



Original Article

## Conservative Management of Early Uncomplicated Appendicitis in Children in a Tertiary Care Hospital

Muhammed Foysol Ahmed<sup>1</sup>, Mohammed Abdul Momin<sup>2</sup>, Farhana Haque Jony<sup>3</sup>, Md Tayef Rahman<sup>4</sup>, Humaira Islam<sup>5</sup>

<sup>1</sup>Assistant Professor, Department of Paediatric Surgery, Jalalabad Ragib-Rabeya Medical College, Sylhet.

<sup>2</sup>Associate Professor, Department of Paediatric Surgery, Jalalabad Ragib-Rabeya Medical College, Sylhet.

<sup>3</sup>Resident, (MD-Pathology, Phase-A), Sylhet MAG Osmani Medical College, Sylhet.

<sup>4</sup>Assistant Registrar, Department of Paediatric Surgery, Jalalabad Ragib-Rabeya Medical College Hospital, Sylhet.

<sup>5</sup>Indoor Medical Officer, Department of Paediatric Surgery, Jalalabad Ragib-Rabeya Medical College Hospital, Sylhet.

### ABSTRACT

The gold standard treatment for acute appendicitis is appendectomy. However, growing evidence indicates that patients with acute uncomplicated appendicitis can be treated safely with antibiotics. This prospective interventional study was conducted in the department of Paediatric Surgery, Jalalabad Ragib-Rabeya Medical College Hospital, Sylhet during the period of one and half years from April 2016 to September 2017 to evaluate the efficacy and outcomes of the conservative management of acute uncomplicated appendicitis in children with an antibiotic first plan. A total of 54 children from  $\geq 3$ -14 years of age, with clinical and radiological features of acute appendicitis presenting within 72 hours of the beginning of abdominal pain with modified Alvarado score  $\geq 6$  were included in the study. All patients received a therapeutic dose of broad-spectrum antibiotics and symptomatic treatment. The follow-up period was 1 year. Among the study population, 30 (55.6%) patients were male and 24 (44.4%) were female with mean age 11.4 years. Conservative treatment was successful in 42 (77.8%) patients and failed in 12 (22.2%) patients. Overall, complications that resulted from non-operative treatment were low and only two cases complication (Appendicular lump and gangrenous appendix; one patient each) occurred throughout the entire study group. So, it may be concluded from the study that conservative management of early uncomplicated acute appendicitis with antibiotics treatment is a safe option in children.

**Keywords:** Acute appendicitis, Antibiotics, Conservative treatment, Uncomplicated acute appendicitis.

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### Address of Correspondence:

Dr. Muhammed Foysol Ahmed, Assistant Professor, Department of Paediatric Surgery, Jalalabad Ragib-Rabeya Medical College, Sylhet, Mobile: +8801712233401, E-mail: drfoysol77@gmail.com

### INTRODUCTION

In 1886 Reginald Heber Fitz coined the term appendicitis to describe inflammation of the vermiform appendix<sup>1</sup>. Acute appendicitis is a common problem in children and young adult. The lifetime risk

for appendicitis is 9% for man and 7% for woman, with peak incidence between age 11 and 12<sup>1</sup>. This problem occurs suddenly and warrants the patients to seek immediate health care. Occasionally perforation of appendix may produce life threatening situations. Morton is credited with performing the first deliberate appendectomy for a perforated appendix in the united state in 1887<sup>1</sup>. Since then appendectomy is the most common acute surgical intervention in children. The surgical modality is however shifting from open to minimal access surgery and now further onto non-operative treatment in selected cases.

Appendectomy carries a risk of several postoperative complications such as surgical wound infection, intestinal obstruction due to adhesions, post operative ileus, intra-abdominal abscess, faecal fistula, pneumonia, and tubal infertility in females<sup>1,2,3,4</sup>. The advent of laparoscopy has led to a risk of high negative appendectomy rates with unnecessary surgery related morbidity<sup>5</sup>.

In recent years, growing literature suggesting antibiotics without surgery may be effective treatment for an uncomplicated acute appendicitis. Surgery may be associated with a longer hospital stay and higher costs compared with non-operative management with antibiotics<sup>6</sup>. So, the aim of this study was to evaluate the efficacy and outcomes of conservative treatment in uncomplicated acute appendicitis in children using antibiotic as a first treatment plan and to assess the treatment failure.

