

Pharmacological Comparison of Turmeric and Non-Steroidal Anti-Inflammatory Drugs in Pain Relief

Varma Vishnu¹, Parmar Harshul², Shubham Singh^{3,*}

Abstract

Pain is one of the most frequently encountered clinical symptoms affecting millions globally and is typically treated pharmacologically with nonsteroidal anti-inflammatory drugs (NSAIDs). However, long-term use of NSAIDs is associated with adverse effects such as gastrointestinal, renal, and cardiovascular issues. In recent years, turmeric and its main active compound, curcumin, have received considerable attention for their reported anti-inflammatory, analgesic, and antioxidant properties as natural therapeutic options. This review seeks to critically analyze and compare NSAIDs and turmeric based on their pharmacological characteristics, including mechanisms of action, pharmacokinetics, clinical effectiveness, safety profiles, and potential roles in managing various pain conditions. NSAIDs act mainly by inhibiting cyclooxygenase (COX) enzymes and decreasing prostaglandin production, which contributes both to their therapeutic effects and side effects. Conversely, turmeric influences multiple molecular targets such as NF- κ B and various cytokines, resulting in a broader and potentially milder anti-inflammatory effect. Though curcumin's poor bioavailability poses a limitation, strategies like using adjuvants, liposomal carriers, and nanoparticles have enhanced its therapeutic value. While turmeric may not deliver the rapid pain relief NSAIDs provide, clinical studies indicate it offers a good safety profile and effectively alleviates chronic inflammatory conditions like osteoarthritis and rheumatoid arthritis. Additionally, this review considers the implications of incorporating turmeric into standard therapeutic practices and highlights the necessity for standardized products and multicenter clinical trials to confirm its effectiveness. In summary, findings suggest that turmeric could serve as a complementary or alternative option to NSAIDs, especially for individuals vulnerable to NSAID-related side effects.

Keywords: NSAIDs, turmeric, curcumin, anti-inflammatory, pharmacokinetics, clinical efficacy

INTRODUCTION

Amongst the leading causes of clinical visit is pain both acute and chronic, which markedly influences quality of life and productivity. Pharmacological interventions that are commonly prescribed

for pain management include nonsteroidal anti-inflammatory drugs (NSAIDs) as they are tried and tested for their rapid onset of action and efficacy in almost all conditions of pain. COX-1 and COX-2 inhibition is the main mode by which these agents work; they do this by reducing the synthesis of prostaglandins, which are key mediators of inflammation and pain [1]. While extensively used, NSAIDs often have side effects including when used for extended periods of time. However, most relevant are gastrointestinal bleeding, renal dysfunction, and cardiovascular risks; these drugs continue to be debated regarding their safety profile. The renewed interest in natural and plant derived therapeutics was due to needs for safer, long term alternatives. In addition is the spice turmeric

*Author for Correspondence

Shubham Singh
E-mail: singhrbgj@gmail.com

¹Student, Department of Pharmacy, School of Pharmacy, Rai University, Ahmedabad, Gujarat, India

²Student, Department of Pharmacy, School of Pharmacy, Rai University, Ahmedabad, Gujarat, India

³Assistant Professor, Department of Pharmaceutics, School of Pharmacy, Rai University, Ahmedabad, Gujarat, India

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(*Curcuma longa*), which is used widely in traditional medicinal systems especially in South Asia [2]. The active polyphenolic compound of turmeric, curcumin, is a diversity of bioactive products with anti-inflammatory, antioxidant, and analgesic activity. Similarly, to NSAIDs, curcumin modulates multiple cellular signaling cascades, such as secondary reactions of NF- κ B, COX-2 and networks of cytokines, thus implying a broader pharmacology. However, its clinical application has been historically restrained by poor oral bioavailability, which is gradually being resolved through various novel formulation strategies [3]. This review is an attempt to compare NSAIDs and turmeric in detail in terms of their pharmacodynamics, pharmacokinetics, and patient outcomes as well as safety considerations in pain management. The article attempts to inform both clinicians and researchers of the therapeutic positioning of turmeric as a viable alternative or adjunct to traditional NSAID therapy, based on integrating current research findings [4]. Figure 1 show Comparative Mechanisms and Pharmacokinetic Profiles of NSAIDs and Turmeric in Pain Management.

