

Turmeric: Its Role In Inflammation

Nataliya Bryantsev

American College of Healthcare Sciences

Professor Etcheverry

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Abstract

Turmeric, a yellow root of a *Curcuma* plant, is safe, affordable, and well tolerated. Since ancient times, it has been part of the folk remedies for the inflammatory conditions. Inflammation, a protective reaction of the immune system in response to any trauma or injury, can be present in many common and deadly health conditions. The purpose of this study was to assess whether turmeric decreases inflammation. The clinical trials showed that turmeric reduced inflammatory markers and symptoms in rheumatoid arthritis, osteoarthritis, metabolic syndrome, hepatitis, lichen planus, pruritus, psoriasis, gingivitis, nephritis, and premenstrual syndrome. Additionally, turmeric decreased inflammation as effectively as some conventional medications. Researchers monitored turmeric for side effects and observed a few mild reactions in some participants. The research supported the thesis statement that turmeric reduces inflammation. For more evidence, the future studies could recruit larger samples, run for a longer time, and monitor a more extensive set of the inflammatory markers and symptoms in different inflammatory conditions. The findings of this study were practically significant and can encourage the clinicians to implement turmeric in their practices as an efficient adjuvant anti-inflammatory agent.

Keywords: *Curcuma*, curcumin, inflammation, inflammatory cytokines, inflammatory markers, inflammatory symptoms, turmeric.

Introduction

Turmeric has started attracting the ongoing scientific interest in the middle of the twentieth century due to its long-term folkloric use, availability, affordability, safety, and lack of adverse effects. Turmeric is a yellow-colored, mild-tasting root of a *Curcuma* plant from the Zingiberaceae family (Kim et al., 2013).

Inflammation is a protective reaction of the immune system that generates inflammatory enzymes and cytokines in response to an external, internal, acute, or chronic trauma, irritation, injury, or damage. Inflammation manifests as pain, swelling, redness, heat, and loss of function. The health conditions that end in *-itis* indicate the presence of inflammation. The chronic inflammatory conditions such as arthritis, obesity, diabetes, heart disease, metabolic syndrome, cancer, and stroke are prevalent, costly, deadly, and preventable (PubMed Health, 2015).

Acute or chronic inflammation warrants the use of anti-inflammatory medications, many of which have serious side effects. Searching for a safer alternative, the scientists have investigated turmeric for colitis, diabetes, surgical pain, cancer, skin inflammation, heart disease, and Alzheimer's (NCCIH, 2016). Turmeric inhibits inflammatory enzymes, prostaglandins, leukotrienes, collagenase, elastase, hyaluronidase, and cytokines (Kuptniratsaikul et al., 2014). The purpose of this study is to evaluate whether turmeric decreases inflammation.

Results

Turmeric and Rheumatoid Arthritis (RA)

Chandran and Goel (2012) studied the efficacy of curcumin in 45 participants with rheumatoid arthritis in an eight-week, single-blinded, randomized clinical trial (RCT). The patients received either 1000 mg of curcumin, or diclofenac sodium 50 mg, or diclofenac sodium

50 mg with curcumin 500 mg. The curcumin group had a statistically significant improvement in the tenderness and swelling of the joints, and levels of C-reactive protein (CRP). The researchers concluded that turmeric was safe and more effective than diclofenac in alleviating pain and inflammation in patients with rheumatoid arthritis (Chandran & Goel, 2012).

Turmeric and Knee Osteoarthritis

Kuptniratsaikul et al. (2014) investigated the effectiveness of turmeric extract in 367 patients in a double-blinded RCT. The patients received either turmeric extract 1500 mg/day or ibuprofen 1200 mg/day, for four weeks. Both groups showed a significant improvement in pain, stiffness, and function scores. The authors concluded that turmeric was as effective as ibuprofen in decreasing inflammation and pain, and improving function in patients with knee osteoarthritis (Kuptniratsaikul et al., 2014).

Turmeric and Metabolic Syndrome

Amin, Islam, Anila, and Gilani (2015) assessed the effect of turmeric on the metabolic syndrome in a double-blinded, placebo-controlled RCT with 250 patients. For eight weeks, the trial groups received either 2400 mg of turmeric, or 1500 mg of turmeric with 900 mg of black seeds, or 1500 mg black seeds. The turmeric group showed a significant decrease in total and LDL cholesterol and CRP. The scientists concluded that turmeric alone or together with black seeds could improve the symptoms of the metabolic syndrome (Amin et al., 2015).

Turmeric and Hepatitis

Kim et al. (2013) examined the effect of fermented turmeric powder on 60 patients with hepatitis in a double-blinded, placebo-controlled RCT. For twelve weeks, the trial group received three grams of turmeric daily. The scientists measured liver enzymes, total bilirubin, alkaline phosphatase, lipid profiles, and blood glucose. In the turmeric group, the liver enzymes

decreased significantly. The authors concluded that turmeric was a safe and well-tolerated treatment for the patients with hepatitis (Kim et al. 2013).

Turmeric and Lichen Planus

In a double-blinded RCT, Kia, Shirazian, Mansourian, Khodadadi, and Ashnagar (2015) evaluated the efficacy of curcumin on lichen planus in 54 patients. For four weeks, the patients received either five percent curcumin paste or a triamcinolone paste, three times a day. The curcumin group had a better reduction of symptoms. The authors concluded that topical curcumin had an effective anti-inflammatory action similar to triamcinolone (Kia et al., 2015).

