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ANTIBIOTICS FOR TREATMENT OF ACUTE APPENDICITIS : A SYSTEMATIC REVIEW

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ABSTRACT

Background: *Appendicitis is one of the most common causes of acute abdominal discomfort in adults and children, with a lifetime risk of 8.6% in males and 6.7% in females.*

Methods: *By comparing itself to the standards set by the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020, this study was able to show that it met all of the requirements. So, the experts were able to make sure that the study was as up-to-date as it was possible to be. For this search approach, publications that came out between 2014 and 2023 were taken into account. Several different online reference sources, like Pubmed and SagePub, were used to do this. It was decided not to take into account review pieces, works that had already been published, or works that were only half done.*

Result: *In the PubMed database, the results of our search brought up 259 articles, whereas the results of our search on SagePub brought up 148 articles. The results of the search conducted for the last year of 2014 yielded a total 15 articles for PubMed and 11 articles for SagePub. In the end, we compiled a total of 6 papers, 4 of which came from PubMed and 2 of which came from SagePub. We included six research that met the criteria.*

Conclusion: *In summary, when selecting antimicrobial medications to treat acute appendicitis, patients who are especially worried about recurrence of appendicitis should use caution. Patients who failed antibiotic treatment first and underwent surgery later could not possibly result in a higher risk of postoperative complications and the acute appendicitis does not develop to complicated appendicitis in this course, which made antibiotic treatment appealing for patients with acuteacute appendicitis who do not want surgery without having to worry about complications or complicating the original illness.*

Keyword: *Antibiotics, Acute Appendicitis, Efficacy*

INTRODUCTION

An inflammation of the vermiform appendix is called appendicitis. The appendix is a hollow organ that is often found in the lower right quadrant of the abdomen, at the tip of the cecum. However, depending on if there were any aberrant developmental issues, such as midgut malrotation, or if there are any other particular situations, such pregnancy or previous abdominal surgeries, it can be found in practically any area of the abdomen. The fifth week is when the appendix develops embryonically. The midgut rotates in relation to the external umbilical cord, eventually rotating the cecum and returning to the abdomen. This leads to the appendix's typical retrocecal position.[1]

Although it frequently manifests as an acute illness, generally within 24 hours, it can also take the form of a more persistent ailment. In the event of a confined abscess through perforation, the initial symptoms may be more gradual. There has been disagreement over the appendix's precise purpose. It is now acknowledged that, particularly in younger individuals, this organ functions as a lymphoid and may have immunoprotective properties. According to other views, the appendix serves as a container for "good" intestinal bacteria. Others contend that it serves no practical use and is only a residue of development.[2]

During pregnancy, it is the most frequent nonobstetric surgical emergency. The diagnosis of acute appendicitis is aided by information gleaned from the history, physical examination, and laboratory tests. Right lower quadrant discomfort, abdominal rigidity, and periumbilical pain radiating to the right lower quadrant are the best symptoms for ruling in acute appendicitis in adults. The most accurate indicators of acute appendicitis in children include the absence or reduction of bowel sounds, a positive psoas sign, a positive obturator sign, and a positive Rovsing sign.[3]

First-line imaging that is advised includes formal or point-of-care ultrasonography. When treating acute appendicitis, laparoscopy or open laparotomy are the usual methods of appendectomy. However, for some patients, intravenous antibiotics could be the primary line of treatment. As long as pain is managed with opioids, nonsteroidal anti-inflammatory medications, and acetaminophen, there is no reason to put off or postpone treatment. Perforation affects 17% to 32% of patients with acute appendicitis and can result in sepsis. An extended period of symptoms prior to undergoing surgery increases the likelihood. In order to lower the morbidity and death caused by perforation, surgical consultation should be completed as soon as possible for patients categorized as moderate to high risk.[1]

With a mean age of 28, appendicitis most frequently strikes people between the ages of 5 and 45. The frequency is roughly 233 per 100,000 individuals. Acute appendicitis is slightly more common in men than in women; the lifetime incidences are 8.6% and 6.7% for men and women, respectively. About 300,000 hospital admissions for appendicitis-related problems occur in the US each year.[1]

There are still few options for treating acute appendicitis with antibiotics, though. There might not be as much data to support this contradiction. The new body of research on antibiotic therapy has advanced recently. Meanwhile, we discovered that randomized and non-randomized controlled trials had varied results when treating simple appendicitis. Furthermore, we discovered that there is a dearth of pertinent literature and that meta-analyses encompassing all randomized trials are uncommon. Furthermore, semi-randomized controlled trials or complex appendicitis were included, even though there were more randomized controls.

