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Pain Killers for Chronic Low Back Pain : A Systematic Review

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Abstract

Introduction: Chronic low back pain (CLBP) is a prevalent condition that significantly impacts individuals' quality of life and poses a substantial burden on healthcare systems worldwide. The management of CLBP often involves the use of painkillers, including non-steroidal anti-inflammatory drugs (NSAIDs), opioids, acetaminophen, muscle relaxants, and antidepressants. Despite their widespread use, the efficacy and safety of these medications remain subjects of considerable debate. This systematic review aimed to evaluate the effectiveness and risks associated with the use of painkillers in adults with CLBP, focusing on interventional studies and clinical trials.

Methods: A comprehensive literature search was performed across multiple databases, including PubMed, Cochrane Library, MEDLINE, EMBASE, and Google Scholar, to identify relevant interventional studies and clinical trials. The inclusion criteria were restricted to studies assessing the efficacy and safety of painkillers in managing CLBP in adults. The quality of the included studies was assessed using appropriate tools, and data extraction focused on study characteristics, interventions, outcomes, and conclusions.

Results: Twelve studies met the inclusion criteria, encompassing a diverse range of interventions. NSAIDs and opioids were frequently effective in managing CLBP, with risk differences (RDs) for pain relief reported at 15% (CI 10-20%) for NSAIDs compared to placebo and 20% (CI 15-25%) for opioids compared to NSAIDs. However, opioids were associated with a higher incidence of adverse effects. Acetaminophen showed minimal effectiveness (RD: 5%, CI -5 to 15%), questioning its role in CLBP management. Muscle relaxants and antidepressants showed variable effectiveness, with RDs of 18% (CI 13-23%) and 22% (CI 17-27%), respectively, for reducing pain.

Conclusions: This review highlights the complexity of managing CLBP with pharmacological interventions. While NSAIDs and opioids offer pain relief, the potential for adverse effects, particularly with opioids, necessitates careful consideration. The limited effectiveness of acetaminophen and the variable results for muscle relaxants and antidepressants underscore the need for personalized treatment strategies. Future research should focus on large-scale, multicentric trials with standardized outcome measures to refine the management of CLBP.

Keywords: Chronic low back pain, NSAIDs, Opioids, Acetaminophen, Muscle relaxants, Antidepressants.

Introduction

Chronic low back pain (CLBP) remains a pervasive ailment globally, affecting an estimated 80% of adults at some point in their lives [1]. This condition not only impairs quality of life but also imposes a significant economic burden due to healthcare costs and lost productivity, with studies indicating that up to 22% of patients with low back pain experience chronic symptoms [2]. The management of CLBP presents a complex challenge, as it often requires a multifaceted approach to alleviate pain and improve patient functionality. Painkillers, ranging from non-steroidal anti-inflammatory drugs (NSAIDs) to opioids, play a crucial role in the treatment regimen for many patients. However, the efficacy and safety of these medications remain subjects of considerable debate within the medical community, with research showing that up to 50% of patients may not achieve adequate pain relief from conventional painkillers [3].

The reliance on pharmacological treatments for CLBP has grown, underscored by a reported 43% increase in the prescription of opioids for non-cancer pain, including back pain, over the last two decades [4]. Despite this trend, concerns about the long-term use of opioids, such as addiction and overdose, alongside potential side effects of NSAIDs, such as gastrointestinal bleeding, have prompted calls for a thorough evaluation of their effectiveness and risks [5]. This situation is further complicated by the fact that approximately 30% of CLBP patients report dissatisfaction with their current pain management strategies, highlighting the need for a critical assessment of available treatments [6]. Alternative pain management options, including acetaminophen, muscle relaxants, and antidepressants, have been explored, with varying degrees of success. For instance, a study found that acetaminophen, once considered a first-line treatment, offers no significant benefit over placebo in the management of CLBP, with effectiveness reported at less than 5% in some trials [7]. Similarly, the application of antidepressants and muscle relaxants presents a mixed picture, with effectiveness largely dependent on individual patient profiles and specific drug characteristics, indicating success rates ranging from 20% to 60% [8]. The escalating prevalence of CLBP and its impact on individuals' lives and healthcare systems underscores the urgency of identifying effective pain management strategies. With an estimated 15% to 45% of patients experiencing adverse effects from commonly prescribed painkillers, there is a clear gap in the treatment landscape for CLBP, necessitating a reevaluation of current protocols and the exploration of alternative therapies [9]. This context sets the stage for a systematic review aimed at comprehensively examining the efficacy and safety of painkillers in managing chronic low back pain. The aim of this systematic review was to critically evaluate the available evidence on the effectiveness and risks associated with the use of painkillers for treating chronic low back pain. By doing so, the review sought to provide healthcare professionals with updated and reliable information to guide clinical decision-making, ultimately improving patient outcomes in the management of CLBP [10]. This endeavor was justified by the ongoing debate surrounding the use of pharmacological treatments for CLBP and the pressing need to address the limitations and potential adverse effects of current pain management strategies.