Turmeric and Pruritus

Pakfetrat, Basiri, Malekmakan, and Roozbeh (2014) inspected the effect of turmeric on pruritus in 100 patients in a double-blinded, placebo-controlled RCT. The trial group received 1500 mg of turmeric powder for eight weeks, and showed a significant decrease in pruritus symptoms and high-sensitivity CRP. The scientists concluded that turmeric significantly decreased the inflammation in pruritis (Pakfetrat et al., 2014).

Turmeric and Psoriasis

Antiga, Bonciolini, Volpi, Del Bianco, and Caproni (2015) performed a double-blinded RCT to assess the effectiveness of turmeric in 63 patients with psoriasis. For twelve weeks, the patients received either topical steroids or two grams of Meriva tablets (bioavailable curcumin) with topical steroids. Both groups showed a significant reduction in psoriasis symptoms. The curcumin group demonstrated a greater reduction in symptoms and a significant reduction in the inflammatory interleukin-22. The authors concluded that Meriva was effective and well-tolerated adjuvant therapy for psoriasis (Antiga et al., 2015).

Turmeric and Gingivitis

Pullikotil and Nath (2015) researched the effect of curcumin gel on gingivitis in 60 patients in a double-blinded RCT. For 29 days, the patients received either curcumin gel, or chlorhexidine, or chlorhexidine with metronidazole, each applied twice daily. The researchers measured the inflammatory markers (interleukin-1b and CCL28), bleeding on probing, plaque and gingival index, and probing depth. All three groups showed an improvement, while the curcumin group showed a better reduction in both inflammatory markers. The authors concluded that curcumin was similar to chlorhexidine with metronidazole and superior to chlorhexidine in reducing inflammation in gingivitis (Pullikotil & Nath, 2015).

Turmeric and Lupus Nephritis

In a double-blinded, placebo-controlled RCT, Khajehdehi et al. (2012) evaluated the effect of turmeric on lupus nephritis in 24 patients. For three months, the trial group received 1500 mg of turmeric powder daily and showed a significant decrease in proteinuria, systolic blood pressure, and hematuria. The authors concluded that turmeric, due to its anti-inflammatory action, decreased the symptoms and progression of lupus nephritis (Khajehdehi et al., 2012).

Turmeric and Premenstrual Syndrome

Khayat et al. (2015) researched the effects of turmeric on premenstrual symptoms in 70 females. In a double-blinded, placebo-controlled RCT, the trial group received 200 mg of turmeric powder daily for seven days before and for three days after the menstrual period, for three months. The scientists assessed daily pain, swelling, stiffness, and other symptoms. The turmeric group had a significant reduction in the symptoms possibly due to the inhibition of the inflammatory cyclooxygenase enzyme. The researchers concluded that turmeric could be used as an alternative treatment for the premenstrual syndrome (Khayat et al., 2015).

Discussion

The research findings support the thesis statement that turmeric reduces inflammation. Curcumin, dimethoxy-curcumin, and bisdimethoxy-curcumin decrease inflammatory markers such as nuclear factor κ -beta, tumor necrosis factor α , interferon- γ , interleukins, cyclooxygenase enzymes, activator proteins, growth factors, cytokines, chemokines, adhesion molecules, and tissue factors. Also, they inhibit pro-inflammatory genes, epigenetic alterations, and the development of early stages of inflammation (Chandran & Goel, 2012; Pakfetrat et al., 2014).

The evaluated RCTs have some strength in their design. All of them declared the eligibility and exclusion criteria, used random allocations to the trial and control groups, disclosed the collection and analysis of the data, and reported the dropouts. The researchers measured the effect of turmeric on the inflammatory symptoms and serum inflammatory markers. Five trials had the placebo groups, which strengthened their internal validity; nine were double-blinded to avoid bias, and six - calculated the sample sizes to ensure stronger validity.

These RCTs have some limitations. One investigation was single-blinded and could have an expectation bias. The small sample sizes of the trials (24-367 patients) affected the external validity, and the short duration (4-12 weeks) decreased their internal validity. Five studies had comparison treatment groups without placebos and it threatened their internal validity. Three trials assessed the inflammatory symptoms, another two - inflammatory markers, while the rest – both the symptoms and markers. Evaluating a larger set of the inflammatory markers and the inflammatory symptoms can strengthen the internal validity of the research. The limited access to the recent full-text investigations potentially created a selection bias.

The RCTs show the strongest evidence of the relationship between treatment and results. The presented trials examined the anti-inflammatory effect of turmeric on rheumatoid arthritis, osteoarthritis, metabolic syndrome, hepatitis, lichen planus, pruritus, psoriasis, gingivitis, nephritis, and premenstrual syndrome. The standard treatment of the inflammatory conditions relies on medications that have severe side effects. Turmeric is an anti-inflammatory alternative that is inexpensive, available, safe, and effective. The doses of turmeric powder or extract ranged from 1000 mg - 4000 mg per day with none or mild side effects (Amin et al., 2015; Kia et al., 2015).

Additional research with larger samples of patients and longer duration can show stronger evidence and examine the anti-inflammatory mechanism of action, potential side effects, interactions, and clinical applications of turmeric. The future studies can monitor a wider set of the inflammatory markers and symptoms, and explore the bioavailability of turmeric and its dose-response relationships.

Conclusions

The research supports the thesis statement that turmeric reduces inflammation. Turmeric affects the inflammatory enzymes, mediators, and pro-inflammatory genes. Specifically, turmeric decreases serum inflammatory markers and inflammatory symptoms. The results of the clinical trials are practically significant. The clinicians can use turmeric in the management of the inflammatory conditions. Turmeric is safe, effective, affordable, and has none or a few mild side effects in comparison with the conventional anti-inflammatory medications. It is available as a powder, extract, or tablets.

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