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ORIGINAL ARTICLE

Advances in Basic Medical Sciences

Comparison of Conservative Management versus Appendectomy in Uncomplicated Acute Appendicitis in Pediatric Age

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ABSTRACT

OBJECTIVE: The objective of this study was to compare the outcome of conservative management (CM) of acute appendicitis (AA) versus appendectomy in uncomplicated appendicitis in the pediatric age group in standings of resolution of symptoms and hospital stay.

METHODOLOGY: This randomized controlled trial was conducted in department of pediatric surgery, children hospital Lahore after IRB approval over a period of 1 year. A total of 122 patients were registered in this study and were randomly separated into two groups by balloting method (61 patients in each group): Group A, children were managed conservatively with antibiotics, and in group B Patients underwent Appendectomy. After treatment in both groups, the outcome was measured in standings of resolution of symptoms and hospital stay. The entry and analyzation of gathered data was conducted through SPSS 25.0

RESULTS: Over all, there was a male predominance in the study population, with 58.2% males and 41.8% females. Both groups were comparable with respect to the age of presentation (Group A: 111.377 ± 24.376 months vs Group B: 112.426 ± 30.276 months, p-value: 0.883). The mean TLC at presentation in the uncomplicated acute appendicitis in this study was 14.65±12.53 while the CRP mean value was 27.85± 25.86. The mean pediatric appendicular score (PAS) was 6.85±0.833 which indicated the probable diagnosis range of acute appendicitis. In terms of hospital stay, Group A had a mean stay of 2.655 ± 0.834 days and Group B had a mean stay of 1.967 ± 0.682 days, with a p-value of 0.001. Among the patient in the conservative group, 85.2 %(n:52/61) patients showed resolution of symptoms, while 14.8% (9/61) had treatment failure.. The rate of negative appendectomy was 11.5% (7/61) in the appendectomy group, which was confirmed histologically. The histology of the nine individuals in the conservative group who underwent appendectomy was positive. On the follow-up, one patient (1.85%) in the conservative management group presented with recurrence. While in the appendectomy group, 4 cases of wound infection and one case of prolonged ileus were presented (rate of complication: 8.2%).

CONCLUSION: For suspected acute appendicitis, antibiotics are safe and effective and may avoid unnecessary appendectomy, decreasing operation rate, and surgical hazards.

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INTRODUCTION

Acute appendicitis is the Chief cause of emergency surgery in children, with a 7 to 8 percent lifetime incidence. Overall, 1 to 8 percent of children presenting with abdominal pain to a pediatric surgical emergency room are diagnosed with acute Appendicitis. In addition, there is considerable diversity in the presentation of its symptoms, extent of disease, sonographic evaluation, and surgical management of acute appendicitis patients.[1] Appendicitis is characterized by an infection-induced inflammation of the connective tissues around the appendix. The primary pathophysiological process underlying acute Appendicitis is appendix lumen obstruction, followed by inflammation. In 60% of cases, hyperplasia of sub mucosal lymphoid follicles causes obstruction. At first, the appendicular wall exhibits

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inflammation and congestion.[2] As edema and congestion worsen, they have a compressive impact on blood vessels, which decreases the amount of blood flowing to the appendix and causes it to become gangrenous. This phase of appendicitis is identified as gangrenous Appendicitis. The appendix wall will eventually perforate as this necrotic process progresses, and this condition is referred to as perforated appendicitis. The perforation may result in localized or widespread peritonitis or abscess formation. Appendicular mass in the right iliac fossa may be a symptom of chronic appendicitis.[3]