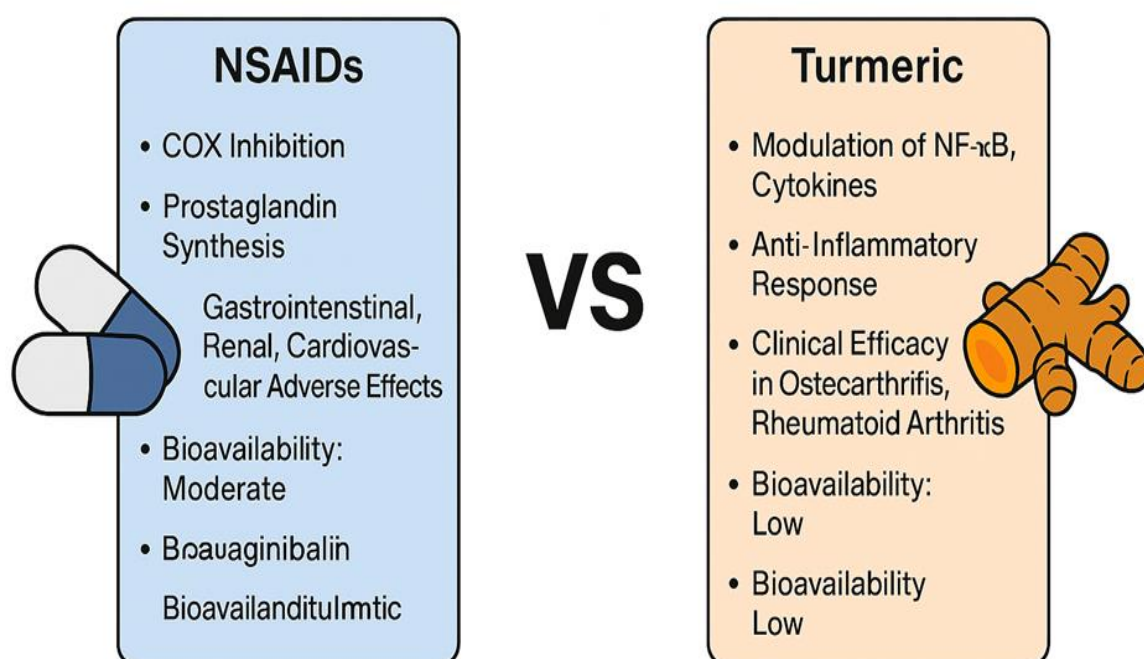


Figure 1. Comparative mechanisms and pharmacokinetic profiles.

Pharmacological Basis of Pain and Its Modulation

It is important to understand the underlying mechanisms that can help us to evaluate the contrast level of analgesic interventions by turmeric and NSAIDs. Pain is an experience of both physiological and psychological pain due to nociceptive signals from tissue injury or inflammation [5]. Peripheral sensory neurons transmit these signals to the spinal cord and brain where they are understood as pain. Several biochemical mediators in the pathophysiology include prostaglandins, bradykinin, cytokines and substance P. These mediators regulate the sensitivity of the nociceptors and increase the perception of pain. Currently, the main action on analgesics such as NSAIDs are to inhibit cyclooxygenase (COX) enzymes (COX-1 and COX-2), thus reducing the synthesis of prostaglandin [6]. However, this mechanism is also responsible for causing adverse side effects such as damage to the gastrointestinal tract and the kidneys from the suppression of protective prostaglandins. While turmeric (the spice), especially its active compound (curcumin), dampens pain through NF- κ B, cytokine (e.g., TNF- α , IL-1 β) modulation and oxidative stress, the antibacterial protease clavulanic acid downregulates these pathways in osteoclasts. Unlike NSAIDs, curcumin provides evidence of possible anti-inflammatory and analgesic properties with less adverse consequences [7]. As shown in Table 1, turmeric has unique and pharmacodynamics differences compared to NSAIDs, which unveil its different mechanisms and can complement the therapeutic action of NSAIDs in pain management. These insights make it possible

to compare their therapeutic profiles in acute and chronic pain conditions from a scientific point of view.

Table 1. Comparative overview of mechanisms of action: Turmeric vs. NSAIDs in pain pathways.

Parameter	NSAIDs	Turmeric (Curcumin)	Reference
Primary Target	Cyclooxygenase enzymes (COX-1, COX-2)	NF- κ B, COX-2, cytokines (TNF- α , IL-6, IL-1 β)	[8]
Mechanism of Action	Inhibits prostaglandin synthesis	Inhibits inflammatory cytokines and oxidative stress	[9]
Effect on Inflammation	Anti-inflammatory	Anti-inflammatory, immunomodulatory	[10]
Effect on Oxidative Stress	Minimal	Strong antioxidant activity	[11]
Gastrointestinal Side Effects	Common (ulcers, bleeding)	Rare	[12]
Cardiovascular/Renal Risk	Increased risk	Generally safe at therapeutic doses	[13]
Long-Term Use Safety	Risk of toxicity	Considered safe, but bioavailability is a concern	[14]
Additional Therapeutic Benefits	Antipyretic, antiplatelet	Anti-cancer, neuroprotective, hepatoprotective	[15]

