

## THE OUTCOME OF ANTIBIOTICS VS OPEN APPENDECTOMY FOR ACUTE NON-PERFORATED APPENDICITIS

RAJA RA<sup>\*1</sup>, ABBASI MH<sup>1</sup>, TAJ MRU<sup>1</sup>, TALHA<sup>1</sup>, QAYYUM T<sup>2</sup>

<sup>1</sup>Department of General Surgery, CMH Jhelum, Pakistan

<sup>2</sup>Department of Obstetrics and Gynaecology, CMH Jhelum, Pakistan

\*Corresponding author's email address: [nisarahmedjaral@gmail.com](mailto:nisarahmedjaral@gmail.com)

(Received, 25<sup>th</sup> January 2023, Revised 19<sup>th</sup> March 2024, Published 10<sup>th</sup> April 2024)

**Abstract:** Acute appendicitis is a common surgical emergency. While appendectomy has been the conventional treatment for this condition, recent advancements in antibiotic therapy have led to exploring the use of antibiotics as a non-surgical alternative for treating non-complicated acute appendicitis. **Objective:** The objective of the present study was to compare the outcomes of administering antibiotics and performing emergency appendectomy in a cohort of individuals diagnosed with non-perforated acute appendicitis based on CT evaluation. **Methods:** After the ethical approval from the institutional review board, this randomised control trial was conducted at Combined Military Hospital Jhelum from July 2022 to December 2023. The patients were randomly assigned, using a closed envelope method, to either have open appendectomy (Group A, n=60) or receive antibiotic therapy (Group B, n=60) with intravenous ertapenem. Open appendectomy was conducted utilising the McBurney technique. The patient's outcomes were assessed during their hospitalization period, specifically on days 0, 1, and 2, and by telephone interviews one week and two months following the intervention. Pain scores were collected at two specific time points, one week and two months after randomisation, utilising a visual analogue scale (VAS). **Results:** No significant differences were observed in the baseline characteristics in both groups. Mean  $\pm$  S.D of the pain experience of the study participants in both groups was  $4.16 \pm 1.04$  and  $3.68 \pm 1.02$  (days) ( $P$  value=0.008). Mean  $\pm$  S.D of the hospital stay of the study participants in both groups was  $3.13 \pm 0.87$  and  $3.16 \pm 0.83$  (days) ( $P$  value=0.843). A significant difference in the VAS score was observed ( $p < 0.0001$ ) in the participants of both groups at discharge and after a one-week follow-up period. **Conclusion:** The findings of the study indicate that a significant proportion of individuals who received antibiotic therapy for non-perforated acute appendicitis did not necessitate the surgical procedure of appendectomy within the two-month post-treatment observation period.

**Keywords:** Pain Score, Appendicitis, Surgical Procedure, Antibiotics

### Introduction

Acute appendicitis is the prevailing rationale for surgical intervention in individuals who are hospitalised due to acute abdominal pain. Approximately 20% of instances involving acute appendicitis exhibit complications, resulting in either localised or diffuse peritonitis. However, the majority of cases remain uncomplicated (1). While prompt appendectomy remains the recommended course of action for treating acute uncomplicated appendicitis, several research, including four randomised trials, have indicated that antibiotic treatment may be effective in curing acute appendicitis or could potentially serve as the initial therapeutic option (2, 3). The applicability of the data from earlier research has been diminished due to design limitations, which have prevented any alteration in the existing treatment plan for acute appendicitis (4). While emergency appendectomy is generally well tolerated by the majority of patients, it is essential to acknowledge that there is still a notable risk of postoperative problems, affecting approximately 2-23% of individuals (5). Furthermore, it was observed that within a span of 10 years, a total of 3% of patients who underwent appendectomy experienced readmission due to intestinal obstruction that was directly associated with postoperative adhesions (6). The avoidance of emergency appendectomy in individuals diagnosed with uncomplicated appendicitis who would have otherwise undergone surgery could potentially

