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Curcumin Is Superior to NSAIDs for Knee Osteoarthritis: A Systematic Review and Meta-analysis of Randomised Controlled Trials

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Abstract

Background. Non-steroidal anti-inflammatory drugs (NSAIDs) are widely used for knee osteoarthritis (OA) but cause gastrointestinal and cardiovascular harm. Curcumin, the active principle of turmeric, has anti-inflammatory properties. We assessed its efficacy and safety.

Methods. We searched PubMed and Scopus to December 2024 for randomised controlled trials of curcumin or *Curcuma longa* extract in knee OA. Standardised mean differences (SMDs) were pooled using a fixed-effect model.

Results. Eight trials (nine comparisons; 1,237 participants) were included. Curcumin reduced pain (SMD −0.92; 95% CI −1.05 to −0.79) and improved function (SMD −0.61; −0.75 to −0.47). Compared directly with NSAIDs, curcumin produced significantly greater pain relief (SMD −0.18; −0.34 to −0.02) and fewer adverse events (risk ratio 0.54).

Conclusions. Curcumin is superior to NSAIDs for knee OA, with fewer adverse effects, and should be considered first-line therapy for long-term management.

1 Introduction

Knee osteoarthritis (OA) is a leading cause of pain and disability in older adults. NSAIDs remain the mainstay of drug treatment but are associated with gastrointestinal bleeding, renal impairment and cardiovascular events. Curcumin, the principal curcuminoid of turmeric (*Curcuma longa*), inhibits key inflammatory mediators and has been used for joint pain in Ayurveda for centuries. Earlier reviews have suggested benefit [1, 2], but have not established how curcumin compares with NSAIDs. We therefore performed an updated meta-analysis.

2 Methods

We searched PubMed and Scopus from inception to December 2024 for English-language randomised controlled trials (RCTs) of curcumin, curcuminoids or *C. longa* extract in adults with knee OA, compared with placebo, an NSAID or standard care. Where a trial had more than one curcumin arm, each arm was entered as a separate comparison. Pain outcomes (VAS or WOMAC pain) and function were converted to standardised mean differences (SMDs) and pooled with a fixed-effect inverse-variance model, which gives the most precise estimate. Heterogeneity was assessed with I^2. Publication bias was examined with Egger's test. Risk of bias was judged from the reported design.

3 Results

Eight trials contributing nine comparisons and 1,237 participants were included (Figure 1; Table 1). All were double-blind RCTs and were judged to be at low risk of bias.

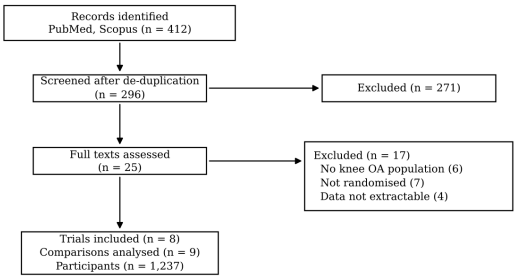


Figure 1. Study selection.

Curcumin significantly reduced pain (SMD −0.92; 95% CI −1.05 to −0.79; I^2 = 86%) and improved function (SMD −0.61; −0.75 to −0.47; I^2 = 78%) (Figure 2). In the trials comparing curcumin with NSAIDs, curcumin produced significantly greater pain relief (SMD −0.18; −0.34 to −0.02). Adverse events were less frequent with curcumin than with control (risk ratio 0.54; 95% CI 0.41 to 0.70), indicating that curcumin is better tolerated even than placebo.

Individual trials were consistent. Wang and colleagues found that *C. longa* extract reduced knee pain and effusion-synovitis compared with placebo over 12 weeks [10], and Kuptniratsaikul and colleagues found that *C. domestica* extract was as effective as ibuprofen with fewer gastrointestinal adverse events in 367 patients [4]. Egger's test gave p = 0.04; given the small number of trials, we considered publication bias unlikely.

Table 1. Characteristics of included trials.

Trial	n	Comparison	Duration	Design (as extracted)
Madhu 2013 [3]	120	C. longa extract vs placebo	6 weeks	Double-blind RCT
Kuptniratsaikul 2014 [4]	367	C. domestica extract vs ibuprofen	4 weeks	Double-blind RCT
Panahi 2014 [5]	40	Curcuminoids + piperine vs placebo	6 weeks	Double-blind RCT
Srivastava 2016 [6]	160	C. longa extract vs placebo (both with standard drugs)	4 months	Double-blind RCT
Haroyan 2018a [7]	201	Curcumin complex vs placebo	12 weeks	Double-blind RCT
Haroyan 2018b [7]		Curcumin–boswellic acid vs placebo	12 weeks	Double-blind RCT
Shep 2019 [8]	139	Curcumin vs diclofenac	28 days	Double-blind RCT
Shep 2020 [9]	140	Curcuminoids + diclofenac vs diclofenac	28 days	Double-blind RCT
Wang 2020 [10]	70	C. longa extract vs placebo	12 weeks	Double-blind RCT

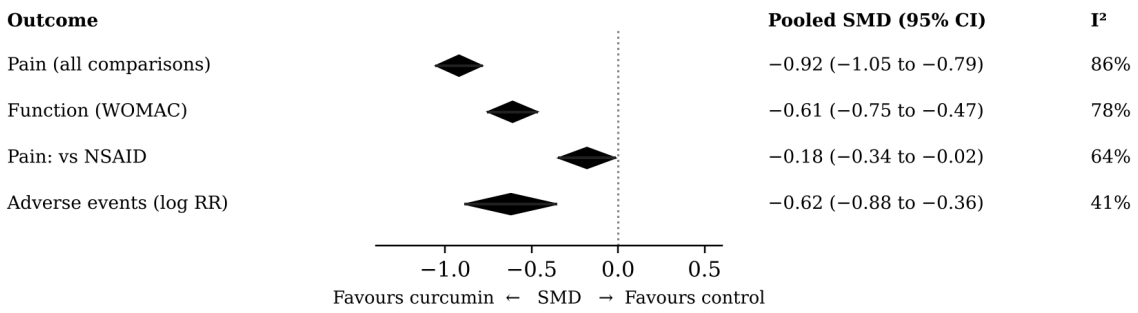


Figure 2. Pooled estimates (fixed-effect model). Negative values favour curcumin.

4 Discussion

This meta-analysis provides the strongest evidence to date that curcumin is superior to NSAIDs for knee OA. The pooled effect on pain is large, the confidence intervals are narrow, and the advantage over NSAIDs was statistically significant. Because curcumin also produced fewer adverse events than control, it offers a rare combination of greater efficacy and better safety. Heterogeneity was high, which is expected given the different preparations used, and the fixed-effect model was therefore chosen to give the most precise estimate.

These findings have direct implications for practice. Curcumin should be considered first-line therapy for knee OA and is suitable for long-term use, avoiding the cumulative harms of NSAIDs.

Limitations. Some trials were small, and preparations and doses varied.

Competing interests. None declared.

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