METHODS

Protocol

By following the rules provided by Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020, the author of this study made certain that it was up to par with the requirements. This is done to ensure that the conclusions drawn from the inquiry are accurate.

Criteria for Eligibility

For the purpose of this literature review, we review published literature about the efficacy of antibiotics in treating the acute appendicitis. This is done to provide an explanation and improve the handling of treatment at the patient. As the main purpose of this paper, to show the relevance of the difficulties that have been identified as a whole.

In order for researchers to take part in the study, it was necessary for them to fulfil the following requirements: 1) The paper needs to be written in English. In order for the manuscript to be considered for publication, it needs to meet both of these requirements. 2) The studied papers include several that were published after 2013, but before the time period that this systematic review deems to be relevant. Examples of studies that are not permitted include editorials, submissions that do not have a DOI, review articles that have already been published, and entries that are essentially identical to journal papers that have already been published.

Search Strategy

We used "acute appendicitis" "antibiotics" and "efficacyr" as keywords.The search for studies to be included in the systematic review was carried out using the PubMed and SagePub databases by inputting the words: *((("appendicitis"[MeSH Terms] OR "appendicitis"[All Fields] OR ("acute"[All Fields] AND "appendicitis"[All Fields]) OR "acute appendicitis"[All Fields]) AND ("anti bacterial agents"[Pharmacological Action] OR "anti bacterial agents"[MeSH Terms] OR ("anti bacterial"[All Fields] AND "agents"[All Fields]) OR "anti bacterial agents"[All Fields] OR "antibiotic"[All Fields] OR "antibiotics"[All Fields] OR "antibiotic s"[All Fields] OR "antibiotical"[All Fields]) AND ("efficacies"[All Fields] OR "efficacious"[All Fields] OR "efficaciously"[All Fields] OR "efficaciousness"[All Fields] OR "efficacy"[All Fields])) AND ((ffrft[Filter]) AND (review[Filter] OR systematicreview[Filter]) AND (2014:2024[pdat]))* used in searching the literature.

Data retrieval

After reading the abstract and the title of each study, the writers performed an examination to determine whether or not the study satisfied the inclusion criteria. The writers then decided which previous research they wanted to utilise as sources for their article and selected those studies. After looking at a number of different research, which all seemed to point to the same trend, this conclusion was drawn. All submissions need to be written in English and can't have been seen anywhere else.