enhance the risk-benefit balance of acute appendicitis management. The appendectomy procedure is a well-established surgical intervention first presented in approximately 1880 (7). Previously, non-operative care was employed for a considerable number of patients; nevertheless, both conservatively managed individuals and those who underwent appendectomy experienced elevated levels of morbidity and death. In 1959, Coldrey conducted a study that included a sample of 471 patients who were administered antibiotics as a sole form of treatment. However, this study did not garner significant attention (8). The conventional approach for managing acute appendicitis has traditionally involved promptly performing an appendectomy to prevent perforation (9). However, studies conducted on a population level have revealed noteworthy long-term complications associated with surgical exploration for appendicitis. These complications include the occurrence of small bowel obstruction necessitating further surgical intervention, which has been observed in 1.3% of cases within a 30-year timeframe (10). The 30-day mortality rate is also 0.24%, with an elevated standard mortality ratio. Various challenges notably impede the occurrence of a negative appendectomy. Consequently, there has been a growing inclination towards antibiotic therapy as the primary approach in recent years. Moreover, several studies have suggested that antibiotics can be utilised as a viable treatment option for children with

[Citation: Raja, R.A., Abbasi, M.H., Taj, M.R.U., Talha., Qayyum, T. (2024). The outcome of antibiotics vs open appendectomy for acute non-perforated appendicitis. *Biol. Clin. Sci. Res. J.*, 2024: 804. doi: <https://doi.org/10.54112/bcsrj.v2024i1.804>]

perforated appendicitis (11). Furthermore, previous investigations conducted on adult patients with conservatively managed perforated appendicitis have indicated that late recurrences of the condition tend to present with a relatively moderate clinical course (12). The objective of the present study was to compare the outcomes of administering antibiotics and performing emergency appendectomy in a cohort of individuals diagnosed with uncomplicated acute appendicitis based on CT evaluation.

**Methodology**

After the ethical approval from the institutional review board, this randomised control trial was conducted at Combined Military Hospital Jhelum from July 2022 to December 2023. The prevalence of acute appendicitis in Pakistan is 8.6%; using the WHO EPI sample size calculator, considering a 95% confidence interval and a 5% margin of error, a sample size of 120 participants was obtained. Through non-probability consecutive sampling, participants between ages 18-60 years of either gender who were admitted to the emergency department and had a clinical suspicion of non-perforated acute appendicitis, which was subsequently confirmed by a CT scan, were included in the study. Exclusion criteria encompassed patients diagnosed with complicated appendicitis, characterised by identifying an appendicolith, abscess, perforation, or suspicion of a tumour on the computed tomography (CT) scan. The patients were randomly assigned, using a closed envelope method, to either have open appendectomy (Group A, n=60) or receive antibiotic therapy (Group B, n=60) with intravenous ertapenem. The randomisation was conducted using a 1:1 equal allocation ratio. Open appendectomy was conducted utilising the McBurney technique, which involves making an incision in the right lower quadrant of the abdomen and separating the muscle. The administration of prophylactic antibiotics, specifically 500 mg of metronidazole and 1.5 g of cefuroxime, took place roughly 30 minutes before the incision was performed. Patients in the surgical group did not get any additional antibiotics unless there was a suspicion of postoperative wound infection. The diagnosis of appendicitis was established in the presence of histological findings indicating the infiltration of neutrophils throughout the appendiceal muscular layer. Ertapenem was selected as the antibiotic for this trial based on its demonstrated effectiveness as a monotherapy for severe intra-abdominal infections. Additionally, its convenient dosing regimen of a single daily dose further supported its inclusion in the study. Patients in the antibiotic group (Group B) were provided intravenous ertapenem sodium at a dosage of 1 g per day for three days, with the

initial dose administered in the emergency room. The administration of intravenous antibiotics was succeeded by a 7-day course of oral levofloxacin at a dosage of 500 mg once a day and metronidazole at a dosage of 500 mg three times per day. Ten patients on antibiotic therapy later went to open appendectomy. The patient outcomes were assessed during their hospitalisation period, specifically on days 0, 1, and 2, and by telephone interviews at 1 week and 2 months following the intervention. Pain scores were collected at two specific time points, one week and two months after randomisation, utilising a visual analogue scale (VAS). Additionally, sick leave was documented, and the occurrence of wound infections and recurrent appendicitis was assessed. The data collected were input and analysed using SPSS version 21. The numerical factors, such as age, number of days the patient experienced discomfort and duration of hospital stay, were reported as mean ± standard deviation (SD). The categorical variables, such as gender and the appendectomy conversion, were presented in frequency and percentage. An independent sample t-test assesses the average number of days patients had discomfort and the length of their hospital stay. A significance level of  $p \leq 0.05$  was employed to determine statistical significance.

