

Outcomes of Conservative Treatment of Uncomplicated Acute Appendicitis in Children

Dr. Mohammad Syfur Rashid^{1*}, Dr. Mitali Hossain², Dr. G. M. Morshed³, Dr. K. M. Shaiful Islam⁴, Dr. Md. Majedul Islam⁵, Prof. Dr. Abdul Hanif Tablu⁶

¹Assistant Professor (CC), Department of Pediatric Surgery, Monno Medical College Hospital, Manikgonj, Bangladesh

²MBBS, Mph (NIPSOM), Dhaka, Bangladesh

³Specialist, Pediatric Surgery, Square Hospital Ltd

⁴Assistant Professor, Department of Pediatric Surgery, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh

⁵Assistant Professor, Department of Surgery, Monno Medical College Hospital, Manikgonj, Bangladesh

⁶Professor and Head, Department of Neonatal Surgery, Dhaka Medical College & Hospital, Dhaka, Bangladesh

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*Corresponding author: Dr. Mohammad Syfur Rashid

Assistant Professor (CC), Department of Pediatric Surgery, Monno Medical College Hospital, Manikgonj, Bangladesh, E-mail: syfurrashid2017@gmail.com

Abstract

Original Research Article

Background: Pediatric healthcare is evolving, with acute appendicitis being a common issue. Traditionally, appendectomy has been the standard treatment. However, recent literature suggests that conservative antibiotic treatment could be a viable option, particularly for uncomplicated cases in children. **Aim of the study:** The aim of the study was to evaluate the outcomes of conservative treatment for uncomplicated acute appendicitis in children. **Methods:** From July 2017 to March 2019, a prospective observational study was conducted at Dhaka Medical College Hospital, Bangladesh, involving 62 children with uncomplicated acute appendicitis. They received conservative treatment, including supportive care, for five days. Patients who responded positively within 24 hours continued for at least five days before discharge and underwent a 6-month follow-up. **Results:** The study encompassed 62 patients, with a mean age of 8.95 years, and a slight male predominance (61.3% male, 38.7% female). Clinical findings revealed a notable decrease in pain intensity (9.42 to 0.77), temperature (101.02° to 98.90°), and inflammatory markers (CRP: 28.13 ± 11.56 mg/L to 9.78 ± 7.50 mg/L) from admission to day 5. The mean duration of hospital stay was 5.26 ± 0.63 days. Remarkably, 95.1% of patients successfully recovered with conservative treatment, while 4.9% required surgery as part of their treatment course. **Conclusion:** This study found some potential benefits of conservative treatment for uncomplicated acute appendicitis in children. Significant improvements in clinical parameters and a high success rate emphasize its potential as a viable alternative to surgery in select cases, warranting further exploration in pediatric healthcare practices.

Keywords: Outcome, Conservative treatment, Uncomplicated, Acute appendicitis, Children.

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1. INTRODUCTION

The appendix typically originates from the posteromedial aspect of the caecum, almost always at the junction of the tenia coli. Its positioning with the caecum can vary, with retrocaecal, retro-colic, pelvic, or descending placements being the most common [1]. Among children aged 2 years and older, appendicitis stands out as the most prevalent surgical abdominal disorder [2]. When children present with abdominal pain, approximately 1% to 8% of them will ultimately receive a diagnosis of acute appendicitis. The lifetime risk of developing acute appendicitis is approximately 6.7% for females and 8.6% for males. This incidence escalates from 1-2 cases per 10,000 children annually from birth to 4 years of age to 25 cases per 10,000 children each

year between the ages of 10 and 17 [3]. The practice of appendectomy has become the established standard of care for acute appendicitis ever since Fitz and Burney's reports associated appendicitis with pelvic abscesses [4]. They provided evidence of reduced morbidity linked to pelvic infections when early appendectomies were performed [5, 6]. It is hypothesized that leaving an inflamed appendix in place could lead to necrosis and eventual perforation, resulting in significant morbidity [7]. However, recent findings from the CODA trial have challenged this standard practice. The trial demonstrated that non-operative management of appendicitis is equally effective as appendectomy in treating appendicitis within the adult population [8]. Non-operative management has shown higher success rates, especially in cases of simple,