## MATERIALS AND METHODS

This prospective interventional study was carried out in the department of Paediatric Surgery, Jalalabad Ragib-Rabeya Medical College Hospital, Sylhet from April 2016 to September 2017. A total of 54 patients irrespective of sex from >3 to 14 years of age were enrolled in this study based on the inclusion and exclusion criteria. Informed written consent was obtained from the legal guardian of the patient after full explanation of the details of the disease pathology and purpose of the study. The parents were counseled about the importance of compliance and regular follow up. All children irrespective of sex from >3 to 14 years of age with a history of pain in the right iliac fossa for less than 72 hours and clinically and radiologically diagnosed as the first attack of appendicitis with modified Alvarado score >6 (Table-I) were included in the study<sup>7</sup>.

**Table-I:** Modified Alvarado score<sup>7</sup>.

		Score
Symptoms	Migratory RIF pain	1
	Anorexia	1
	Nausea and vomiting	1
Signs	Tenderness (RIF)	2
	Rebound tenderness	1
	Elevated temperature	1
Laboratory	Leukocytosis	2
Total		9

Patients with recurrent appendicitis, complicated appendicitis such as perforation, abscess, mass on clinical examination or radiological reports and were excluded from the study. Patients' guardians unwilling for enrolment were also excluded from the study. Data included age, sex, duration of presenting symptoms, outcomes of conservative treatment and appendectomies after trial of conservative treatment. All patients meeting the inclusion criteria received intravenous antibiotics (Ceftriaxone: 75 mg/kg/day as single dose and metronidazole: 7.5 mg/kg/dose as 3 times daily) for at least 24-72 hours. During this time patients were nothing per oral (NPO) and received intravenous (I/V) fluids. Patients were monitored 4 hourly for temperature, blood pressure, pulse rate, respiratory rate and local abdominal signs. Patients whose signs and symptoms improved, were discharged home at the next morning with oral antibiotics (Cefixim: 10 mg/kg/day as two divided doses and metronidazole: 7.5 mg/kg/dose as 3 times daily) for 7-10 days. Patients were told to contact immediately if pain recurs and vomiting or fever occurs. In patients whose clinical condition did not improve and did not respond to conservative treatment or worsened, were operated. Successful conservative treatment was defined as being discharged from the hospital following the resolution of symptoms with no recurrence within the follow-up period of 1 year. Failure of conservative treatment was divided into two groups. First, treatment failure - indicates a lack of clinical improvement, necessitating appendectomy while attempting conservative treatment. Second, recurrence - indicates repeated symptoms or disease within the follow-up period of 1 year in an earlier successfully conservatively managed patient. Ethical issues were maintained properly in the study. All the

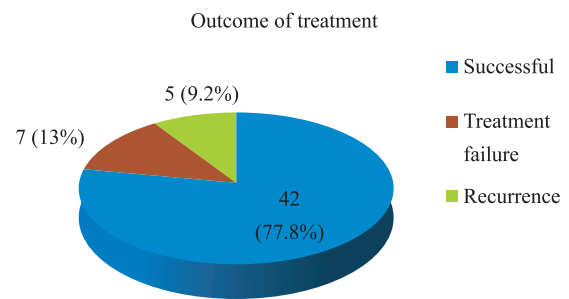
collected data were compiled and analyzed using the statistical package for social science (SPSS) 21 for windows. Quantitative data were analyzed by mean and standard deviation. Qualitative data were analyzed by frequency, percentage and comparison. Chi-square ( $\chi^2$ ) test and fisher exact tests were done to find out the level of significance. A probability value (p) of <0.05 was considered statistically significant.

