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Emergency Management of Acute Abdominal Pain: A Systematic Review

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Abstract

Objectives: To examine and summarize the latest research on how acute abdominal pain is managed in emergency care settings. **Methods:** A detailed computerized search of relevant databases was conducted to identify studies that met the inclusion criteria. The search encompassed PubMed, SCOPUS, Science Direct, Cochrane Library, and Web of Science to find pertinent research. **Results:** Our analysis included six studies with a total of 1906 patients and females comprised more than half of the participants, totaling 1147 (60.2%). In pediatric emergency care, providing pain relief for acute abdominal pain was both effective and safe, reducing the need for unnecessary surgeries. Using sublingual analgesia proved particularly helpful, as it controlled pain without complicating diagnosis. For adults, intravenous hydromorphone worked better than lidocaine, especially for generalized abdominal pain or kidney stones, though lidocaine often required additional painkillers. Many patients needed surgery, with appendicitis and gallbladder issues being the most common reasons. Patient-controlled analgesia (PCA) led to higher satisfaction compared to morphine, but gender disparities were evident, with women receiving delayed treatment despite reporting similar pain levels as men. **Conclusion:** This systematic review shows that effective pain management for acute abdominal pain is possible for both pediatric and adult patients in emergency settings. Analgesia in children does not compromise diagnostic accuracy or increase unnecessary surgeries, making it a reliable option. For adults, intravenous hydromorphone is preferred over lidocaine, while patient-controlled analgesia improves satisfaction. Addressing gender disparities in treatment is crucial to ensure all patients receive timely care. Further research is needed to eliminate these biases and enhance the overall standard of care.

Keywords: *Acute abdominal pain; Emergency medicine; Management; Treatment; Systematic review.*

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Introduction

Abdominal pain is the most prevalent reason for visiting the emergency department (ED), representing 8 million (7%) of the 119 million visits to the ED in 2006 [1]. Anyone performing emergency medicine (EM) must be proficient at assessing abdominal pain. Although stomach discomfort is a common presentation, it should be treated seriously because it is frequently an indication of serious disease and can lead to misdiagnosis. Abdominal discomfort is the presenting condition in a large proportion of medicolegal proceedings against general and pediatric emergency physicians [2, 3].

Visceral, somatoparietal, and transferred pain are three types of abdominal discomfort. Visceral pain receptors, which are found on serosal surfaces, in the mesentery, and in visceral muscles and mucosa, often respond to strain. Visceral pain is typically dull, painful, and non-localized. The epigastric region is characterized by pain in the stomach, lower esophagus, and duodenum; discomfort in the periumbilical area is caused by the small intestine and right colon; and pain in the suprapubic midline is caused by the

transverse and left colon. The discomfort can be subtle, diffuse, crampy, or searing. Sweating, nausea, vomiting, pallor, and anxiety may all be symptoms of concurrent autonomic involvement [4].

All patients with intractable pain, sick-like appearance, hemodynamic instability, or suspected surgical reasons should be admitted to the hospital. All children with hypovolemia/shock should be given appropriate fluid resuscitation (20 ml/kg of NS) and vasoactive medications as needed. Constant vital sign monitoring and repeated physical assessments are essential for determining a particular diagnosis and detecting complications [5].

Acute abdominal pain is one of the most frequent reasons patients seek care in emergency departments, and its causes can range from relatively mild conditions to serious, life-threatening emergencies. The challenge for healthcare providers lies in the wide spectrum of possible diagnoses, including gastrointestinal, vascular, gynecological, and even traumatic conditions. Quick and accurate diagnosis is critical, as delays can lead to serious complications, worsening patient outcomes, or unnecessary procedures. The high stakes involved in managing acute abdominal pain in emergency settings highlight the need for a structured approach that balances thoroughness with speed. The primary goal of this systematic review is to examine and summarize the latest research on how acute abdominal pain is managed in emergency care settings. The review focused on understanding the most effective ways to treat patients and the outcomes of different treatment approaches.

Methods

This study conducted a systematic review following the guidelines set by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [6]. We performed an electronic search on the management methods of acute abdominal pain in emergency medicine. The search encompassed four databases: PubMed, Web of Science, SCOPUS, and Science Direct. Our search strategy included keywords; (((((acute abdominal pain) OR (acute abdomen)) AND (emergency medicine)) OR (emergency department)) AND (Treatment)) OR (Management). Two reviewers independently analyzed the search results, selecting acceptable papers, retrieving data, and using appropriate rating instruments to determine the caliber of the included study.