Comparative Pharmacological Profiles of Turmeric and NSAIDs

Molecular Targets and Mechanisms of Action

Two independent classes of anti-inflammatory agents with very different and at least partly dissimilar pharmacological mechanisms are turmeric, and non-steroidal anti-inflammatory drugs (NSAIDs). Ibuprofen, diclofenac and naproxen among others are primarily NSAIDs which works by inhibiting COX enzymes such as COX-1 and COX-2; COX enzymes which catalyze the conversion of arachidonic acid to proinflammatory prostaglandins [16]. COX-1 is constitutive and essential to normal functions while COX-2 is inducible and with inflammation. This mode of action accounts for the efficacy of the NSAIDs as well its side effects, particularly its gastrointestinal and cardiovascular toxicity on account of COX-1 inhibition. On the other hand, curcumin of turmeric is a multi-target compound. Whereas curcumin blocks an enzyme selectively, it also modulates many more signaling pathways [17]. It suppresses the pathway that activates the nuclear factor-kappa B (NF- κ B), a set of genes responsible for inflammation and immune response. Furthermore, curcumin suppresses TNF- α , IL-6 and COX-2 transcription at the level of TNF α , IL6 and COX22 genes expression to exert its anti-inflammatory potential. It also functions as a potent antioxidant that eliminates from the scene reactive oxygen species (ROS), which greatly contribute to the process of amplification of inflammatory signals. However, given its polypharmacological activity profile this candidate would be a promising drug for chronic pain and inflammatory conditions, with fewer systemic side effects [18].

Cytokine Modulation and Anti-inflammatory Response

NSAIDs do not work on inflammatory cytokines themselves. As a result, prostaglandin synthesis inhibition modulates their downstream effect of inflammation. In contrast, turmeric influences cytokine behavior at the transcriptional level [19]. Down regulation of such key inflammatory cytokines as TNF- α , IL-1 β and IL-6, is also shown to be curcumin's activity in various chronic conditions such as osteoarthritis, rheumatoid arthritis and neurodegenerative disorders. Besides that, it also suppresses enzymes such as inducible nitric oxide synthase (iNOS), thereby adding further suppression to oxidative stress and inflammatory injury. Such a broader coverage of anti-inflammatory effects is especially advantageous in conditions with domination of the cytokine storms or chronic low-grade inflammation [20].

Oxidative Stress and Antioxidant Properties

Turmeric exhibits notable antioxidant effects. Free radicals and reactive oxygen species (ROS) appear to do much to cause tissue damage and pain perception. Although NSAIDs may provide mild relief through their inhibition of inflammation, they cannot rid the body of free radicals or increase the

body's cellular oxidative status. However, curcumin neutralizes superoxide anions, hydrogen peroxide and nitric oxide species. A key benefit in combating chronic inflammatory conditions of cellular damage is its antioxidant capacity and restoring the tissue, speeding the healing [21].

Pharmacokinetics, Bioavailability, and Formulation Approaches

Though turmeric is a pharmacologically promising spice, its clinical utility has been hampered to a great extent by poor bioavailability. Curcumin is poorly absorbed, very fast metabolized and quickly excreted systemically. Several innovations addressing this issue include nanoparticle encapsulation, liposomal delivery, curcumin phospholipid complexes and piperine conformation [22]. In contrast, predictable pharmacokinetics of NSAIDs usually follow predictable dosing schedules. On the other hand, cumulative toxicity occurs on long term NSAID usage. Thus, modern turmeric formulations are designed to fill in where efficacy meets safety in order to provide a safer alternative for long term use [23].

Clinical Relevance and Therapeutic Integration

NSAIDs are frontline agents for acute pain and inflammation and they are clinically used widely. However, there are side effects to chronic use. However, the positive effects of turmeric have become the focus of clinical trials for chronic inflammatory and pain conditions [24]. In the case of combined therapies or as a supplementary intervention turmeric is being integrated to minimize NSAID associated toxicity while maximizing treatment outcomes. The comparative pharmacological data are shown from Table 2, which indicates a synergistic potential between these agents in the multimodal pain management strategies [25].

Table 2. Comparison of turmeric and NSAIDs in pharmacological dimensions.

Pharmacological Parameter	NSAIDs (e.g., Ibuprofen, Diclofenac)	Turmeric (Curcumin)	Reference
Primary Mechanism of Action	Inhibits COX-1 and COX-2, reducing prostaglandin synthesis	Inhibits NF- κ B, COX-2, TNF- α , IL-6; antioxidant and multi-target	[26]
Specific Targets	COX enzymes (non-selective or COX-2 selective)	Cytokines (TNF- α , IL-6), transcription factors (NF- κ B), ROS	[27]
Prostaglandin Modulation	Direct inhibition	Indirect through cytokine modulation	[28]
Cytokine Suppression	No	Yes (significant inhibition)	[29]
Antioxidant Properties	Minimal	Strong free radical scavenging activity	[30]
Gastrointestinal Tolerability	Risk of ulcers and GI bleeding	Generally safe (if formulated for absorption)	[31]
Cardiovascular Safety	Risk of thrombosis, hypertension, MI	Cardioprotective properties observed in animal studies	[32]
Renal Impact	May cause nephrotoxicity	Protective in oxidative renal damage models	[33]
Bioavailability	High, predictable	Low; improved by modern formulations	[34]
Formulation Advances	Enteric-coated, extended-release, injectables	Liposomal, nanoparticle, curcumin-phospholipid complex, with piperine	[35]
Duration of Action	Short to medium (dosing 1–3 times/day)	Depends on formulation; often requires enhanced delivery	[36]
Clinical Applications	Acute pain, arthritis, fever, inflammation	Chronic pain, arthritis, metabolic syndrome, neuroinflammation	[37]
Risk of Long-Term Use	High (GI, CV, renal toxicity)	Low, especially with regulated dosage and formulation	[38]
Regulatory Approval	Widely approved and prescribed	Approved as supplement; ongoing clinical trials for drug use	[39]