**RESULTS**

During the study period, 54 cases of uncomplicated acute appendicitis were managed conservatively. The age of the patients ranged from 4 to 14 years with the mean age of 11.56 years. Among 54 patients 27 (50%) were above the age of 10 year. Majority 30 (55.6%) were male and 24 (44.4%) females with a ratio of 1.25: 1 (Table-II). Among 54 patients who were managed conservatively for uncomplicated acute appendicitis, conservative treatment was successful in 42 (77.8%) patients in the follow-up period of 1 year. However, in the remaining 12 (22.2%) patients, conservative treatment was failed. Treatment failure during initial admission was seen in 7 (13%) patients whereas recurrence was seen in 5 patients (9.2%) (Figure-I). Twenty five (46.3%) patients presented with signs and symptoms of acute appendicitis to the hospital within 24 hours, 20 (37%) patients presented with time interval of 24 to 48 hours and 9 (16.7%) patients presented between 48 to 72 hours. Results also showed that, patient attended 48 hours after sign-symptom of appendicitis had significant effects on the outcomes of the conservative treatment as majority of treatment failure occurred among these patient who attended 48 hours after onset of symptom ( $\chi^2=19.601$ ;  $p=0.0001$ ). But difference of treatment outcome between 1 and 2 days of onset of symptoms were not statistically significant ( $p=0.6423$ ) (Table-III). Among 12 patients who failed to respond to conservative treatment, 7 patients were operated after 2 days of treatment, 2 patients were operated 2 months after completion of treatment and remaining 3 patients were operated 4, 7 and 8 months after completion of treatment (Table-IV). In the operated patients, 6 patients had faecolith in the lumen of appendix, acute catarrhal appendicitis in 4 patients, 1 patient had gangrenous appendix and 1 had an appendicular mass (Table-V).

**Table-II:** Distribution of the patients by age and sex (n=54).

Parameters	Frequency	Percentage
<b>Age (In years)</b>		
≥3 to 5	7	13
5 to 10	20	37
>10	27	50
Mean		11.46
<b>Sex</b>		
Male	30	55.6
Female	24	44.4



**Figure-1:** Outcomes of conservative treatment (n=54).

**Table-III:** Outcome of conservative treatment according to duration of pain (n=54).

Hours of Attack	No of Patient (%)	Outcomes of Conservative Treatment		P-value
		Successful No (%)	Failure No (%)	
<24	25 (46.3)	23 (92)	2 (8)	0.6423 0.0001
24- 48	20 (37)	17 (85)	3 (15)	
48-72	9 (16.7)	2 (22.2)	7 (77.8)	
Total	54 (100)	42 (77.8)	12 (22.2)	

**Table-IV:** Appendectomies after trial of conservative treatment (n=12).

Time of Interval Appendectomy	Frequency
Treatment failure: Appendectomy after 48 hours of treatment	7
Recurrence	
Appendectomy after 2 months of treatment	2
Appendectomy after 4 months of treatment	1
Appendectomy after 6 months of treatment	1
Appendectomy after 8 months of treatment	1
Total	12

**Table-V:** Post operative findings (n=12).

Outcome	Frequency	Percentage
Faecolith	6	50
Catarrhal appendicitis	4	30
Gangrenous appendicitis	1	10
Appendicular lump	1	10
Total	12	100

## DISCUSSION

Acute appendicitis is one of the most common abdominal emergencies worldwide. Appendectomy had been regarded as the gold standard treatment for acute appendicitis since it was first reported by Fitz in 1886<sup>1</sup>. Despite improvements in surgical and peri-operative care, conservative management of early uncomplicated appendicitis with antibiotics was gaining more and more popularity<sup>8</sup>. Surgical dogmas dictating emergent appendectomy have seen a paradigm shift to a non-operative approach<sup>9</sup>. There were many advantages of conservative treatment (i.e. antibiotic treatment) over surgical treatment. Conservative treatment with antibiotics gave the chance to treat acute appendicitis when surgical means were not readily accessible particularly in developing countries or isolated areas and reduce the risk associated with surgery<sup>10</sup>.