Eligibility Criteria

Inclusion Criteria:

1. Participants admitted to the emergency department with acute abdominal pain.
2. Studies that assess management approaches to acute abdominal pain.
3. English-language articles published.
4. Articles published within the last 10 years (2014-2024), or a specified relevant time frame defined by the researchers.

Exclusion Criteria:

1. Studies that do not report relevant outcomes.
2. Studies not published in English.
3. Commentaries, editorials, case reports, case series, and the reviews.
4. Studies with overlapping patient populations or outcomes reported in other included studies.

Data Extraction

Rayyan (QCRI) was used to ensure the accuracy of the search results [7]. The search generated titles and abstracts, which were evaluated for relevance using the predefined inclusion and exclusion criteria. The research team painstakingly examined all studies that satisfied these criteria. Any differences were settled by debate and consensus. A predetermined extraction form was used to record key study data, which included: titles, authors, publication year, study location, participant demographics, gender distribution,

population type, management, and main outcomes. An unbiased evaluation technique was developed to examine the possibility of bias in the included studies.

Data Synthesis Strategy

Summary tables were created with data from relevant studies to provide a qualitative summary of the research findings and major aspects. After collecting data for the systematic review, the most effective approach for using the information from the included studies was determined.

Quality of review

The Cochrane Risk of Bias Instrument [8] was used to conduct a critical appraisal of the identified RCTs. This tool evaluates the risk of bias in seven fields: arbitrary sequence generation, allocation secrecy, blinding of participants and employees, blinding of outcome evaluation, inadequate outcome data, selective reporting, and additional bias sources. The risk of bias in each of these domains was classified as low, unclear, or high.

We utilized the ROBINS-I technique to evaluate the risk of bias because it allows for extensive assessment of confounding, which is significant because bias owing to omitted variables is common in studies in this field. The ROBINS-I tool is intended to evaluate non-randomized investigations and can be applied to cohort designs in which participants exposed to various staffing levels are monitored over time. Two reviewers separately assessed the risk of bias for each paper, and disagreements were resolved through group discussion [9].

Results

Systematic search outcomes

A thorough search of 516 study papers yielded 283 duplicates that were disregarded. After reviewing the titles and abstracts of 233 studies, 189 articles were rejected. Out of the 42 reports that were necessary, 2 were not found. 18 papers were excluded because the study results were inaccurate, one was editor's letters, and three were abstracts. 14 of the 42 publications that passed the full-text screening stage were disqualified for using the wrong demographic types. The qualifying requirements are met by the six research publications that comprise this systematic review. A diagram illustrates the process by which the literature was selected in **Figure 1.**

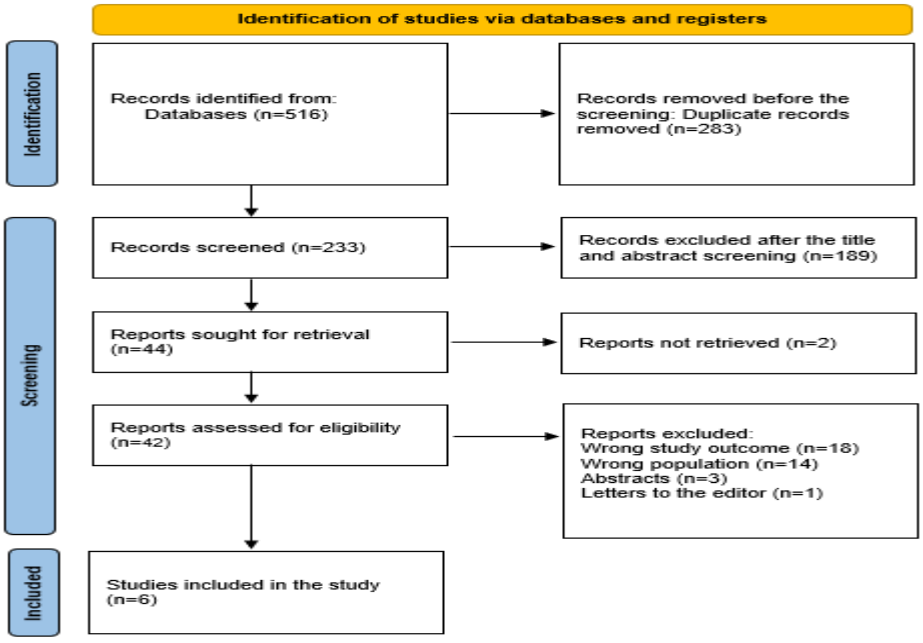

Figure 1: A PRISMA diagram is employed to encapsulate the research decisions.