**Results**

Table 1 shows the baseline characteristics of the participants in both study groups, and no significant differences were observed in the baseline characteristics in either group. Mean± S.D of the age of the study participants in both groups was  $31.88 \pm 6.27$  and  $32.95 \pm 8.81$  years (P value=0.480). Both groups have the majority of male participants: Group A, 72%, and Group B, 65%. Mean± S.D of the haemoglobin of the study participants in both groups was  $13.22 \pm 3.5$  and  $13.06 \pm 2.69$  g/L (P value=0.781). Mean± S.D of the TLC of the study participants in both groups was  $11.41 \pm 1.77$  and  $11.6 \pm 1.82 (10^9/L)$  (P value=0.542). Mean± S.D of the CRP of the study participants in both groups was  $35.4 \pm 12.9$  and  $33.35 \pm 12.4$  (mg/L) (P value=0.393). Mean± S.D of the Creatinine of the study participants in both groups was  $70.48 \pm 4.77$  and  $70.6 \pm 4.69$  (µmol/L) (P value=0.900). Table 2 shows the outcome measures observed in both study groups. Mean± S.D of the pain experience of the study participants in both groups was  $4.16 \pm 1.04$  and  $3.68 \pm 1.02$  (days) (P value=0.008). Mean± S.D of the hospital stay of the study participants in both groups was  $3.13 \pm 0.87$  and  $3.16 \pm 0.83$  (days) (P value=0.843). A significant difference in the VAS score was observed ( $p < 0.0001$ ) in the participants of both groups at discharge and after a one-week follow-up period.

**Table 1: Baseline parameters of the participants in both study groups**

Baseline parameters	Group A (open appendectomy, n=60)	Group B (Antibiotic therapy, n=50)	P-Value
Age (years)	$31.88 \pm 6.27$	$32.95 \pm 8.81$	0.480
<b>Gender</b>			0.45
Male	43 (72%)	39 (65%)	
Female	17 (28%)	21 (35%)	
Hemoglobin (g/L)	$13.22 \pm 3.5$	$13.06 \pm 2.69$	0.781
Total leucocyte count $\times 10^9/L$	$11.41 \pm 1.77$	$11.6 \pm 1.82$	0.542

[Citation: Raja, R.A., Abbasi, M.H., Taj, M.R.U., Talha., Qayyum, T. (2024). The outcome of antibiotics vs open appendectomy for acute non-perforated appendicitis. *Biol. Clin. Sci. Res. J.*, 2024: 804. doi: <https://doi.org/10.54112/bcsrj.v2024i1.804>]

CRP (mg/L)	35.4±12.9	33.35±12.4	0.393
Creatinine (µmol/L)	70.48±4.77	70.6±4.69	0.900

**Table 2: Intervention outcomes of the participants in both study groups**

Outcome parameters	Group A (open appendectomy, n=60)	Group B (Antibiotic therapy, n=50)	P-Value
Pain Experience (days)	4.16±1.04	3.68±1.02	0.008
Length of Hospital Stay (Days)	3.13±0.87	3.16±0.83	0.843
<b>VAS Score</b>			
At discharge	3	2	<0.0001
After 1 Week	2	1	<0.0001
After 2 Moths	1	1	0.182