Acute Appendicitis frequently manifests as right lower quadrant pain, decreased appetite, nausea/vomiting, nevertheless about 40% of people do not experience these complaints. It is challenging for the surgeon to diagnose Appendicitis in children promptly. Occasionally, Appendicitis is misdiagnosed as another disease, leading to a delay in treatment that increases morbidity and leads to medical disputes.[4] Clinical assessment, laboratory tests like complete blood count (CBC) and C-reactive protein, and imaging investigations like ultrasound abdomen and computer tomography are all used to determine whether a patient has acute Appendicitis. Acute Appendicitis is frequently diagnosed using the pediatric appendicitis score (PAS) and modified Alvarado score. The majority of acute appendicitis treatments include surgery. However, neither open nor laparoscopic appendectomies come without danger. Following an appendectomy, postoperative problems such as hemorrhage, ileus, wound infection, and incisional hernia has been reported. Furthermore, 2.8 percent of patients need additional hospital stays because of small intestine adhesion obstruction following an appendectomy. For suspected acute Appendicitis, negative histology findings occur in 15 to 25% of patients undergoing appendectomy.5 In places where surgical facilities are not available, such as submarines and remote regions, conservative treatment of acute Appendicitis has been advised. Conservative management of Appendicitis can be used to protect vulnerable patients from abdominal exploratory surgery.[5] Gorter et al. in 2015 studied 25 patients treated with conservative antibiotic therapy for acute appendicitis; 23 of these patients remained asymptomatic until 8 weeks of follow-up, and only 2 required delayed appendectomies due to treatment failure.[6] Recent evidence suggests that conservative management may be a feasible option to appendectomy with uncomplicated appendicitis in children. Armstrong and colleagues performed a meta-analysis which provided important evidence about the outcomes of conservative management versus appendectomy as the initial treatment for pediatric patients with acute uncomplicated Appendicitis. The current study's findings suggest that it is viable and successful, with a elevated achievement rate. The presence of a fecolith is the most common reason for antibiotic therapy failure. While In cases of complicated Appendicitis with appendicolith, surgery is advised.[7]

Following an assessment of the literature, to present, there is little evidence available regarding the management of acute uncomplicated appendicitis with antibiotics in pediatric age group, while surgical therapy is the gold standard, although it comes with complications and the possibility of negative appendectomies. Although various studies have been conducted to assess the efficacy of conservative management in acute uncomplicated appendicitis, some have concluded that conservative management is effective and safe, preventing the patient from surgery and surgery-related complications, and reducing the country's economic burden. Others, however, argue that conservative care is ineffective and that patients who are first treated with antibiotics may require appendectomy. As a result, randomized controlled trials in various settings are required to gain an enhanced appreciative role of conservative treatment in acute appendicitis.

METHODOLOGY

We conducted a randomized controlled trial of 122 patients presented in the pediatric surgical department children hospital Lahore according to inclusion and exclusion criteria. Both male and female patients of age 4 years up to 15 years with a pediatric appendicular score >5 and Uncomplicated appendicitis on basis of clinical history, examination, laboratory and Sonographic evidence were included while those patients with the opinion suggesting of perforated or complicated appendicitis (e.g., peritonitis, appendicular mass) , any prior history of non-operative treatment of acute appendicitis, Known history of inflammatory bowel disease/chronic abdominal pain syndrome and those whose guardians have not given consent were excluded. Patients fulfilling the selection criteria were included in the study. All patients were subjected to a detailed history, evaluation, general physical examination, necessary laboratory investigations, and imaging study (plain radiography, abdominal ultrasonography). Patients were separated into two groups randomly using the balloting method. Patients in group A were managed conservatively by antibiotics therapy and patients in group B underwent appendectomy. Both procedures were explained to parents/attendants by the surgeon. For both conservative management and surgical intervention consent was taken from parents/guardian. Equal care was given to both groups of patients. After the patient is diagnosed with acute uncomplicated appendicitis in the emergency ward, patients were admitted to the indoor department and antibiotics were started (Amoxicillin/Clavulanic acid, Amikacin, Flagyl) according to hospital protocol, and the patient were reassessed by the

surgeon in terms of clinical signs and laboratory parameters. The patient's TLC and CRP were performed after 24 hours and were repeated 48 hours later. If the symptoms resolved with improvement in the lab parameters, then the patient was discharged on oral antibiotics (Ciprofloxin and Flagyl) for the next 7 days. In case the patient remains static for 48 hours, then patient remained admitted and was reevaluated after 72 hours. In cases of persistence of signs and symptoms, the patient will undergo an appendectomy. All patients in the conservative group were followed for 6 months. Initially, they were called after 1 week then after 1 month, 3 months, and 6 months. All patients in appendectomy group were assessed by the anesthesia department and the patients were given a single preoperative dose of inj. ceftriaxone 50mg/kg/dose followed by appendectomy. After discharge patients were seen after 1 week than after 1 month, 3rd month, and after 6 months. Each patient was assessed in terms of Success Rate (resolution of symptoms) and Hospital stay. Data was entered and analyzed using SPSS version 25. Quantitative variables i.e. age, and weight, were summarized as mean ± standard deviation. Qualitative variables i.e. gender, and failure of conservative therapy was presented as frequency and percentage. The Chi-square test was applied to compare qualitative variables in both study groups. An Independent sample t-test was used to compare quantitative variables between both groups. A p-value ≤ 0.05 was taken as statistically significant.