Sociodemographics and clinical parameters of the involved participants and studies

Table 1 summarizes the socio-demographic data from the research articles. Our analysis included six studies with a total of 1906 patients and females comprised more than half of the participants, totaling 1147 (60.2%). This study comprised three RCTs [11, 12, 14], two were cross-sectionals [10, 13], and a prospective cohort [15]. Geographically, two studies were conducted in the USA [12, 15], and one each in Canada [10], Italy [11], Iran [13], and Malaysia [14].

Table (2) shows the clinical parameters

Five studies investigated analgesics as a management approach for acute abdominal pain and only one studied the surgical options [13]. In the pediatric population, giving pain relief in emergency cases of acute abdominal pain showed positive outcomes. Doctors were more likely to provide appropriate pain management, and this did not lead to an increase in unnecessary surgical consultations. In particular, using sublingual pain medication was found to be an effective treatment for children in emergency rooms [10, 11]. This approach not only managed the pain efficiently but also helped reduce the need for more invasive procedures. Overall, the results suggest that giving the right type of pain medication to children in these situations is both safe and effective, without increasing the likelihood of unnecessary surgery.

In the general population, intravenous hydromorphone showed better results compared to intravenous lidocaine, especially in patients presenting with generalized abdominal pain or kidney stones [12]. However, in many cases where lidocaine was administered, additional analgesia was needed to effectively manage pain, highlighting its limitations. A significant proportion of patients with acute abdominal pain required surgical intervention, with appendicitis and cholecystitis being among the most common causes [13]. Furthermore, PCA was associated with higher patient satisfaction compared to intravenous morphine, suggesting PCA is a favorable option for managing non-surgical pain [14]. Gender disparities in pain management were also identified, as women were less likely to receive timely analgesic treatment compared to men, despite reporting similar levels of pain [15].

Table (1): Sociodemographic parameters of the comprised research.

Study ID	Study design	Country	Participants (n)	Mean age	Females (%)
Poonai et al., 2016 [10]	Cross-sectional	Canada	149	43.6±8.4	77 (52%)
Cozzi et al., 2019 [11]	RCT	Italy	210	9 to 14	123 (58.6%)
Chinn et al., 2019 [12]	RCT	USA	154	42±12	98 (63.6%)
Goodarzi et al., 2019 [13]	Cross-sectional	Iran	350	54.1	182 (52%)
Ab Rahman & Kanesan 2016 [14]	RCT	Malaysia	62	40.1	28 (45%)
Chen et al., 2008 [15]	Prospective cohort	USA	981	39±16	639 (65%)

Table (1): Clinical parameters and outcomes of the comprised research.

Study ID	Population	Treatment	Main outcomes	ROBINS-I
Poonai et al., 2016 [10]	Pediatrics	Analgesia	Pediatric emergency clinicians' self-reported rates of giving analgesia for acute abdominal pain situations were greater than previously documented and did not appear to be connected to surgical consultation requests. However, a reticence to provide narcotic analgesia, a notion that analgesia can mask a postoperative condition, and a refusal to accept self-reported pain at face value persists.	Low
Cozzi et al., 2019 [11]	Pediatrics	Analgesia	Sublingual analgesia proved a viable pain treatment option for pediatric patients with acute abdominal pain in the emergency room.	NA
Chinn et al., 2019 [12]	General population	Analgesia	Intravenous hydromorphone outperformed intravenous lidocaine in both general abdominal pain and a subset of individuals with nephrolithiasis. The majority of individuals randomly assigned to lidocaine required extra analgesics.	NA
Goodarzi et al., 2019 [13]	General population	Surgical	24% of patients with stomach pain were taken to the operating room for surgery. The leading causes of surgery were appendicitis, cholecystitis, and blockage, whereas the least common causes were uterine bleeding and diverticulitis.	Low
Ab Rahman & Kanesan 2016 [14]	General population	Analgesia	There was no substantial variance in pain score decrease between PCA and intravenous morphine for the treatment of severe acute non-traumatic abdominal discomfort in the emergency department. However, PCA gave higher patient satisfaction and should be explored as a different form of acute pain management in the ED.	NA
Chen et al., 2008 [15]	General population	Analgesia	Gender bias may contribute to oligo-analgesia in the management of acute abdominal pain. Despite having equal pain scores, women are less likely than males to receive analgesic treatment, particularly opiates, and have longer wait times for their prescriptions.	Moderate