## Discussion

The surgical procedure known as appendectomy has long been regarded as the established and widely accepted treatment for cases of acute appendicitis, maintaining its status as the prevailing approach up to the present time. (13). Several writers have lately put up the proposition that the treatment of acute appendicitis could potentially be limited to the use of antibiotics alone. There is a body of data that advocates for the use of interval appendectomy, citing concerns over the potential for recurrent episodes of acute appendicitis and the possibility of an undetected tumour. (14). However, there is a growing inclination towards only utilising antibiotics as a means of avoiding surgical intervention. This assertion is grounded in believing that numerous inflammatory abdominal illnesses can be effectively managed without surgical procedures. Furthermore, it posits that the current surgical approach to acute appendicitis is primarily based on customary practices rather than substantial empirical data. Nevertheless, the utilisation of antibiotics for the treatment of appendicitis is a multifaceted process that relies on various aspects, such as the distinction between severe and uncomplicated cases, the age group of patients, the choice between definitive therapy and the interval to appendectomy, as well as the consideration of alternative treatment alternatives. Numerous research studies documented that selection bias can lead to inconsistent outcomes. (15).

Despite our inability to establish the noninferiority of antibacterial treatment compared to appendectomy for appendicitis, our findings indicate that 50 out of 60 patients diagnosed with uncomplicated acute appendicitis achieved successful outcomes alone by antibiotic therapy. This finding demonstrates a favourable comparison to the outcomes observed in earlier randomised trials (16, 17) as well as a population-based prospective research (18) In the present study, 60 patients who received antibiotic treatment were included, of whom ten individuals (17%) underwent an appendectomy procedure.

There was a statistically significant difference in the average duration of pain between the two study groups, which was inconsistent with findings from previous research. (19, 20). The choice of antibiotics posed a constraint in the management of appendicitis. To effectively address the potential bacteria responsible for appendicitis, employing a wide-ranging antibiotic that encompasses a diverse range of microorganisms is imperative. It was noted in the present study that the average duration of hospitalisation was only slightly extended in the antibiotic cohort. Nonetheless, this

measure was predetermined to prioritise the safety of the patients. Other researchers have also reported similar findings. (3, 16). The present investigation discovered that there were no statistically significant variations in hospitalisation between patients who received conservative treatment and those who underwent operational treatment for acute appendicitis. Therefore, based on the results obtained from this study, it is advisable to consider the option of conservative treatment using antibiotics for patients diagnosed with uncomplicated appendicitis to prevent potential problems associated with surgical intervention. Nevertheless, if cautious management proves ineffective, it is imperative to implement vigilant monitoring and prompt intervention.

## Conclusion

The majority of patients in the group receiving antibiotic treatment did not necessitate appendectomy within the 2-month term of follow-up. The utilisation of antibiotics as a therapy method for uncomplicated acute appendicitis remains a viable alternative that warrants consideration.

## Declarations

### Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

### Ethics approval and consent to participate

Approved by the department concerned. (IRBEC/CMHJ-21/085)

### Consent for publication.

Approved

### Funding

Not applicable

## Conflict of interest

The authors declared the absence of a conflict of interest.

## Author Contribution

### RAMEEZ AHMED RAJA

Study Design, Review of Literature.

Conception of Study, Development of Research Methodology Design, Study Design, manuscript Review, and final approval of manuscript.

### COLONEL M. HANIF ABBASI

Coordination of collaborative efforts.

Conception of Study, Final approval of manuscript.

**COLONEL M RIZWAN ULLAH TAJ**

Manuscript revisions, critical input.

Coordination of collaborative efforts.

**MAJOR TALHA**

Data acquisition and analysis.

Manuscript drafting.

**TEHREEM QAYYUM**

Data entry and Data analysis, drafting article.

Data acquisition and analysis.