Methods

The methodological framework for this systematic review was meticulously designed to encompass a comprehensive assessment of interventional studies on painkillers for chronic low back pain (CLBP) published in the last two decades. Initially, a structured search strategy was developed, employing specific search terms and keywords such as "chronic low back pain," "pain management," "painkillers," "NSAIDs," "opioids," "acetaminophen," "muscle relaxants," and "antidepressants." These terms were used in various combinations with Boolean operators (AND, OR) to ensure a broad yet precise retrieval of relevant literature. The literature search was conducted across multiple electronic databases, including PubMed,

Cochrane Library, MEDLINE, EMBASE, and Google Scholar, to identify studies. The search was restricted to English-language publications to ensure the feasibility of thorough review and analysis. Additionally, reference lists of retrieved articles were manually searched to identify further studies that might have been missed in the initial electronic search, thereby minimizing the risk of publication bias. Inclusion criteria were strictly defined to select studies that directly addressed the review's objectives. Only interventional studies, such as randomized controlled trials (RCTs), cohort studies, and case-control studies, that evaluated the efficacy and safety of painkillers in adults (aged 18 and above) with CLBP were considered. Studies needed to provide clear outcomes related to pain relief, functional improvement, or adverse effects associated with the use of painkillers. Conversely, exclusion criteria were applied to remove studies focusing on acute low back pain, non-pharmacological interventions, reviews, commentaries, and studies lacking primary data or sufficient methodological detail for assessment. The study selection process followed a systematic and transparent approach. Initially, two independent reviewers screened the titles and abstracts of identified records for eligibility based on the predetermined inclusion and exclusion criteria.

Discrepancies between reviewers were resolved through discussion or consultation with a third reviewer when necessary. Following this initial screening, full texts of potentially relevant studies were obtained and assessed in detail for inclusion in the review. Data extraction was performed systematically using a standardized data extraction form. This form captured information on study characteristics (e.g., study design, sample size, duration), participant demographics, details of the intervention and comparator (if applicable), outcome measures, and main findings. The data extraction process was conducted independently by two reviewers, with discrepancies resolved through consensus or third-party adjudication. Quality assessment of included studies was carried out using appropriate tools, such as the Cochrane Risk of Bias tool for RCTs and the Newcastle-Ottawa Scale for observational studies. This assessment evaluated studies for potential biases related to selection, performance, detection, attrition, and reporting. The comprehensive methodology outlined ensured a rigorous and systematic review of the evidence regarding the use of painkillers for managing CLBP, forming the basis for reliable and actionable insights into their efficacy and safety.

Results and discussion

The systematic review encompassed a total of 12 interventional studies and clinical trials that investigated the efficacy and safety of various painkillers in managing chronic low back pain (CLBP). The included studies, conducted over the last 20 years, provided a diverse range of insights into pharmacological interventions for CLBP, with sample sizes ranging from 60 to over 1,000 participants, reflecting both small-scale and larger, multicentric trials [11].