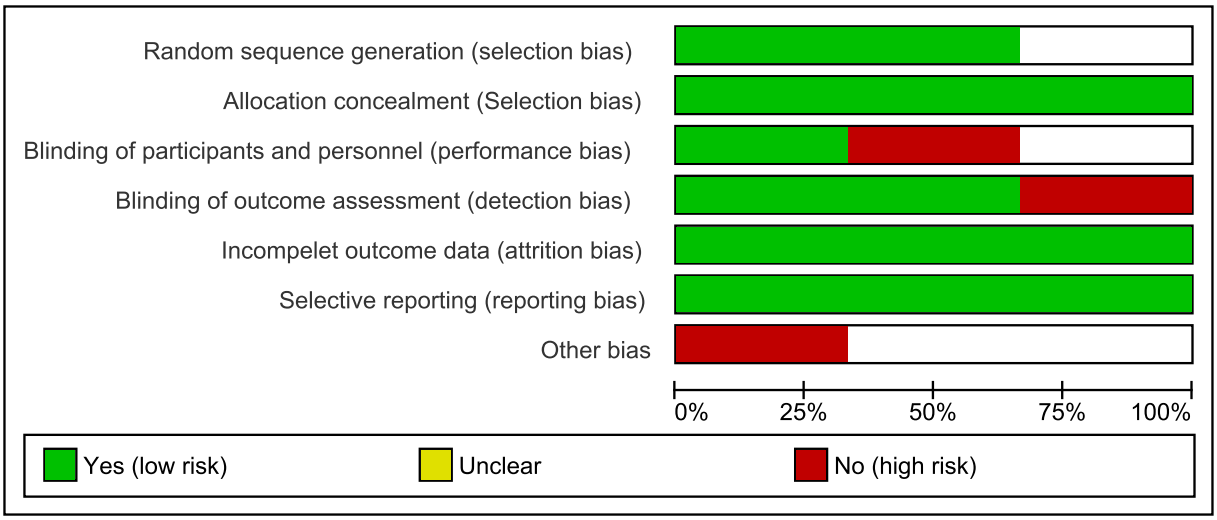

Figure (2): Risk of bias graph.

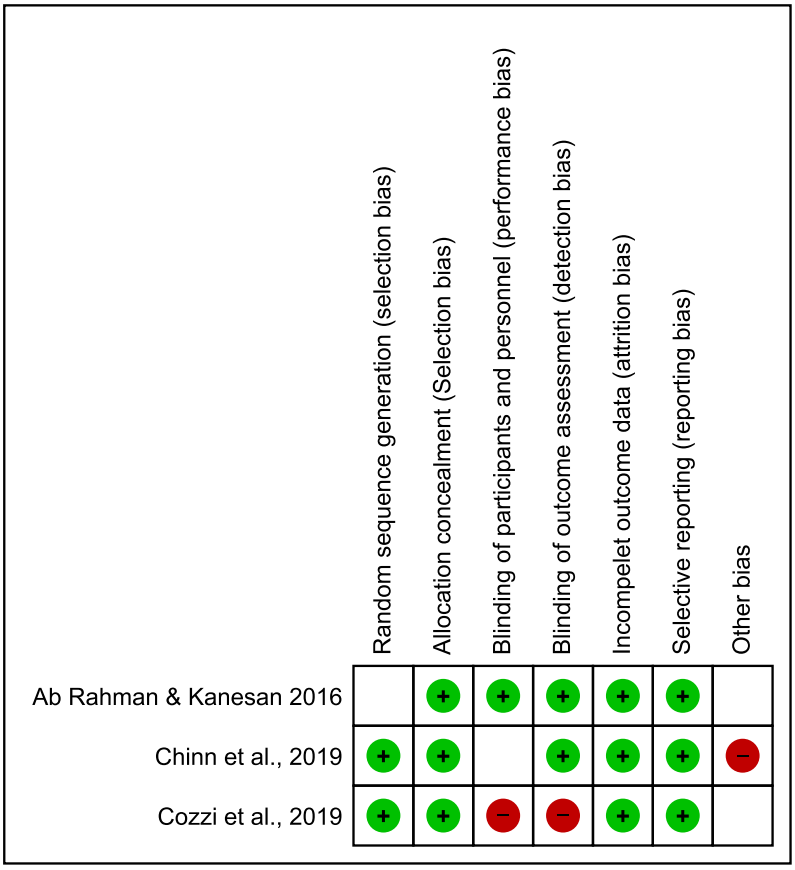

Figure (3): Risk of bias summary.

Discussion

The management of acute abdomen is a considerable problem for healthcare practitioners. Acute abdomen refers to abdominal discomfort that is sensed in a region other than the actual underlying pathology. To guarantee correct diagnosis and proper care, a systematic and multidisciplinary approach is required due to the condition's numerous causes and complexity.