## References

1. Bhangu A, Søreide K, Di Saverio S, Assarsson JH, Drake FT. Acute appendicitis: modern understanding of pathogenesis, diagnosis, and management. *The Lancet*. 2015;386(10000):1278-87.
2. Sippola S, Grönroos J, Tuominen R, Paajanen H, Rautio T, Nordström P, et al. Economic evaluation of antibiotic therapy versus appendectomy for the treatment of uncomplicated acute appendicitis from the APPAC randomised clinical trial. *Journal of British Surgery*. 2017;104(10):1355-61.
3. Salminen P, Tuominen R, Paajanen H, Rautio T, Nordström P, Aarnio M, et al. Five-year follow-up of antibiotic therapy for uncomplicated acute appendicitis in the APPAC randomised clinical trial. *Jama*. 2018;320(12):1259-65.
4. Suwanwongse K, Shabarek N. Successful conservative management of acute appendicitis in a coronavirus disease 2019 (COVID-19) patient. *Cureus*. 2020;12(4).
5. Viorel M, Petru B, Galina P, Sergiu B. Risk factors in the development of acute appendicitis complications. *The Moldovan Medical Journal*. 2018;61(4):3-9.
6. Krielen P, Stommel MW, Pargmae P, Bouvy ND, Bakkum EA, Ellis H, et al. Adhesion-related readmissions after open and laparoscopic surgery: a retrospective cohort study (SCAR update). *The Lancet*. 2020;395(10217):33-41.
7. Gaskill CE, Simianu VV, Carnell J, Hippe DS, Bhargava P, Flum DR, et al. Use of computed tomography to determine perforation in patients with acute appendicitis. *Current problems in diagnostic radiology*. 2018;47(1):6-9.
8. Svensson JF. On the treatment of acute appendicitis in children: Karolinska Institutet (Sweden); 2015.
9. Jones MW, Lopez RA, Deppen JG. *Appendicitis*. 2018.
10. Rollins KE, Varadhan KK, Neal KR, Lobo DN. Antibiotics versus appendectomy for the treatment of uncomplicated acute appendicitis: an updated meta-analysis of randomised controlled trials. *World journal of surgery*. 2016;40:2305-18.
11. Kang J, Zhang W, Zeng L, Lin Y, Wu J, Zhang N, et al. The modified endoscopic retrograde appendicitis therapy versus antibiotic therapy alone for acute uncomplicated appendicitis in children. *Surgical Endoscopy*. 2021;35:6291-9.
12. Gorter RR, van der Lee JH, Cense HA, Kneepkens CF, Wijnen MH, In't Hof KH, et al. Initial antibiotic treatment for acute simple appendicitis in children

is safe: short-term results from a multicenter, prospective cohort study. *Surgery*. 2015;157(5):916-23.

13. Huston JM, Kao LS, Chang PK, Sanders JM, Buckman S, Adams CA, et al. Antibiotics vs. appendectomy for acute uncomplicated appendicitis in adults: review of the evidence and future directions. *Surgical infections*. 2017;18(5):527-35.
14. Gorter RR, Eker HH, Gorter-Stam MA, Abis GS, Acharya A, Ankersmit M, et al. Diagnosis and management of acute appendicitis. EAES consensus development conference 2015. *Surgical endoscopy*. 2016;30:4668-90.
15. Sartelli M, Catena F, Abu-Zidan FM, Ansaloni L, Biffl WL, Boermeester MA, et al. Management of intra-abdominal infections: recommendations by the WSES 2016 consensus conference. *World journal of emergency surgery*. 2017;12(1):1-31.
16. Podda M, Cillara N, Di Saverio S, Lai A, Feroci F, Luridiana G, et al. Antibiotics-first strategy for uncomplicated acute appendicitis in adults is associated with increased rates of peritonitis at surgery. A systematic review with meta-analysis of randomized controlled trials comparing appendectomy and non-operative management with antibiotics. *the surgeon*. 2017;15(5):303-14.
17. Kandaan AUR. Antibiotic Therapy Versus Appendectomy for Uncomplicated Acute Appendicitis. *Journal of Surgery Pakistan*. 2020;25(1):3-7.
18. Vons C, Barry C, Maitre S, Pautrat K, Leconte M, Costaglioli B, et al. Amoxicillin plus clavulanic acid versus appendectomy for treatment of acute uncomplicated appendicitis: an open-label, non-inferiority, randomised controlled trial. *The Lancet*. 2011;377(9777):1573-9.
19. Cohn SM. Antibiotic therapy vs. appendectomy for treatment of uncomplicated acute appendicitis: the APPAC randomised clinical trial. 50 Landmark Papers Every Acute Care Surgeon Should Know: CRC Press; 2019. p. 54-6.
20. Ansaloni L, Catena F, Coccolini F, Gazzotti F, Pinna AD. Re: Conservative Management of Acute Appendicitis. *Journal of Gastrointestinal Surgery*. 2010;14:931-2.



**Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>. © The Author(s) 2024