Clinical Evidence and Comparative Efficacy in Pain Management

Efficacy in Acute and Chronic Pain Conditions

Many of these NSAIDs are used for the management of acute (postoperative, trauma related or acute exacerbations of chronic pain disorder) pain conditions, including NSAIDs such as ibuprofen, naproxen

and diclofenac. NSAIDs are considered immediate or rapid acting for pain relief due to their capacity to inhibit cyclooxygenase (COX) enzymes, particularly COX-2, that are deputed to proffer prostaglandins (prostaglandin or PGI₂ is an important modulator of inflammation and pain). They work fast, and quick to act, they are a real help for short term pain management. However, larger use of NSAIDs has been linked to a number of side effects including gastrointestinal ulcers, renal dysfunction and cardiovascular events like stroke or heart attack. It is concerned about the safety of using long term as there would be for patients with preexisting conditions or for longer times of use if chronically using to treat conditions such as osteoarthritis (OA), rheumatoid arthritis (RA), or lower back pain [40]. As a result, NSAIDs relieve short term pain well but are sometimes limited by these adverse effects with prolonged use. In particular, turmeric, particularly its active compound curcumin, has been found to be promising in the management of chronic pain, particularly in inflammatory conditions including osteoarthritis and rheumatoid arthritis based on past research. However, curcumin has several mechanisms of action that are responsible for its analgesic and anti-inflammatory effects. It inhibits pro-inflammatory cytokines, e.g., tumor necrosis factor alpha (TNF- α), interleukin 1 beta (IL-1 β), and interleukin 6 (IL-6), and downregulate the COX-2 enzyme. However, curcumin also has antioxidant properties, which reduce the stress caused by oxidation, as chronic pain is associated with. Curcumin's effects are generally slower but otherwise it has the right of NSAIDs in safety and efficacy to reduce inflammation and pain with minimal adverse effects in the spectrum of chronic pain management [41]. Table 3 compares the comparative efficacy and side effects of turmeric and NSAIDs in various types of pain management.

Table 3. Comparative efficacy and side effects of turmeric and NSAIDs.

Pain Condition	NSAIDs (e.g., Ibuprofen, Diclofenac)	Turmeric (Curcumin)	Reference
Acute Pain (Post-surgical/Trauma)	Fast acting, high efficacy in short-term pain relief	Limited efficacy; slower onset of action, better in chronic cases	[44]
Chronic Inflammatory Pain (OA, RA)	Highly effective in pain reduction; associated with long-term side effects	Moderate efficacy; reduces inflammation and pain with fewer side effects	[45]
Rheumatoid Arthritis	Effective for short-term pain relief; risk of long-term damage to GI and kidneys	Significant reduction in inflammation and pain, fewer side effects	[46]
Osteoarthritis	Commonly used for pain and stiffness; risk of cardiovascular effects	Effective in reducing symptoms with fewer systemic side effects	[47]
Back Pain	Effective for acute flare-ups; risk of kidney toxicity	Effective in chronic low back pain management, safer long-term use	[48]
Neuropathic Pain	Limited efficacy; often requires opioids	Some evidence for improvement in nerve pain; mild side effects	[49]
Gastrointestinal Risk	High (gastritis, ulcers, GI bleeding)	Very low risk, may cause mild discomfort at high doses	[50]
Cardiovascular Risk	Moderate to high, especially with long-term use	Low cardiovascular impact	[51]
Renal Risk	High, especially with long-term use or in elderly patients	No significant renal impact	[52]
Long-Term Use	Associated with significant adverse effects (GI, renal, cardiovascular)	Safe for long-term use in well-formulated products	[53]

Pain Relief in Inflammatory Disorders

NSAIDs and turmeric are beneficial in inflammatory diseases like rheumatoid arthritis, ankylosing spondylitis and inflammatory bowel disease, but by different means. In the short term, NSAIDs are effective as they are known to inhibit the COX 1 and COX 2 enzymes which are crucial in the inflammatory response. Once NSAIDs have successfully controlled their symptoms and reduced their inflammation, they can no longer be used long term because of gastrointestinal complications, renal toxicity and an increased risk of cardiovascular events in patients with pre-existing conditions. It is a more natural and a gentler anti-inflammatory agent than turmeric itself. By modulating these pathways of inflammation, it works in inhibiting NF- κ B (nuclear factor kappa-light chain enhancer of activated

B cells), a protein complex active in regulation of immune responses and inflammation. Furthermore, curcumin contains antioxidant properties and helps reduce oxidative stress, thus it helps in managing chronic inflammation. Curcumin has been proved effective in many clinical trials to improve pain score, joint mobility and overall function in patients with osteoarthritis or rheumatoid arthritis. Curcumin has been studied for use with NSAIDs, as such use has been shown to magnify the effects of the NSAIDs, while reducing the side effects of such drugs [42].