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uncomplicated appendicitis with a shorter duration of symptoms and the absence of fecalith [9]. Appendectomy itself is associated with various intra and post-operative morbidities, including vascular injuries, urinary tract complications, hematomas, colonic fistulas, surgical site infections, adhesions, bowel obstructions, and a significant length of hospital stay [10]. The postoperative complication rate can range from 2% to 23%, and more than 3% of patients may require readmission due to intestinal obstruction and postoperative adhesion [11, 12]. While surgery has been the traditional approach for acute appendicitis in adults and, more recently, in children, there has been a shift in thinking in recent years. The notion of non-operative management, primarily through the use of antibiotics, has challenged this surgical dogma. However, it's important to note that the non-operative management of acute appendicitis remains a population of controversy and remains unproven due to the lack of well-designed large prospective randomized controlled trials (RCTs) [13]. While appendectomy is generally considered a straightforward procedure, it does entail the use of general anesthesia and carries inherent risks and potential complications. Complications related to surgery or anesthesia occur in over 10% of children within 30 days of undergoing appendectomy [14]. Additionally, it's worth noting that not all patients diagnosed clinically and/or radiologically with acute appendicitis have the condition. Even with current imaging methods, approximately 6.3% of children in Canada and 4.3% in the USA who undergo appendectomy are subsequently found to have a normal appendix [15]. A meta-analysis [16] has highlighted some benefits of non-operative treatment, such as fewer complications, improved pain control, and shorter sick leave. However, the combined failure and recurrence rates in non-operative patients were found to make this approach less effective overall. Therefore, the decision between surgical and non-operative management of acute appendicitis remains complex and must be made on a case-by-case basis, taking into account the individual patient's condition and circumstances.

2. METHODOLOGY

This prospective observational study was conducted at the Department of Paediatric Surgery, Dhaka Medical College Hospital in Dhaka, Bangladesh, spanning from July 2017 to March 2019. The study included 62 children admitted for uncomplicated acute appendicitis. Ethical approval for the study was granted by the hospital's ethical committee, and all participants provided written consent before any data collection procedures. Patients eligible for the study were those with uncomplicated acute appendicitis, aged up to 12 years, regardless of gender, and those with appendicitis associated with fecolith. Patients excluded from the study were those over the age of 12, patients with an obstructed appendix, and those with an appendicular lump or abscess. The cases in this study were

purposefully selected from the specified research location for inclusion in the research. The researcher designed a questionnaire covering various factors and personally conducted the data collection. Informed consent was obtained from the patients or their guardians, with a focus on ensuring confidentiality. The conservative treatment commenced with a combination therapy consisting of injection. Ceftriaxone (100 mg/kg per day), inj. Metronidazole (1.5 mg/kg/twice daily), and injection. Amikacin (7.5 mg/kg/twice daily) for five days, along with associated supportive management. After 24 hours of treatment, patients who responded positively to the above management continued the same treatment for at least five days before being discharged. They were then followed up for 6 months. Demographic and clinical data were diligently recorded throughout the study, and all data were processed, analyzed, and presented using MS Office tools.

3. RESULT

This study involved 62 patients with diverse demographic characteristics. Age distribution showed that 8 patients (12.9%) were aged 4-6 years, 28 patients (45.2%) were 6-10 years old, and 26 patients (41.9%) were 11-12 years old. The mean age was 8.95 years (range: 4-12), and there was a slight male predominance, with 38 patients (61.3%) being male and 24 patients (38.7%) being female. The clinical findings of the 62 patients in this study exhibited significant changes over time. On the first day, the pain intensity, measured using the VAS score, was high with a mean of 9.42 (range: 8.00 - 10.00), but it steadily decreased to 7.13 on the second day, 4.77 on the third day, and remarkably reduced to 0.77 on the fifth day. Similarly, the temperature on the first day was elevated, with a mean of 101.02° (range: 100.00 - 103.10), but it gradually normalized over time. The total white blood cell count (TC) was initially high at 14708.23 (range: 16000 – 21000) on the first day but decreased to 11820.97 on the third day and further reduced to 9852.26 on the fifth day. Neutrophil count followed a similar trend, starting at 79.98 (range: 68.80 - 89.00) on the first day and decreasing to 73.42 on the third day and 62.26 on the fifth day. Additionally, the diameter of the appendix, as measured by ultrasound, decreased from 6.97 mm at admission to 5.71 mm on day 15, 5.55 mm on day 30, and 5.05 mm at 3 months. These findings indicate a significant improvement in clinical parameters throughout treatment. The mean duration of hospital stay was 5.26 ± 0.63 days. At admission, the mean CRP (C-reactive protein) was 28.13 ± 11.56 (mg/L), indicating an inflammatory response. However, by day 5, there was a significant reduction in CRP levels, with a mean of 9.78 ± 7.50 (mg/L), suggesting a substantial improvement in the inflammatory condition. As the ultrasound (USG) findings at day 15, 6.5% exhibited probe tenderness, which increased slightly to 8.1% at day 30 but decreased to 3.2% after 3 months, with no occurrences after 6 months. Peri appendicular fluid was observed in 1.6% at day 15, rising to 9.7% at