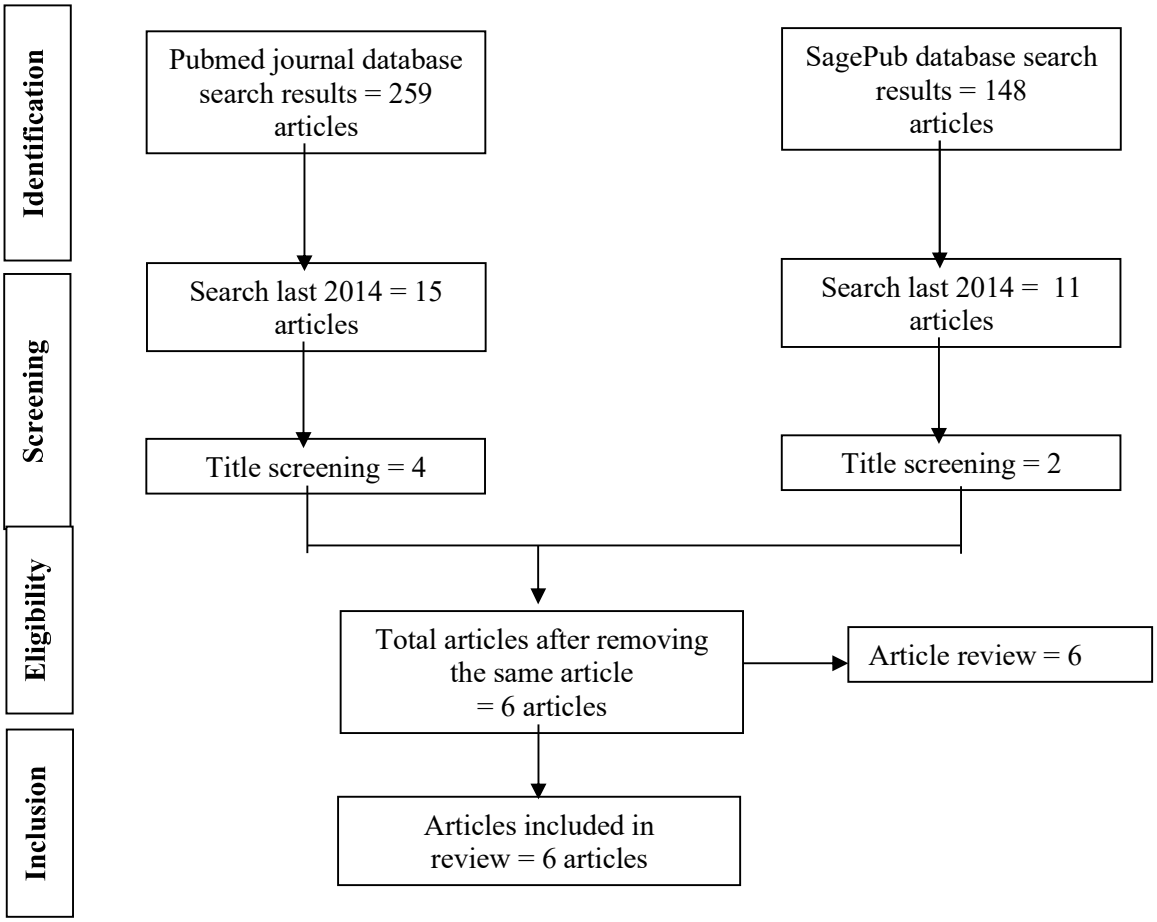

Figure 1. Article search flowchart

Only those papers that were able to satisfy all of the inclusion criteria were taken into consideration for the systematic review. This reduces the number of results to only those that are pertinent to the search. We do not take into consideration the conclusions of any study that does not satisfy our requirements. After this, the findings of the research will be analysed in great detail. The following pieces of information were uncovered as a result of the inquiry that was carried out for the purpose of this study: names, authors, publication dates, location, study activities, and parameters.

Quality Assessment and Data Synthesis

Each author did their own study on the research that was included in the publication's title and abstract before making a decision about which publications to explore further. The next step will be to evaluate all of the articles that are suitable for inclusion in the review because they match the criteria set forth for that purpose in the review. After that, we'll

determine which articles to include in the review depending on the findings that we've uncovered. This criteria is utilised in the process of selecting papers for further assessment. in order to simplify the process as much as feasible when selecting papers to evaluate. Which earlier investigations were carried out, and what elements of those studies made it appropriate to include them in the review, are being discussed here.

RESULT

In the PubMed database, the results of our search brought up 259 articles, whereas the results of our search on SagePub brought up 148 articles. The results of the search conducted for the last year of 2014 yielded a total 15 articles for PubMed and 11 articles for SagePub. In the end, we compiled a total of 6 papers, 4 of which came from PubMed and 2 of which came from SagePub. We included six research that met the criteria.

Salminen, et al[4] (2015) showed that the predefined criterion for noninferiority compared with appendectomy was not met by antibiotic therapy among patients with CT-proven, uncomplicated appendicitis. During the one-year follow-up period, the majority of patients who were randomly assigned to receive antibiotic treatment for uncomplicated appendicitis did not require an appendectomy, and those who did did not have any serious complications.

Otero, et al[5] (2022) showed that the results support non-randomized study results that 70–90% of juvenile appendicitis cases that are not difficult can be treated with antibiotics alone, resulting in fewer days of incapacity. Failures seem complex and are frequently caused by real-world obstacles rather than drug shortages. These results add to the information available to surgeons regarding the heterogeneity of treatment outcomes when they evaluate nonoperative regimens for simple appendicitis.

Svensson, et al[6] (2015) showed that the symptoms of 22 out of 24 patients (92%) who received antibiotic treatment resolved. During follow-up, only 1 patient (5%) out of these 22 experienced an acute appendicitis recurrence. During the follow-up period, 62% of patients had not undergone an appendectomy. According to this pilot study, nonoperative treatment for acute appendicitis in children is safe and viable, and more research into nonoperative treatment is necessary.