In the present study, 54 uncomplicated appendicitis were managed conservatively whose age ranged from 4 years to 14 years with the mean age of 11.46 years. Half (50%) of the patients were above the age of 10 years. This result was consistent with the study of Arif et al. at Narsingdi Sadar Hospital<sup>11</sup>. Arif et al. in their study (Diagnosing acute appendicitis in children using Alvarado Score) found average age of 71 patients as

10.4 years. This result was also similar to other studies that, appendicitis was common in children and young adult and peak incidence is 11 to 12 years in case of children<sup>1,12</sup>. Only 7 (13%) patients were below the age of 5 years in this study. This might be due to less incidence of appendicitis in this age group and exclusion of children below the age of 3 years because of high rate of perforation, even as high as 100% in case of infant<sup>1,12</sup>. In the current study, male female ratio was 1.25:1 which was similar slight male preponderance of childhood appendicitis in the study of Arif et al. and Babu et al. that male to female ratio was 1.37:1 and 1.22:1 respectively<sup>11,13</sup>. Appendicitis was equal among male and female before puberty. In teenager and young adults the male female ratio increased to 3:2 at age 25; thereafter, the greater incidence in male declines<sup>11,12,14</sup>.

In this study, 42 patients (77.8%), out of 54 patients were successfully treated conservatively and 7 patients (13%) failed to respond to initial conservative treatment and had been operated and further 5 patients (9.2%) showed recurrence of appendicitis during the follow-up period. So a total of 12 patients failed to respond and the failure rate was 22.2%. A similar study in a medical college and research centre in Bhopal, Madhya Pradesh, India showed that, 71.43% patients treated conservatively successfully and 28.57% patients failed to respond to conservative treatment. The findings were nearly similar to our study results<sup>15</sup>. Another study done in Baghdad, Iraq found that, 75.6% patients treated conservatively successfully and 24.4% patients failed to respond conservatively<sup>16</sup>. This result resembled our results. Our study results also concurred with a study done in India in 2016 by Gedam et al. which involved 71 patients with 74.65% success rate, 14.08% treatment failure and 13.11% recurrence<sup>17</sup>. Successful treatment of uncomplicated appendicitis also described in many studies where success ranges from 67% to 85%<sup>18-23</sup>.

It was noteworthy that, almost every study used a different protocol concerning the choice of antibiotics. There was consensus regarding the start of intravenous antibiotics and then proceeding to oral medication. We used third generation cephalosporin and metronidazole in all patients treated conservatively, might be the best option given the coverage of aerobic gram-positive and gram-negative bacteria. Alnasera et al. and Gedam et al. used same antibiotics in their study and got similar result<sup>16,17</sup>. Similar results were also found by Vons et al. using amoxicillin plus clavulanic acid<sup>23</sup> and Turhan et al. using ampicillin plus gentamycin<sup>19</sup>.

It was evident from this study, the difference in time of

presenting illness had significant effect on the outcomes of conservative treatment of acute appendicitis ( $p=0.0001$ ). Majority of treatment failure occurred among these patients who attended 48 hours after onset of symptom. But, there was no statistical difference regarding outcome of conservative treatment among the patients who attended within 24 hours and within 48 hours of onset of symptoms ( $p=0.6423$ ). This result was supported by other authors as delaying treatment allowed the inflammatory process to progress rampantly and increases perforation rates<sup>1,12,14</sup>. However, Alnasera et al. in their study of effectiveness of conservative management of uncomplicated acute appendicitis found time of presenting illness had no significant effect on the outcomes of conservative treatment<sup>16</sup>.

Several studies found significant correlations in factors that were associated with failure of non-operative management. The presence of faecolith in the lumen of appendix that failed non-operative management or experienced recurrences had been mentioned in several studies<sup>24,25,26</sup>. This result also supported by our study. Among 12 operated patients, 6 had faecolith in the lumen of appendix, 4 was catarrhal appendicitis, gangrenous appendix 1 and an appendicular lump. We observed 9.2% recurrence rate in whom, appendicitis had resolved by antibiotic treatment on primary admission, with a median duration of 4 months within a follow-up period of 1 year. This result was consistent with the literature where studies reported recurrence rate range from 5%-37% and median duration of recurrence were 2 to 8 months<sup>18,21,22</sup>.

## CONCLUSION

So, it may be concluded from the study, conservative management of early uncomplicated acute appendicitis with antibiotics is safe, feasible and alternative to appendectomy with acceptable low treatment failure and recurrence rate. However, close monitoring and repeated re-evaluation is needed to recognize clinical status of the patient. Further studies involving multicenter, large sample size is needed to conclusively define the role of conservative treatment versus appendectomy in the management of uncomplicated acute appendicitis in children.

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