day 30, then decreasing to 4.8% after 3 months, and no cases after 6 months. Lumen distension was noted in 3.2% at day 15, 8.1% at day 30, and increased to 12.9% after 3 months, with no cases after 6 months. The majority of patients, accounting for 95.1% (n=59),

demonstrated positive responses to the conservative treatment, resulting in their safe discharge from the hospital. A smaller portion, comprising 4.9% (n=3) of the participants, underwent surgery as part of their treatment course.

Table 1: Demographic status of patients, (N=62)

Characteristics	n	%
Age distribution		
4-6 years	8	12.9
6-10 years	28	45.2
11-12 years	26	41.9
Mean ± SD	8.95 ± 2.10 (4-12)	
Gender distribution		
Male	38	61.3
Female	24	38.7

Table 2: Clinical findings over time, (N=62)

Time	Mean ±SD	Min-max
Pain (VAS score)		
1 st day	9.42 ± 0.92	8.00 - 10.00
2 nd day	7.13 ± 1.00	6.00 - 8.00
3 rd day	4.77 ± 0.98	4.00 - 6.00
5 th day	0.77 ± 0.98	0.00 - 2.00
Temperature (°)		
1 st day	101.02 ± 0.84	100.00 - 103.10
2 nd day	100.04 ± 0.76	99.00 - 101.40
3 rd day	99.45 ± 0.64	98.00 - 101.20
5 th day	98.90 ± 0.41	98.00 - 99.60
Total count (TC)		
1 st day	14708.23 ± 2575.15	16000 – 21000
3 rd day	11820.97 ± 1957.09	12000 – 16400
5 th day	9852.26 ± 1018.44	7800 – 11800
Neutrophil count		
1 st day	79.98 ± 3.99	68.80 - 89.00
3 rd day	73.42 ± 5.20	52.00 - 82.20
5 th day	62.26 ± 7.83	11.30 - 72.20
Diameter (mm) of the appendix by USG		
At admission	6.97 ± 0.36	6.10 - 7.50
At day 15	5.71 ± 0.82	0.20 - 7.10
At day 30	5.55 ± 0.67	4.20 - 7.40
At 3 months	5.05±0.76	3.60-7.00

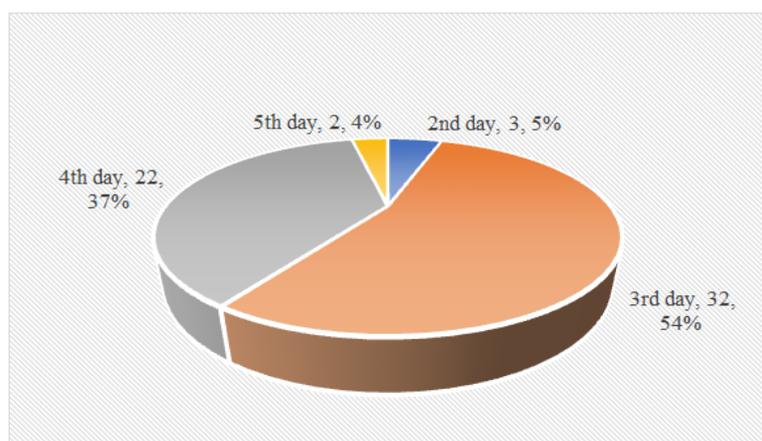


Figure I: Symptom relief of the study population, (N=62)