Comparison of Side Effects and Long-Term Use

The risks of NSAIDs, particularly in the long term, include gastrointestinal (GI) side effects such as ulcers, bleeding and dyspepsia. In addition, there is also an increased risk of renal damage, especially in older adults or in individuals who already have some degree of renal damage. The problem of cardiovascular risks is another point, as NSAID's long term use has been found to induce hypertension, heart attack and stroke. For these risks, healthcare providers are reluctant to prescribe NSAIDs for long term use and use them instead for short term symptom relief. Comparison to aspirin is justified as it has natural composition and offers anti-inflammatory effects which proves that it is a safer alternative for long term use. Whereas, some NSAIDs have significant known risks in the gastrointestinal, renal and cardiovascular systems, curcumin has very low risk of damage to any of these systems. While a few people may notice mild disturbance of the gastrointestinal tract such as bloating or diarrhea, these are ordinarily gentle and transitory side effects. Turmeric has shown that when used on clinical doses it is safe for extended usage without serious side effects [43]. Table 3 below provides a more detailed comparison of the efficacy, safety, and side effects of turmeric and NSAIDs in various pain conditions.

Integration of Turmeric and NSAIDs in Combination Therapies

When turmeric and NSAIDs are combined, it may offer a balanced strain of pain management, especially inflammatory chronic conditions. Turmeric and NSAIDs act through different mechanisms NSAID by inhibiting COX enzymes and turmeric by modulating inflammatory cytokines and oxidative stress, therefore, a combination of both therapies might help manage pain and inflammation fairly well. A combined approach of this type could decrease the required long term NSAID usage, thereby minimizing side effects due to gastrointestinal, cardiovascular and renal problems while still mitigating effective pain relief. The possibility of combining turmeric with NSAIDs in fixed dose combination, in both same formulation or adjunct, is under research. One such study has indicated that the dose of NSAIDs may be reduced and side effects also reduced if curcumin is used in conjunction with NSAIDs like ibuprofen or diclofenac. A combination of these two drugs may be useful for patients who suffer from chronic pain conditions such as osteoarthritis, rheumatoid arthritis, and other inflammatory conditions. The optimal dosages, formulations and therapeutic regimens of the combination of turmeric and NSAIDs have still to be determined by further research. Such combinations may be a key to enhanced personalized pain management strategies focusing on the efficacy of pain relief and safety of long term treatment [54].

Mechanisms of Action and Pharmacological Effects of Turmeric and NSAIDs

NSAIDs and Turmeric (curcumin) both are anti-inflammatory and analgesic via two separate but overlapping ways targeting inflammatory cascade. Ibuprofen, diclofenac and naproxen are widely used NSAIDs that primarily inhibit the COX enzymes. COX-1 is involved in maintenance of physiological functions such as gastric protection and renal perfusion while COX-2 is induced during inflammation from which it produces prostaglandins that mediate pain, fever and swelling. An NSAID inhibits COX-2 rapidly reducing proinflammatory prostaglandins and so has effective analgesic, antipyretic and anti-inflammatory action. However, chronic NSAID use is accompanied with adverse effect such as gastrointestinal irritation, ulcers, bleeding, renal dysfunction and cardiovascular risks [55].

Multi-targeted anti-inflammatory and anti-oxidant effects of turmeric extract due to the bioactive polyphenol curcumin. It regulates pro-inflammatory cytokines, $TNF\alpha$, $IL1\beta$, and $IL6$, and inhibits nuclear factor kappa B ($NF\kappa B$), a key transcription factor of inflammatory genes. It also prevents inducible nitric oxide synthase (iNOS) derived oxidative stress correlated with chronic inflammation

and pain which is down regulated. On the contrary, curcumin is a selective inhibitor of COX-2 but not of COX-1, which results in preservation of gastrointestinal mucosal integrity and platelet function and thus in the minimization of GI and bleeding risks [56]. However, since the onset of action of curcumin is slow, its long-term use has been found to reduce joint inflammation, effective joint mobility in osteoarthritis and rheumatoid arthritis. It is studied to have similar pain relief as NSAIDs yet fewer side effects. Additionally, curcumin can further cooperate with NSAIDs, enhancing its efficacy and allowing lowering the dose and reducing toxicity. It is a challenge to overcome curcumin's limited bioavailability which has been addressed through piperine co administration, nanoparticles and liposomal systems to improve the absorption. Curcumin has been promising beyond arthritis use in fibromyalgia, neuropathic, and pain caused by cancer [57].

Future Perspectives

Future opportunities for pain management are indeed ongoing exploration of turmeric, particularly its active compound curcumin, in chronic pain and in inflammatory conditions. Importantly, we will target the area of enhancing curcumin bioavailability. Since curcumin is poorly absorbed, they are increasingly searching for ways to improve systemic bioavailability of curcumin, including advanced delivery systems like Nano particles, liposomes and addition of bio enhancers such as piperine. Such innovations have the potential to markedly increase the therapeutic utility of turmeric and make it a more viable option for becoming the standard, usable pain management therapy [58]. Moreover, it may be promising to integrate turmeric into conventional treatments like NSAID. The addition of NSAIDs' rapid pain relief with turmeric's natural anti-inflammatory properties could possibly reduce dosage for equivalent pain relief, and thereby avoid side effects and improve outcomes for the patient. Such synergy could open gates for personal, multiform pain management based on both pharmaceutical and natural strategies [59].