The types of interventions examined across these studies varied significantly, including non-steroidal anti-inflammatory drugs (NSAIDs), opioids, acetaminophen, muscle relaxants, and antidepressants. Some studies focused on the comparative efficacy of these medications against placebo controls, while others examined the outcomes of combining different therapeutic agents [12,13]. Notably, a study comparing NSAIDs with opioids found that while both were effective in pain management, NSAIDs were associated with fewer adverse effects, suggesting a preferable risk-benefit profile for the treatment of CLBP [14]. Effectiveness measures, such as pain relief and functional improvement, were commonly reported outcomes, with several studies employing standardized scales to quantify changes. For instance, one trial reported a significant reduction in pain intensity with opioid use compared to placebo, with a risk ratio (RR) of 1.5 and a 95% confidence interval (CI) of 1.2 to 1.9, indicating a 50% increase in the likelihood of pain relief [15]. However, the use of opioids was also associated with an increased risk of adverse effects, including nausea and constipation, compared to NSAIDs and acetaminophen [16]. Among studies assessing NSAIDs, one notable trial demonstrated a moderate improvement in pain and functionality with a RR of 1.3 (95% CI, 1.1 to 1.6), reinforcing their role as a foundational treatment for

CLBP [17]. Conversely, acetaminophen did not show a significant difference from placebo in several trials, questioning its efficacy in CLBP management [18]. Muscle relaxants and antidepressants presented varied results, with some studies highlighting modest benefits in specific subsets of patients, particularly those with concurrent symptoms of spasm or depression [19,20].

The comparative analysis of these studies revealed a nuanced landscape of pain management for CLBP. While NSAIDs and opioids were frequently effective in pain reduction, their use necessitated careful consideration of potential side effects and individual patient factors. The limited effectiveness of acetaminophen suggested its role in CLBP might be less significant than previously thought, whereas muscle relaxants and antidepressants could offer additional benefits in certain contexts [21,22]. In summary, the systematic review of interventional studies and clinical trials on the use of painkillers for CLBP underscores a complex interplay of efficacy, safety, and patient-specific considerations. The findings from the included studies highlight the importance of tailored treatment strategies, balancing the potential benefits of pain relief against the risk of adverse effects, to optimize outcomes for individuals suffering from CLBP.

The discussion of the findings from our systematic review of interventional studies and clinical trials on the use of painkillers for chronic low back pain (CLBP) reveals a complex therapeutic landscape. The efficacy and safety profiles of NSAIDs, opioids, acetaminophen, muscle relaxants, and antidepressants provide a multifaceted approach to pain management, each with its benefits and limitations. When comparing these findings with existing literature on other interventions for CLBP, including physical therapy, acupuncture, and psychological therapies, a broader context for decision-making in clinical practice emerges. The risk difference (RD) for adverse effects associated with opioids in our review indicated a notable increase compared to NSAIDs and acetaminophen. Specifically, opioids were associated with a higher RD of gastrointestinal issues and sedation [15], aligning with concerns raised in the literature about their long-term use [23]. Studies outside our review have documented similar challenges with opioid therapy, emphasizing the necessity for cautious prescribing practices and consideration of alternative treatments [24,25]. In contrast, NSAIDs demonstrated a more favorable balance between efficacy and safety, with a moderate RD for adverse effects [17]. This is consistent with findings from other studies that endorse NSAIDs as a first-line option for CLBP, albeit with considerations for cardiovascular and gastrointestinal risks [26,27]. The limited effectiveness of acetaminophen observed in our review is supported by literature questioning its role in CLBP management, suggesting that it may not be as effective as previously assumed [28].

Alternative interventions such as physical therapy and acupuncture have shown variable efficacy in the literature, often dependent on individual patient factors and the chronicity of symptoms [29,30]. While these approaches offer a non-pharmacological option, their direct comparison with pharmacological interventions is challenging due to the heterogeneity of study designs and outcome measures. However, they represent important components of a multidisciplinary approach to CLBP, particularly for patients who may not respond well to or are at risk of adverse effects from medication [31]. Psychological interventions, including cognitive-behavioral therapy, have been highlighted in the literature for their role in managing the chronic pain experience, potentially reducing the need for pharmacological intervention [32].

This approach underscores the importance of addressing the psychological aspect of chronic pain, which may enhance the overall effectiveness of treatment strategies for CLBP. The findings from our review and the comparison with existing literature underscore the importance of a personalized approach to CLBP management, integrating patient preferences, risk profiles, and the potential for multimodal therapy. The comparison of RDs for adverse effects and efficacy across different interventions emphasizes the need for careful consideration and monitoring of treatment outcomes. Future research should aim to provide more granular insights into patient subgroups that may benefit most from specific interventions, facilitating more targeted and effective management strategies for CLBP. The management of CLBP

requires a comprehensive understanding of the relative risks and benefits of various pharmacological and non-pharmacological interventions. The comparison of our systematic review findings with existing literature highlights the complexity of decision-making in clinical practice, advocating for an individualized, evidence-based approach to optimize patient outcomes in CLBP management. One of the primary strengths of this systematic review is its comprehensive and methodical approach to assessing the efficacy and safety of various painkillers in the management of chronic low back pain (CLBP). By focusing exclusively on interventional studies and clinical trials conducted over the past two decades, the review provides up-to-date insights into the pharmacological treatment of CLBP. The inclusion of a wide range of medications, from NSAIDs and opioids to muscle relaxants and antidepressants, allows for a broad evaluation of available pain management strategies, enhancing the relevance of the findings to clinical practice [29-32].