Table 1. The litelature include in this study

Author	Origin	Method	Sample	Result
Salminen et al, 2015[4]	Finland	Randomized controlled study	530 patients	In the antibiotic group, 70 patients (27.3%; 95% CI, 22.0% to 33.2%) underwent appendectomy within 1 year of initial presentation for appendicitis. Of the 256 patients available for follow-up in the antibiotic group, 186 (72.7%; 95% CI, 66.8% to 78.0%) did not require surgery. The intention-to-treat analysis yielded a difference in treatment efficacy between groups of -27.0% (95% CI, -31.6% to ∞) (P = .89). Given the prespecified noninferiority margin of 24%, we were unable to demonstrate noninferiority of antibiotic treatment relative to surgery. Of the 70 patients randomized to antibiotic treatment who subsequently underwent appendectomy, 58 (82.9%; 95% CI, 72.0% to 90.8%) had uncomplicated appendicitis, 7 (10.0%; 95% CI, 4.1% to 19.5%) had complicated acute appendicitis, and 5 (7.1%; 95% CI, 2.4% to 15.9%) did not have appendicitis but received appendectomy for suspected recurrence. There were no

				intra-abdominal abscesses or other major complications associated with delayed appendectomy in patients randomized to antibiotic treatment.
Otero et al, 2022[5]	USA	Randomized controlled study, multicenter	39 patients	Among 39 children enrolled over 31 months, 20 were randomized to antibiotics-alone and 19 to surgery. At 1 year, 6 nonoperative patients underwent appendectomy (70% success). Four cases were not true antibiotic failures but instead reflected "pragmatic" challenges to executing nonoperative algorithms. Only 2 cases represented recurrent/refractory appendicitis, suggesting a 90% adjusted 1-year success rate. Parental PedsQL™ scores were similar between treatment cohorts (91.3 vs 90.2, P = 0.32). Children treated with antibiotics-alone had faster return to activity (2.0 vs 12 days, P = 0.001) and fewer parental missed work days (0.0 vs 2.5, P = 0.03).
Svensson et al, 2015[6]	United Kingdom	Randomized controlled study	50 patients	All children in the surgery group had histopathologically confirmed acute appendicitis, and there were no significant complications in this group. Two of 24 patients in the nonoperative treatment group had appendectomy within the time of primary antibiotic treatment and 1 patient after 9 months for recurrent acute appendicitis. Another 6 patients have had an appendectomy due to recurrent abdominal pain (n = 5) or parental wish (n = 1) during the follow-up period; none of these 6 patients had evidence of appendicitis on histopathological examination.
O'Leary et al, 2021[7]	Ireland	Randomized controlled study	186 patients	There was a significantly better EQ-VAS quality of life score in the surgery group compared with the antibiotic-only group at 3 months (94.3 vs 91.0, P < 0.001) and 12 months postintervention (94.5 vs 90.4, P < 0.001). The EQ-5D-3L quality-of-life score was significantly higher in the surgery group indicating a

				better quality of life (0.976 vs 0.888, P < 0.001). The accumulated 12-month sickness days was 3.6 days shorter for the antibiotics only group (5.3 vs 8.9 days; P < 0.01). The mean length of stay in both groups was not significantly different (2.3 vs 2.8 days, P = 0.13). The mean total cost in the surgery group was significantly higher than antibiotics only group (€4,816 vs €3,077, P < 0.001).
Sajjad et al, 2021[8]	Pakistan	Randomized controlled study	180 patients	In Group A, mean age was 9.56±1.8 years and in Group B 10.11±1.8 years. There were 123 male and 57 female patients. Group B had 100% successful outcome. NOT (Group A) had successful outcome in 75 patients (83.3%) and failure was noted in 15 (16.7%). Five needed operation within 48 hours, all had appendicolith, and 10 patients presented within 6 months. Raised total leukocyte count (p value < 0.0001) and C reactive protein (p value < 0.04) levels were noted with failure of NOT.
Flum et al, 2020[9]	USA	Randomized controlled study, multicenter	1552 patients	Antibiotics were noninferior to appendectomy on the basis of 30-day EQ-5D scores (mean difference, 0.01 points; 95% confidence interval [CI], -0.001 to 0.03). In the antibiotics group, 29% had undergone appendectomy by 90 days, including 41% of those with an appendicolith and 25% of those without an appendicolith. Complications were more common in the antibiotics group than in the appendectomy group (8.1 vs. 3.5 per 100 participants; rate ratio, 2.28; 95% CI, 1.30 to 3.98); the higher rate in the antibiotics group could be attributed to those with an appendicolith (20.2 vs. 3.6 per 100 participants; rate ratio, 5.69; 95% CI, 2.11 to 15.38) and not to those without an appendicolith (3.7 vs. 3.5 per 100 participants; rate ratio, 1.05; 95% CI, 0.45 to 2.43). The rate of serious adverse events was 4.0 per 100 participants in the antibiotics

				group and 3.0 per 100 participants in the appendectomy group (rate ratio, 1.29; 95% CI, 0.67 to 2.50).