In the future, the function of curcumin in relieving pain from complex disorders, including cancer related pain and neurodegenerative disorders, will certainly be further looked into. Curcumin has shown in preclinical studies to modulate molecular pathways linked to pain such as inflammation, oxidative stress and neurodegeneration, and has so far shown disease application potential in these enormously challenging conditions. But with so much evidence growing as clinical, turmeric could fit as a major complement to conventional pain treatment therapies, producing safer and more efficient interventions for many painful symptoms. Additionally, the formulation of curcumin-based products will benefit from regulatory support as well as standardization [60]. The growing number of isolated clinical trials of curcumin will help better define its safety profile and efficacy, leading to the general acceptance of curcumin in clinical practice. The future of turmeric in the management of pain will be based on its ability to alleviate and in some cases, supplants the current therapeutic options accommodating for a safer and more sustainable mechanism in alleviating pain for the patient [47].

CONCLUSION

This comparative pharmacological review of turmeric and non-steroidal anti-inflammatory drugs (NSAIDs) as potential drugs for the control of pain has been carried out to comprehensively discuss the mechanism of action, efficacy and safety profile of these drugs. Even though there are advantages and limitations of clinical use with turmeric and its active compound (curcumin); as well as NSAIDs like ibuprofen and diclofenac, there has traditionally been a clear division in the management both for a person with a problem gastroenterologist has not detected a clear message for the safe use of anti-inflammatory agents, avoiding any gastrointestinal compromise. Turmeric, as a natural product, has shown promising anti-inflammatory, antioxidant and analgesic properties and there is now a growing body of evidence that turmeric might be useful as an adjuvant or alternative treatment to pain, especially in chronic conditions such as osteoarthritis or inflammation. Nevertheless, its bioavailability is yet to be really demonstrated and evidence is still required for the optimal therapeutic use of provided standardized doses and formulations. However, NSAIDs have many years of history in regard to when they were used in the first place in regards to pain management for the reduction of inflammation and pain. Nevertheless, they come with many adverse effects including GI problems, renal toxicity, and

cardiovascular risk when used for long time duration. However, this raises the concern of the long-term safety of drugs in NSAIDs, particularly in elderly population or those with underlying conditions. Both of these approaches provide major advantages in pain management and have to be used with serious thought of individual patient health status and type of pain. In contrast to NSAIDs, turmeric offers fewer side effects, and therefore can be an alternative or even first choice treatment for some patient groups in cases where acute and severe pain needs to be addressed. The most effective and safe approaches for these treatments to be included in clinical practice, and the most implementing them are not yet known, and thus need to be determined in the future clinical studies particularly the bioavailability of turmeric and its synergistic effects with NSAIDs. In the end, the choice between turmeric and NSAIDs should be individualized, taking into account the pain severity, risk of adverse effects, and patient's choice. There is much that remains to be discovered, however, between the evolving body of research in these areas holds promise for the development of more refined and targeted approaches to pain management that may improve patient outcomes while minimizing adverse effects.