In this review, we found giving pain relief in emergency cases of acute abdominal pain in the pediatric population showed positive outcomes. Doctors were more likely to provide appropriate pain management, and this did not lead to an increase in unnecessary surgical consultations. In particular, using sublingual

pain medication was found to be an effective treatment for children in emergency rooms [10, 11]. This approach not only managed the pain efficiently but also helped reduce the need for more invasive procedures. Overall, the results suggest that giving the right type of pain medication to children in these situations is both safe and effective, without increasing the likelihood of unnecessary surgery. **Balachandran *et al.*** reported that in a sick patient, the first steps are immediate IV access and normal saline 20 ml/kg (in the context of shock/hypovolemia), appropriate analgesia, no peroral/IV fluids, Ryle's tube aspiration, and surgical consultation. In almost all cases of moderate to severe pain with localized abdominal findings, an ultrasonography abdomen is performed initially. In individuals with substantial abdominal trauma or pancreatitis, a contrast-enhanced computerized tomography (CECT) abdomen is a preferable first option. Continuous surveillance and physical examinations should be performed in all cases. Specific management differs depending on the etiology [16]. The findings support the use of analgesia in children, addressing a previously debated concern that it could mask symptoms of serious conditions.

This review also found that in the general population, intravenous hydromorphone demonstrated better outcomes compared to intravenous lidocaine, particularly in patients with generalized abdominal pain or kidney stones [12]. However, when lidocaine was used, additional analgesia was often necessary, highlighting its limitations. A large number of patients with acute abdominal pain required surgery, with appendicitis and cholecystitis being common causes [13]. PCA resulted in higher patient satisfaction than intravenous morphine, indicating that PCA is a preferred option for managing non-surgical pain [14]. Gender disparities in pain management were also identified, as women were less likely to receive timely treatment despite reporting similar pain levels as men [15]. A review of the literature conducted by **Balachandran *et al.*** on widespread aetiologies and treatment of acute abdominal pain in adults in general and particular patient populations encountered in the emergency room demonstrated that intravenous paracetamol, dipyrone, or piritramide are at present the analgesics preferred in this medical environment. Patients experiencing moderate, severe, or extreme pain should be given a combination of non-opioids and opioids, with treatment adjusted based on recurrent pain assessments, which optimizes overall pain management [16].

Heydarian & Azar, found that pain control is a significant priority in the treatment of acute abdominal referrals. Nonsteroidal anti-inflammatory medicines (NSAIDs), such as ibuprofen or diclofenac, can effectively relieve pain by decreasing inflammation and blocking pain mediators. Opioids may be necessary in extreme situations, but their use should be limited due to the danger of side effects and dependence [17].

The findings of this review provide valuable insights for emergency clinicians. In pediatric patients, the safe use of analgesics, such as sublingual options, should be encouraged to manage acute pain while avoiding unnecessary delays in treatment or surgery. For adult patients, the preference for intravenous hydromorphone over lidocaine for managing severe pain should be considered, especially for conditions like nephrolithiasis and generalized abdominal pain. Additionally, the PCA method has shown higher patient satisfaction and could be more widely implemented to enhance the patient experience. Addressing gender disparities in pain management is critical, as delayed treatment for women could result in worse health outcomes.

Strengths and limitations

A major strength of this review is the comprehensive analysis of both pediatric and adult populations, providing a well-rounded perspective on acute abdominal pain management across different age groups. The inclusion of multiple analgesic options, and the exploration of their respective outcomes, allows for practical recommendations that can improve emergency care. Additionally, the review highlights both surgical and non-surgical approaches, giving a broader view of treatment strategies in emergency departments.

One limitation is the variability in the types of studies included in the review, which may affect the generalizability of the results. The review also highlighted gender disparities but did not deeply explore the reasons behind these differences, leaving an opportunity for further investigation into the root causes.

Additionally, while this review focused on common causes of acute abdominal pain, other less common causes may not have been thoroughly represented in the studies included.

Conclusion

This systematic review demonstrates that effective pain management is achievable for both pediatric and adult patients presenting with acute abdominal pain in emergency settings. The use of analgesia, particularly in children, does not hinder diagnostic accuracy or increase unnecessary surgeries, offering a reliable approach to managing pain. In adults, intravenous hydromorphone is favored over lidocaine, and patient-controlled analgesia shows promise for improving patient satisfaction. However, addressing gender disparities in pain treatment is essential to ensure all patients receive timely and appropriate care. Further research is necessary to understand and eliminate these biases, ultimately improving the standard of care for all patients.

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