Table 3: CRP of the study populations, (N=62)

CRP	Mean ±SD	Min-max
At admission	28.13 ± 11.56	10.70-67.40
At day 5	9.78 ± 7.50	3.70-36.20

Table 4: USG finding of the study populations, (N=62)

Time	%	%
Probe tenderness		
At day 15	4	6.5
At day 30	5	8.1
After 3 months	2	3.2
After 6 months	0	0.0
Peri appendicular fluid		
At day 15	1	1.6
At day 30	6	9.7
After 3 months	3	4.8
After 6 months	0	0.0
Lumen distended		
At day 15	2	3.2
At day 30	5	8.1
After 3 months	8	12.9
After 6 months	0	0.0

4. DISCUSSION

This study aimed to evaluate the outcomes of conservative treatment for uncomplicated acute appendicitis in children. In this study, the participants had a mean age of 8.95±2.10 years, ranging from 4 to 12 years. The male-to-female ratio was 1.6:1. In a similar study [17], the male-to-female ratio was 2:1, with a mean age of 13.3 years. Upon admission, the mean diameter of the uncomplicated acute appendix in this study was 6.97±0.36 mm. In a different study [18], the mean diameter of the appendix was reported as 7.4±1.0 mm. The mean length of hospital stay for our patients in this study was 5.26 ± 0.63 days. In another study [19], the length of hospital stays was 2.95±0.38 for patients undergoing conservative treatment with antibiotics. In this study, 59 out of 62 patients (95.1%) responded favorably to antibiotic therapy and were safely discharged from the hospital. Discharges took place at various intervals, including 48 hours (4.8%), 72 hours (51.6%), 96 hours (35.5%), and 120 hours (3.1%). During the conservative treatment period, three patients (4.9%) ultimately required surgery. In various studies, the success rate of conservative treatment with antibiotics has been reported as follows: 86.0% in the study by Styrud *et al.*, (2006) [20], 91.0% in the study by Park *et al.*, (2011) [18], 95.0% in the study by Malik and Bari (2009) [21], and 92.0% in the study by Winn *et al.*, (2004) [22]. Hansson *et al.*, (2009) [23] also reported a treatment efficacy rate of 90.8% for antibiotic therapy. In our study, we observed a 13.0% recurrence of appendicitis in conservatively treated children within six months. The recurrence rate of symptoms within one year was reported as 15.0% in the study by Styrud *et al.*, (2006) [20] and 5.0% within 18 months in the study by Park *et al.*, (2011) [18]. Additionally, four patients (10.0%) were readmitted within one year due to recurrent

appendicitis, necessitating surgery when appendicitis was confirmed, as reported by Malik and Bari (2009) [21]. Hansson *et al.*, (2009) [23] reported a recurrence rate of 13.9%, with one-third of recurrences occurring within 10 days and two-thirds appearing between 3 and 16 months after hospital discharge. Conversely, Liu *et al.*, (2007) [19] and Winn *et al.*, (2004) [22] observed a lower recurrence rate of only 5.0% for appendicitis. The findings from our current study may offer valuable insights for future research in similar areas.

Limitation of the study

This study had several limitations. Firstly, its short duration prevented long-term follow-up, which potentially limited the assessment of treatment outcomes over time. Secondly, the sample size of 62 cases, although informative, did not provide precise figures or cover the full range of outcomes. Thirdly, logistical challenges like transportation issues and participants residing in remote areas from the study center led to variations in follow-up schedules, potentially affecting data consistency and completeness. These limitations should have been kept in mind when interpreting the study's findings and highlighted the importance of future research with larger samples and extended follow-up periods.

5. CONCLUSION & RECOMMENDATION

This study has shed light on the potential benefits of conservative treatment for uncomplicated acute appendicitis in children. Our findings have demonstrated significant improvements in various clinical parameters and have highlighted a high success rate associated with this non-operative approach. These results underscore the significance of considering conservative treatment as a viable alternative to surgery in select cases. Further research and exploration in the

realm of pediatric healthcare practices are warranted to fully harness the potential of this approach and to refine its application in clinical settings.

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