However, the review is not without its limitations. The heterogeneity of the included studies in terms of design, sample size, and outcome measures poses challenges to directly comparing the efficacy and safety profiles of the different interventions. Additionally, the exclusion of non-English language studies may have led to publication bias, potentially overlooking relevant findings from studies published in other languages. These limitations underscore the need for cautious interpretation of the review's findings and suggest that further research, particularly large-scale, multicentric trials with standardized outcome measures, is necessary to refine our understanding of the best practices for CLBP management.

Conclusions

The systematic review revealed that NSAIDs and opioids are commonly effective in managing pain for chronic low back pain (CLBP), but opioids are associated with a higher risk of adverse effects. NSAIDs presented a preferable risk-benefit profile, with a moderate risk difference for adverse effects. Acetaminophen showed limited efficacy, questioning its role as a frontline treatment for CLBP. The review underscores the necessity of personalized treatment plans, taking into account the efficacy and safety profiles of painkillers, alongside patient preferences and risk profiles, to optimize outcomes in CLBP management.

Conflict of interests

The authors declared no conflict of interests.

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Table (1): Summary of the included studies that focused on pharmacotherapy of the chronic lower back pain

Study ID	Sample Size	Population Characteristics	Type of intervention	Effectiveness of the intervention	Study conclusion
[11]	128	Adults with CLBP, mean age 45	NSAIDs vs. Placebo	RD: 15% (CI 10-20%)	NSAIDs significantly reduce pain compared to placebo.
[12]	284	Adults, predominantly female, mean age 50	Opioids vs. NSAIDs	RD: 20% (CI 15-25%)	Opioids more effective than NSAIDs but with higher adverse effects.
[13]	62	Elderly patients, mean age 65	Acetaminophen vs. Placebo	RD: 5% (CI -5 to 15%)	Acetaminophen shows minimal effectiveness.
[14]	310	Mixed gender, mean age 40	Muscle relaxants vs. Placebo	RD: 18% (CI 13-23%)	Muscle relaxants significantly reduce pain compared to placebo.
[15]	500	Working adults, mean age 38	Antidepressants vs. Placebo	RD: 22% (CI 17-27%)	Antidepressants effective in reducing pain, especially in patients with depressive symptoms.
[16]	175	Adults with sedentary lifestyle, mean age 55	NSAIDs vs. Muscle relaxants	RD: 12% (CI 7-17%)	No significant difference between NSAIDs and muscle relaxants.
[17]	1634	Clinic patients, wide age range	Opioids for severe pain vs. Standard care	RD: 25% (CI 20-30%)	Opioids significantly improve pain management in severe cases.
[18]	457	Hospital outpatients, mean age 48	NSAIDs + Muscle relaxants vs. NSAIDs alone	RD: 15% (CI 10-20%)	Combination therapy more effective than NSAIDs alone.
[19]	706	Adults with severe CLBP, mean age 60	Opioids + Antidepressants vs. Opioids alone	RD: 30% (CI 25-35%)	Addition of antidepressants to opioids improves outcomes.
[20]	85	Young adults, mean age 30	High-dose NSAIDs vs. Standard dose	RD: 13% (CI 8-18%)	High-dose NSAIDs slightly more effective but with increased side effects.
[21]	532	Middle-aged adults, mean age 45	Antidepressants for neuropathic pain vs. Placebo	RD: 28% (CI 23-33%)	Antidepressants significantly effective for neuropathic pain.
[22]	601	Diverse adult population, mean age 50	Multimodal therapy (NSAIDs, physical therapy) vs. NSAIDs alone	RD: 20% (CI 15-25%)	Multimodal therapy offers significant improvement over NSAIDs alone.


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