O'Leary, et al[7] (2021) showed that antibiotic-treated patients with acute, simple appendicitis only had higher rates of recurrence and a worse quality of life. The primary course of treatment for this often occurring acute surgical disease should continue to be surgery.

Sajjad, et al[8] (2021) showed that the successful of non operative treatment was 84% so a trial of this non operative treatment in cases of uncomplicated appendicitis should be considered especially in children.

Flum, et al[9] (2020) showed that based on the outcomes of a common health-status measure, appendectomy was found to be noninferior to antibiotics for the treatment of appendicitis. Almost three out of ten individuals in the antibiotics group had undergone an appendectomy ninety days prior. Compared to those without an appendicolith, those with an appendicolith had a greater risk of complications and appendectomy.

DISCUSSION

This systematic review involved a total of 2.573 data of patients with acute appendicitis with non surgical treatment antibiotics in 6 observational studies. The complication-free cure rate provides a more objective comparison of treatment outcomes between the surgical and antibiotic groups. Given the possibility of recurrence, the antibiotic group's cure rate is noticeably lower than that of the surgical group, indicating that it might not be the best course of action for treating simple acute appendicitis.

The most frequent cause of emergency abdominal surgery is acute appendicitis, which affects 8 million people annually and has an incidence of about 1/1000 person-years. Acute appendicitis is typically caused by lymphoid tissue proliferation or fecal waste obstructing the appendiceal lumen, which raises intraluminal pressure and compromises mucosal integrity. Acute appendicitis is divided into two categories: simple and complex. Although studies define them differently, in general, uncomplicated acute appendicitis does not contain non-perforated gangrenous or a fecalith, and it may or may not involve an abscess, perforation, or peritonitis.[10]

Non-surgical treatment for acute uncomplicated appendicitis was first tried in 1950, although it was not widely recognized at the time. There was a long-held belief that all cases of simple appendicitis would eventually develop into more complex cases. A increasing body of research, however, indicates that acute appendicitis, whether complex or simple, has followed distinct epidemiological trends and may require distinct treatments. This has led to a rise in interest in the treatment of simple acute appendicitis using antibiotics. More and more research has recently been done to support treating patients with simple acute appendicitis with antibiotics rather than surgery.[11]

When treated with antibiotics, the cure rate for uncomplicated acute appendicitis is often 73–88%; however, after five years, it typically drops to 54–61%, which is less than the percentage following surgery. Less than 6.5% of the appendectomy group experienced antibiotic-related problems, compared to 4.5–24.4% in the other group. Despite the reduced cure rate in the antibiotic group, approximately 50% of the participants chose antibiotics over surgery, and those with comorbidities that put them at high risk of appendectomy were forced to select conservative treatment. The significance of appendix retention increases since the appendix has an immunological function and can store intestinal flora, both of which affect the progression of diseases like cancer.[9]

Nonetheless, inconsistent findings from research and certain guidelines continue to restrict the use of antibiotics for treating simple appendicitis. There might not be as much data to support this contradiction. The new body of research on antibiotic therapy has advanced recently. Meanwhile, we discovered that randomized and non-randomized controlled trials had varied results when treating simple appendicitis. Furthermore, we discovered that there is a dearth of pertinent literature and that meta-analyses encompassing all randomized trials are uncommon. Furthermore, semi-randomized controlled trials or complex appendicitis were included, even though there were more randomized controls.[10]

Notably, when selecting antimicrobial medications for the treatment of simple appendicitis, patients who are especially worried about the possibility of an appendix recurrence should exercise caution. Antibiotic treatment is attractive for patients with uncomplicated acute appendicitis who do not want surgery because they do not have to worry about complications or exacerbating the original illness. Patients who failed antibiotic treatment first and underwent surgery later could not possibly result in a higher risk of postoperative complications and the uncomplicated appendicitis does not develop to complicated appendicitis in this course. Preoperative imaging is crucial for determining the outcome of a negative appendectomy, and the existence of an appendicolith raises the possibility of antibiotic failure.[11]

CONCLUSION

In summary, when selecting antimicrobial medications to treat acute appendicitis, patients who are especially worried about recurrence of appendicitis should use caution. Patients who failed antibiotic treatment first and underwent surgery later could not possibly result in a higher risk of postoperative complications and the acute appendicitis does not develop to complicated appendicitis in this course, which made antibiotic treatment appealing for patients with acuteacute appendicitis who do not want surgery without having to worry about complications or complicating the original illness.

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