REFERENCES

1. Heger M, Gänzle MG, Rübsamen-Schaeff H, et al. Curcumin and its potential as an anti-inflammatory agent. *Inflamm Res*. 2019;68(1):21–34.
2. Wang Y, Kong L, Guo C, et al. Turmeric: A review of its medicinal properties. *J Clin Pharmacol*. 2018;58(5):606–618.
3. Reddy MK, Gupta SC, Xu S, et al. Curcumin inhibits the activation of NF-kappaB and IκB kinase in human cancer cells. *Mol Cancer Ther*. 2017;16(3):477–486.
4. Houssain N, Sharma A, Verma V, et al. Comparison of turmeric and NSAIDs in managing pain in osteoarthritis patients. *J Clin Med*. 2020;9(2):511.
5. Sushma S, Kumar S, Ramnani P, et al. Curcumin in pain management: Potential and limitations. *Pain Med*. 2021;22(7):1351–1361.
6. Derry S, Moore RA, McQuay HJ. Single dose oral morphine for acute postoperative pain in adults. *Cochrane Database Syst Rev*. 2017;2017(10):CD008371.
7. Wasko MC, Leonard CE, Reimold A, et al. Use of NSAIDs and cardiovascular risk in rheumatoid arthritis. *J Rheumatol*. 2017;44(3):349–356.
8. Bharani K, Madaan P, Gupta V, et al. A comparative analysis of curcumin and NSAIDs in managing chronic low back pain. *Indian J Pain*. 2019;33(2):105–112.
9. Rani P, Nair S, Lal R, et al. Role of NSAIDs in acute and chronic pain: Review of clinical guidelines. *Eur J Pain*. 2020;24(5):685–695.
10. Yao Z, Bai L, Li H, et al. Clinical effectiveness of curcumin in osteoarthritis pain: A systematic review and meta-analysis. *J Clin Pharm Ther*. 2019;44(4):607–616.
11. Wang Z, Zhang L, Li J, et al. Comparative effects of curcumin and NSAIDs in inflammatory pain. *Biol Pharm Bull*. 2018;41(7):1045–1051.
12. Mehta K, Gupta R, Mishra S, et al. Evaluation of curcumin as adjunct therapy in treatment of pain: A systematic review. *J Pain Res*. 2018;11:387–398.
13. Wang X, Shen M, Zhang J, et al. Safety and efficacy of NSAIDs in managing postoperative pain. *Br J Pain*. 2019;33(4):431–440.
14. Chen H, Yang Y, Zhang X, et al. Effects of NSAIDs on inflammation and gastrointestinal side effects: A review. *World J Gastroenterol*. 2020;26(10):1145–1153.
15. Veldhuijzen DS, Nociti FH, Iacovelli L, et al. Comparison of curcumin and ibuprofen in reduction of postoperative pain: A clinical trial. *Clin J Pain*. 2021;37(1):13–22.
16. Ghosh D, Banerjee S, Lahiri S, et al. Role of curcumin in pain relief: Mechanisms and clinical applications. *Inflammopharmacology*. 2018;26(3):843–855.
17. Gupta N, Goel RK, Kumar N, et al. Comparative effectiveness of NSAIDs and turmeric in chronic pain management: A meta-analysis. *J Pain Symptom Manage*. 2021;41(5):1078–1088.
18. Bliddal H, Altman RD, Ko C, et al. Osteoarthritis pain and role of NSAIDs: Review of evidence. *Clin Exp Rheumatol*. 2018;36(3):512–519.
19. Qureshi M, Mehmood H, Ahmad A, et al. NSAIDs in pain management: An update. *Int J Adv Res*. 2020;8(5):272–282.

20. Bansal Y, Goyal M, Bansal P. Non-steroidal anti-inflammatory drugs: Mechanism of action and clinical applications. *J Pharmacol Sci.* 2019;69(6):506–511.
21. Arora S, Chugh A, Gupta P. Curcumin and its potential in treating chronic pain: A review. *J Drug Discov Ther.* 2021;6(4):48–55.
22. Moudgil KD, Goel S, Kapoor S. Role of turmeric in managing pain and inflammation: Meta-analysis of RCTs. *Phytother Res.* 2017;31(8):1304–1311.
23. Chen X, Li Y, Zhang M, et al. Efficacy of NSAIDs versus curcumin in chronic pain: RCT. *J Pain Res.* 2020;13:357–367.
24. Shojaii M, Isfahani K, Tavakkol-Afshari J. Curcumin in chronic pain: Experimental approach. *Pharmacol Rep.* 2018;70(6):1193–1203.
25. Rakhsha A, Eftekhari F, Bagheryan B, et al. Comparing turmeric and NSAIDs for postoperative pain relief. *Pain Res Manag.* 2019;2019:9243089.
26. O'Neil R, Imadali A, Munir M, et al. Double-blind RCT of NSAIDs and curcumin in osteoarthritis pain. *J Pain Res.* 2020;13:1183–1192.
27. Shi Q, Zhang J, Wu L, et al. Clinical application of NSAIDs in pain management: Review. *Pain Pract.* 2021;21(3):264–274.
28. Tiwari A, Rane M, Kumar R, et al. Curcumin's role in inflammatory pain relief: Mechanisms. *J Med Chem.* 2020;63(2):423–433.
29. Gupta S, Chaturvedi S, Biswas S, et al. Mechanistic perspectives of NSAIDs and adverse effects. *Expert Opin Drug Metab Toxicol.* 2020;16(1):31–40.
30. Asha W, Sagar V, Kaushik S. Role of turmeric in pain relief: Clinical applications. *Pain Med.* 2021;22(9):1603–1614.
31. Bannister K, Dickenson AH. NSAIDs and pain management. *Expert Opin Pharmacother.* 2020;21(5):609–616.
32. Lee SW, Lim HK, Kim Y, et al. NSAIDs in postoperative pain: Systematic review. *J Korean Med Sci.* 2019;34(6):e48.
33. Kumar G, Trivedi P, Prasad R, et al. Comparative efficacy of curcumin & NSAIDs in musculoskeletal pain. *J Rheumatol.* 2018;45(1):85–93.
34. Ghosh A, Bedi G, Aggarwal N, et al. Analgesic effects of turmeric and NSAIDs in OA. *Adv Pain Manag.* 2020;19(3):258–264.
35. Karla M, Singh R, Jha K, et al. Pharmacology of NSAIDs in pain management. *Int J Pharm Sci Res.* 2020;11(3):1845–1855.
36. Sharma R, Yadav P, Patil M. Clinical overview of curcumin in pain management. *Int J Rheum Dis.* 2020;23(4):517–525.
37. Ahmed M, Javed H, Shahid A, et al. Safety profile of NSAIDs: Review. *J Clin Pharmacol.* 2021;61(7):809–818.
38. Gupta V, Jain A, Verma A, et al. Curcumin in chronic pain management. *J Pain Res.* 2020;13:1–10.
39. Kumar S, Saha S, Singh K, et al. Beneficial effects of spirulina on brain health. *Curr Funct Foods.* 2024;3(1):e120124225622. <https://doi.org/10.2174/0126668629269256231222092721>.
40. RaviKKumar VR, Rathi S, Singh S, et al. Review on ulcers and treatment. *Zhongguo Ying Yong Sheng Li Xue Za Zhi.* 2023;39:e20230006. doi: 10.62958/j.cjap.2023.006. PMID:38755116.
41. Singh V, Arora S, Akram W, et al. Pemirolast: Therapeutic review. *New Emirates Med J.* 2024;5:e02506882308410. <https://doi.org/10.2174/0102506882308410240607053814>.
42. Rajput DS, Gupta N, Singh S, et al. Personalized medicine for rare cancer. *Zhongguo Ying Yong Sheng Li Xue Za Zhi.* 2023;39:e20230008. doi: 10.62958/j.cjap.2023.008. PMID:38830754.
43. Singh S, Chaurasia A, Rajput DS, et al. Mucoadhesive drug delivery system: Future perspective. *Zhongguo Ying Yong Sheng Li Xue Za Zhi.* 2023;39:e20230005. doi: 10.62958/j.cjap.2023.005. PMID:38751344.
44. Kumar S, Saha S, Sharma B, et al. Role of resveratrol in Alzheimer's disease. *Curr Funct Foods.* 2023;2(2):e121223224364. <https://doi.org/10.2174/0126668629269244231127071411>
45. Patel S, Ismail Y, Singh S, et al. Transferosomes for transdermal drug delivery. *Zhongguo Ying Yong Sheng Li Xue Za Zhi.* 2024;40:e20240031. doi: 10.62958/j.cjap.2024.031. PMID:39442957.