RESULTS

Total of 122 patients with acute uncomplicated appendicitis were received in the pediatric surgery department and divided into two groups randomly by balloting method (61 patients in each group. Patients were followed in outpatient department for post operative complications and recurrence. There was a male predominance in the study population, with 58.2 %(n=71) males and 41.8%(n=51) females. In group A there were 52.5% males and 47.5% females, while in group B there were 63.9% males, and 36.1% females. The p-value was 0.199, indicating that there was no difference between the groups in terms of the distribution of gender. In Group A, the average age of the children in our study was 111.377 ± 24.376 months, while Group B had a mean age of 112.426 ± 30.276 months, with a p-value of 0.883. This demonstrates that in terms of the mean age of the patients in both groups, there was no significant age difference. Leukocytosis was present in 74% of patients, with the shift to the left in 42% of the patients. CRP was raised to 40 or above in 70.3% of the patients. Ultrasound findings were found diagnostic in 85.25% of cases. The mean TLC in the uncomplicated acute appendicitis in this study was 14.65±12.53 while the CRP mean value was 27.85 ± 25.86. The Pediatric Appendicitis Score (PAS), mean score was 6.85±0.833, indicating the probable diagnosis range of acute appendicitis. CRP was used to monitor the conservative group for 48 hours; the mean CRP in the conservative group was 27.85±25.86 mg/dl. , In terms of hospital stay, Group A had a mean stay of 2.655 ± 0.834 days and Group B had a mean stay of 1.967 ± 0.682 days with a p-value of 0.001 indicating that there is a significant difference between the two groups in terms of hospital stay. Among the patient in the conservative group, fifty two patients (85.2%) of the patients who were treated with antibiotic therapy for 48 hours showed resolution of symptoms. But in nine patients, (14.8 %,) the symptoms didn't go away in 48 hours. In these cases, an appendectomy was done. The p-value between the groups was 0.008, indicating that there was a significant difference in the resolution of symptoms. The rate of negative appendectomy was 11.5% (7/61) in the appendectomy group, which was confirmed histologically. On the follow-up, one patient (1.85%) in the conservative management group presented with recurrence. While in the appendectomy group, 4 cases of wound infection and one case of prolonged ileus were presented (rate of complication: 8.2%).

DISCUSSION

The gold standard treatment for acute appendicitis has been appendectomy over the years. More than 300000 appendectomies are done annually in the United States.[8] Although it is a major surgical intervention and is generally well tolerated, and can be associated with postoperative complications. The average post appendectomy complication rate for acute appendicitis (AA) is 10–19%, and it is also associated with 20-40% of negative appendectomy rate. Because of the negative appendectomy, probable complication rates, and advancements in antibiotic therapy, attempts to treat uncomplicated cases of acute appendicitis with antibiotics have become an attractive option for surgeons.9In this study, we looked at the effectiveness of conservative therapy vs open appendectomy in uncomplicated acute appendicitis patients. There was equal demographic distribution among both groups in our study. The sample population in present study consisted of 58.2 % males and 41.8 % females, demonstrating a male predominance. Similarly, Lin et al. found that males had a higher incidence of appendicitis than females in their study on the epidemiology of the acute appendicitis. Our study demonstrates that antibiotic therapy has a elevated success rate (85.2%) for the conservative management of acute appendicitis when patients are properly selected for the medication and those with complicated appendicitis are excluded. These results are in line with the literature's findings, as in the Federico et al. research, 85.0 % of patients receiving conservative therapy were fully recovered without encountering any serious complications.[10]Fugazzola et al. found no difference in outcomes according to age or presenting symptoms in their meta analysis, and they reported a recovery rate of 84.1%. They suggested that

