS, Ergin F, Varan B, Demirhan B, Aslan H, Özyaylali İ. Acute abdomen caused by *Salmonella typhimurium* infection in children. J Pediatr Surg. 2001;36(12):1849-52.
9. Atema JJ, van Rossem CC, Leeuwenburgh MM, Stoker J, Boermeester MA. Scoring system to distinguish uncomplicated from complicated acute appendicitis. Br J Surg. 2015;102(8):979-90.
10. Becker T, Kharbanda A, Bachur R. Atypical clinical features of pediatric appendicitis. Acad Emerg Med. 2007;14(2):124-9.
11. Nance ML, Adamson WT, Hedrick HL. Appendicitis in the young child: a continuing diagnostic challenge. Pediatr Emerg Care. 2000;16(3):160-2.
12. St. Peter SD, Wester T. Appendicitis. In: Holcomb and Ashcraft's Pediatric Surgery. 7th ed. Philadelphia, PA: Elsevier; 2020.
13. Ngim CF, Quek KF, Dhanoa A, Khoo JJ, Vellusamy M, Ng CS. Pediatric appendicitis in a developing country: what are the clinical predictors and outcome of perforation? J Trop Pediatr. 2014;60(6):409-14.
14. Gardikis S, Touloupidis S, Dimitriadis G, Limas C, Antypas S, Dolatzas T, et al. Urological symptoms of acute appendicitis in childhood and early adolescence. Int Urol Nephrol. 2002;34(2):189-92.
15. Rothrock SG, Skeoch G, Rush JJ, Johnson NE. Clinical features of misdiagnosed appendicitis in children. Ann Emerg Med. 1991;20(1):45-50.

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