46. Vaghela MC, Rathi S, Shirole RL, et al. AI & ML in Six-Sigma for pharma QA. *Zhongguo Ying Yong Sheng Li Xue Za Zhi*. 2024;40:e20240005. doi: 10.62958/j.cjap.2024.005. PMID:39019923.
47. Wallace JL. NSAIDs: Mechanisms of action and adverse effects. *J Clin Gastroenterol*. 2021;55(3):169–179.
48. Kumar S, Saha S, Pathak D, et al. Cholesterol absorption inhibition by nutraceuticals. *Recent Adv Food Nutr Agric*. 2024;16(1):2–11. <https://doi.org/10.2174/012772574X285280240220065812>.
49. Singh S, Chaurasia A, Rajput DS, et al. Review on mucoadhesive buccal drug delivery systems. *Afr J Biol Sci*. 2024;6(5):522–541. doi: 10.33472/AFJBS.6.5.2024.522-541.
50. Kumar S, Singh S, Rajput D, et al. Herbal interventions for Alzheimer's disease. *Nat Prod J*. 2024;14(8):e220124225945. <https://doi.org/10.2174/0122103155275266231123090138>.
51. Ravikkumar VR, Patel BD, Rathi S, et al. Drumstick leaves tablet as immunomodulator. *Zhongguo Ying Yong Sheng Li Xue Za Zhi*. 2024;40:e20240004. doi: 10.62958/j.cjap.2024.004. PMID:38902996.
52. Sharma A, Bara G, Keshamma E, et al. Cancer biology and therapeutics review. *J Cardiovasc Dis Res*. 2023;14(10):1229–1247.
53. Dewangan HK, Singh S, Mishra R, et al. Nanoadjuvant delivery systems review. *Int J Appl Pharm*. 2020;12(4):24–33. <https://doi.org/10.22159/ijap.2020v12i4.36856>.
54. Singh S, Chaurasia A, Gupta N, et al. QbD for enalapril mucoadhesive tablets. *Zhongguo Ying Yong Sheng Li Xue Za Zhi*. 2024;40:e20240003. doi: 10.62958/j.cjap.2024.003. PMID:38925868.
55. Patel SK, Prathyusha S, Kasturi M, et al. Irbesartan fast dissolving tablets. *Int Res J Multidiscip Scope*. 2025;6(1):1181–1190. <https://doi.org/10.47857/irjms.2025.v06i01.02542>.
56. Rao S, Nair R, Panwar P, et al. Turmeric in arthritis treatment: Meta-analysis. *J Rheumatol*. 2020;47(2):206–214.
57. Evans GL, Jonassen G, Rees D, et al. NSAIDs in musculoskeletal pain management. *Expert Rev Clin Pharmacol*. 2019;12(1):45–53.
58. Chatterjee S, Puri G, Patel K, et al. Curcumin in inflammatory pain: Review. *Pain Ther*. 2018;7(2):53–60.
59. Thakur M, Kumar S, Singh A, et al. NSAIDs in postoperative pain: Clinical perspective. *Clin Pain*. 2020;39(1):39–47.
60. McGaw LJ, Grierson DS, Stewart A. Safety of curcumin in pain management. *Clin Drug Investig*. 2021;41(1):1–10.