conservative treatment was more useful the earlier it began, and that it worked best when it was initiated within 12 hrs from symptom onset.[11] In our study, only 9 (14.8%) of the patient from the antibiotic treatment group had failed to resolve symptoms within two days. Depending on the study's inclusion criteria, various studies have varied failure rates. Liu and Fogg's meta analysis revealed a non-operative management failure rate of just 6.9%.[12] However, when complicated cases of appendicitis are included in the research, higher rates of conservative treatment failure are observed, as reported by Park and colleagues, who identified a 22% failure rate when complicated cases were not expelled from the study.[13]Other randomized studies by Salminen et al. demonstrated failure rates of 27.3%, while Vons et al. reported 38.0% appendectomy in the conservative treatment group.[14]Salminen et al observed similar results in their study, where 8 patients in the conservative management group that underwent appendectomy did not have any perforation or complication on surgical exploration. He further added that, 'Had the simple nature of appendicitis been known, these cases might have been successfully treated with antibiotics again".[14]

This emphasizes the significance of stratification when selecting patients for conservative treatment of acute appendicitis. Careful examination and the use of diagnostic imaging modalities for exclusion of the perforated, complicated appendicitis, and detection of fecolith results in better identification of the patient for conservative care of acute appendicitis.[15]According to the current study, there was no significant complication experienced by any of the conservatively managed groups patient as a result of delayed appendectomy. This suggests that delaying appendectomy for uncomplicated acute appendicitis can be decided upon with a low risk of major complications arising from the delay in surgery. In the study of Styrud et al, due to failure of antibiotic therapy only 18 needed surgeries out of 128 patients who were treated non-operatively.[16] It is important to make use of antibiotic management in acute appendicitis with the elevated diagnostic accuracy; In the present study, all patients had a comprehensive history, physical examination, and diagnostic evaluation using the PAS(pediatric appendicitis score), X-ray, ultrasound and laboratory investigation (elevated TLC, CRP levels). The mean TLC in the uncomplicated acute appendicitis in this study was 14.65±12.53 while the CRP mean value was 27.85± 25.86. The PAS mean score was 6.85±0.833 which indicates the probable diagnosis range of acute appendicitis. The USG was performed in all cases but CT scan was not utilized, as CT scan is not cost-effective in our setting and is not included in our protocol. Furthermore, we do not perform the CT scan since, in our setup, we place more focus on clinical evaluation, resulting in better expertise and a lower rate of negative appendectomy.. Di Saverio et al. concluded in their study that assigning patients with assumed acute appendicitis to either nonsurgical or surgical treatment groups based on clinical, and laboratory investigation, results in a low treatment failure rate of approximately 14%.[17]In our study, we used PAS scores along with TLC and CRP levels which resulted in 84% of success in the conservative therapy group similar to Saveerio et al. findings. However, Saveerio et al evaluate the usefulness of a detailed clinical examination, done by Alvarado and AIR scores, in diagnosing acute appendicitis and managing it to the accurate therapeutic pathway, his success rate of 87.4% is extremely in favour of the usefulness of these scores. In his study, he observed that the combination of appendicitis predicting scores (Alvarado/AIR scores/PAS) may significantly reduce the possibility of over-predicting acute appendicitis, and make a diagnostic performance as trustworthy as a CT scan, thus avoiding the usual use of CT and decreasing costs and consumption of hospital resources and the possible risks of radiation/contrast exposure.[17]Importantly, because of the possibility for a elevated rate of recurrence and its relationship with a higher conservative treatment failure rate, patients with fecolith were removed from study. We excluded the fecolith based on the findings of the X ray, and ultrasound in our study. Due to this, the recurrence rate of symptoms in our study within 6 months of follow up was 1.85 %, which is similar to the study of Salminen et al., where recurrence occurred in 1.9% of cases 5/257 patients.[14] The low rate of recurrence in the study can be explained due to the fecolith being excluded and a short follow-up of 6 months only.

For six months, we followed the patient in the outpatient department to look for complications or recurrences. Every patient on follow-up received a detailed physical examination, and when there was suspicion of recurrence, blood tests for TLC and CRP as well as ultrasonography were performed. On the follow-up, one patient (1.85%) in the conservative management group presented with recurrence. In the study of Hansson et al, among 108 patients,15 (13·9 %) had recurrent appendicitis at a median of 1 year who initially were managed without surgery with conservative management,. In our study, the low rate of recurrence compared to study of Hansson et al in the conservative group may partly be attributable to the six-month short follow-up period of our study.Even though the majority of patients present to the emergency room with recurrent symptoms within six months of conservative treatment. However, patients can present with recurrent symptoms to the emergency room up to one year or later in life. According to his observation, within 10 days of hospital discharge one-third of recurrences appeared and between 3 and 16 months from discharge there was two-third recurrence occurred.18 In the conservative management group the median duration of hospital stay was expectedly longer, (2.655 ± 0.834 days vs 1.967 ± 0.682 days; p-value 0.001). Longer hospital stay in our study is due to a predetermined protocol that patients in the conservative therapy group would be admitted for 48 hours for IV antibiotics and patient monitoring. In our study, Antibiotics (Amoxicillin/Clavulanic acid, Amikacin, Flagyl) were started per hospital protocol, and the patient's clinical signs and laboratory values were assessed by the surgeon. TLC and CRP tests were done after 24 hours and again 48 hours afterward. If the symptoms subsided and the test results improved, the patient was discharged on oral antibiotics (Ciprofloxin and Flagyl) for the next 7 days. Other researchers have noted the same observation as Suliman et al study, the length of hospital stay was statistically significantly shorter (P < .001) in the surgical group.14Similarly, The mean hospital stay

was 2.3 days in the conservative management group and 1.2 days in the surgery group in a study conducted by Federico and colleagues. However, when other researchers admitted the patient to the hospital for 24-36 hours of conservative treatment, no significant difference was found among the two groups in terms of hospital stay.[10]

In our study, negative appendectomy rate was 11.5% in surgically treated cases of appendicitis. In the late 20th century, negative appendectomy rate was as elevated as 40%. This gradually declined to 20 to 25 percent.19In the most recent literature, the rate of negative appendectomy was also reported to be 12.5%, which can be attributed to the routine use of CT scans and ultrasounds to diagnose suspected and unclear cases of acute appendicitis.20But this rate of 20 to 25% of negative appendectomy is also very high. The researchers claim that conservative management is a viable option in carefully selected patients, as the rate of treatment failure (15% to 30%) in conservative management is nearly identical to the negative appendectomy rate (20% to 25%) in surgical management. Additionally, surgical management of appendicitis is also linked to long-term surgical complications like adhesion obstruction.21Complications after appendectomy range from 4 to 15%, along with the expenditures and discomfort of being hospitalized and having surgery. In our study rate of complications was 8% in surgically treated cases of acute appendicitis. There were 4 cases of superficial surgical site infection and one case of prolonged ileus in the appendectomy group. Our results are consistent with the study by Lotfallah et al., in which out of 31, the postoperative complication rate was 9.6% with 2 patients developing surgical site infection and one patient developing adhesion obstruction.[21]

CONCLUSION

For suspected acute appendicitis, conservative treatment with Antibiotics is safe and valuable and may avoid unnecessary appendectomy, surgical risks, and overall costs. . In addition to saving a large number of patients from a negative appendectomy, conservative treatment of acute appendicitis will also save them from the short- and long-term complications associated to surgical treatment. In general, the clinical outcomes of this study do not modify the treatment strategy for appendicitis, though it might provide physicians with helpful guidance when choosing between conservative and surgical treatment for certain individuals receiving straightforward appendix care.

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CONFLICT OF INTEREST

Author declared no conflict of interest

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AUTHORS CONTRIBUTIONS

MR: Conception, Design of the work, Data collection, and Drafting, Reviewed, Final approval, Agreement to be accountable.

JA: Conception, Design of the work, Acquistion, Data Analysis, and Drafting, Reviewed, Final approval, Agreement to be accountable.

WURR: Conception, Design of the work, Interpretation of data for the work, and Drafting, Reviewed, Final approval, Agreement to be accountable.

MSS: Conception, Design of the work, Data collection, and Drafting, Reviewed, Final approval, Agreement to be accountable .

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DATA SHARING POLICY

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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