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Effectiveness of Turmeric (Curcumin Longa L) Against CRP and IL-6: Literature Review

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Abstract

Inflammation is a biological response to infection, injury, or tissue damage and is commonly marked by increased inflammatory biomarkers, including C-Reactive Protein (CRP) and Interleukin-6 (IL-6). Turmeric (Curcuma longa L.), particularly its active compound curcumin, has been widely studied for its anti-inflammatory potential through the inhibition of nuclear factor-kappa B (NF-κB), cyclooxygenase-2 (COX-2), and pro-inflammatory cytokines. This study aimed to review the effectiveness of turmeric/curcumin in reducing CRP and IL-6 levels based on previously published studies. This research used a narrative literature review design by collecting relevant articles from Google Scholar, Semantic Scholar, PubMed NCBI, and ResearchGate. The inclusion criteria consisted of full-text articles published between 2021 and 2026, written in Indonesian or English, and discussing the effect of turmeric or curcumin on CRP and/or IL-6. A total of 10 articles were reviewed and analyzed descriptively. The findings showed that turmeric/curcumin supplementation generally demonstrated anti-inflammatory effects, particularly in reducing CRP levels. Several studies also reported significant reductions in IL-6, especially in chronic inflammatory conditions such as type 2 diabetes mellitus, asthma, and other metabolic disorders. However, the effectiveness of curcumin on IL-6 remained inconsistent across different clinical conditions, including chronic kidney disease, rheumatoid arthritis, and systemic lupus erythematosus. These variations may be influenced by dosage, duration of supplementation, disease severity, sample characteristics, and curcumin bioavailability. In conclusion, turmeric/curcumin has potential as an adjunctive anti-inflammatory therapy, particularly for reducing CRP levels, while its effect on IL-6 requires further confirmation through well-designed clinical studies with larger sample sizes and standardized formulations.

Introduction

Inflammation is a condition where the body reacts to infection, irritation or injury which is characterized by redness, heat, swelling and pain. Inflammatory reactions are known as non-specific immune responses. Inflammation/inflammation is also defined by the presence of five microscopic pathological phenomena, namely tumor (swelling of tissue), calor (increased tissue temperature), rubor (blood-like redness of vascularized tissue in areas where inflammation occurs), dolor (organ dysfunction) (Emelda et al., 2022; Kuriyama et al., 2025).

C-Reactive Protein (CRP) is an acute phase protein produced by the liver in response to increased IL-6 during acute inflammatory processes. CRP is known as an important biomarker in assessing the degree of systemic inflammation in the body (Amezcua-Castillo et al., 2023;

Levinson & Wasserman, 2022; Dongiovanni et al., 2023; Ali et al., 2023). When acute inflammation or tissue damage occurs, IL-6 produced by the damaged muscle or tissue stimulates the liver to produce large amounts of CRP, which can cause an increase in CRP levels in the blood up to 1,000 times normal. Elevated CRP indicates significant tissue damage or infection, and CRP works by binding to pathogens or damaged cells, thereby facilitating phagocytosis by the immune system (Wardika & Sikesa, 2021; Mahardieni et al., 2026; Suardi et al., 2022; Rahmayani et al., 2023; Darmo et al., 2023; Marrena et al., 2023; Olson et al., 2023; Wang et al., 2024; Han et al., 2024).

Currently, the use of natural ingredients as complementary therapy in reducing inflammation is growing. One of the herbal plants that has been widely studied is turmeric (*Curcuma longa*). Turmeric (*Curcuma longa* L.) is a common medicinal plant. Turmeric can be used as a natural food coloring, kitchen spice, or ingredient in traditional medicine (El-Saadony et al., 2023; Łuczaj et al., 2023). Apart from that, turmeric is also known to have broad pharmacological activity, including as an antibacterial, anti-HIV, antitumor, anticarcinogenic, and antiarthritis agent. The main content in turmeric is curcuminoid compounds consisting of curcumin, demethoxycurcumin, and bis-demethoxycurcumin (Turnip & Pasaribu, 2025; Rohmah, 2024; Hidayatullah et al., 2026; Afriyana et al., 2023).

Anti-Inflammatory Properties Curcumin is known to have anti-inflammatory properties by inhibiting the activation of the transcription factor NF-κB which plays a role in regulating the expression of pro-inflammatory cytokines (Zamanian et al., 2024). Studies show that curcumin can reduce the production of TNF-α, IL-1β, and IL-6. Role of Curcumin in Modulating the JAK-STAT Pathway plays an important role in the activation of T helper cells that contribute to inflammation. Curcumin has been shown to suppress the activity of this pathway, thereby inhibiting the production of IL-4 and IL-13 which trigger inflammation in the skin (Pasadena & Widiasari, 2025; Sudjarwo et al., 2023; Wilapangga & Arif, 2026).

The increasing trend of returning to nature is caused by several factors, including the large number of traditional medicine ingredients available, the many reports of side effects from using modern medicine, several chronic or malignant diseases that cannot be treated with modern medicine, and the large space for obtaining information about traditional medicine. In addition, the World Health Organization WHO has recommended the use of herbal medicines to maintain public health and prevent and treat disease. The use of traditional medicine is recommended for degenerative, chronic and cancer-complementary diseases (Shufyani et al., 2024).

Based on the description, the researcher is interested in conducting research in the form of a literature review regarding "The Effectiveness of Turmeric/Curcumin on CRP and IL-6" with the aim of determining the extent of the effectiveness of turmeric/curcumin in reducing inflammatory biomarker levels based on the results of previously published research.

Methods

Study Design

This study employed a narrative literature review to evaluate the effectiveness of turmeric (*Curcuma longa* L.) or its active compound, curcumin, in reducing inflammatory biomarkers, particularly C-reactive protein (CRP) and Interleukin-6 (IL-6). A narrative review design was selected to summarize and critically discuss evidence from previously published studies conducted in different clinical settings.

Literature Search Strategy

A literature search was conducted using four electronic databases: Google Scholar, PubMed NCBI, Semantic Scholar, and ResearchGate. The search covered articles published between 2021 and 2026 using combinations of the following keywords: *Curcuma longa*, turmeric,

curcumin, C-reactive protein, CRP, Interleukin-6, IL-6, inflammation, inflammatory biomarkers, and anti-inflammatory.

Study Selection

The study selection process followed the flow presented in Figure 1. After identification of potentially relevant articles, duplicate records were removed. Titles and abstracts were screened to assess their relevance to the research objective. Full-text articles meeting the eligibility criteria were subsequently reviewed. Following the selection process, 10 articles were considered eligible and included in the final review.

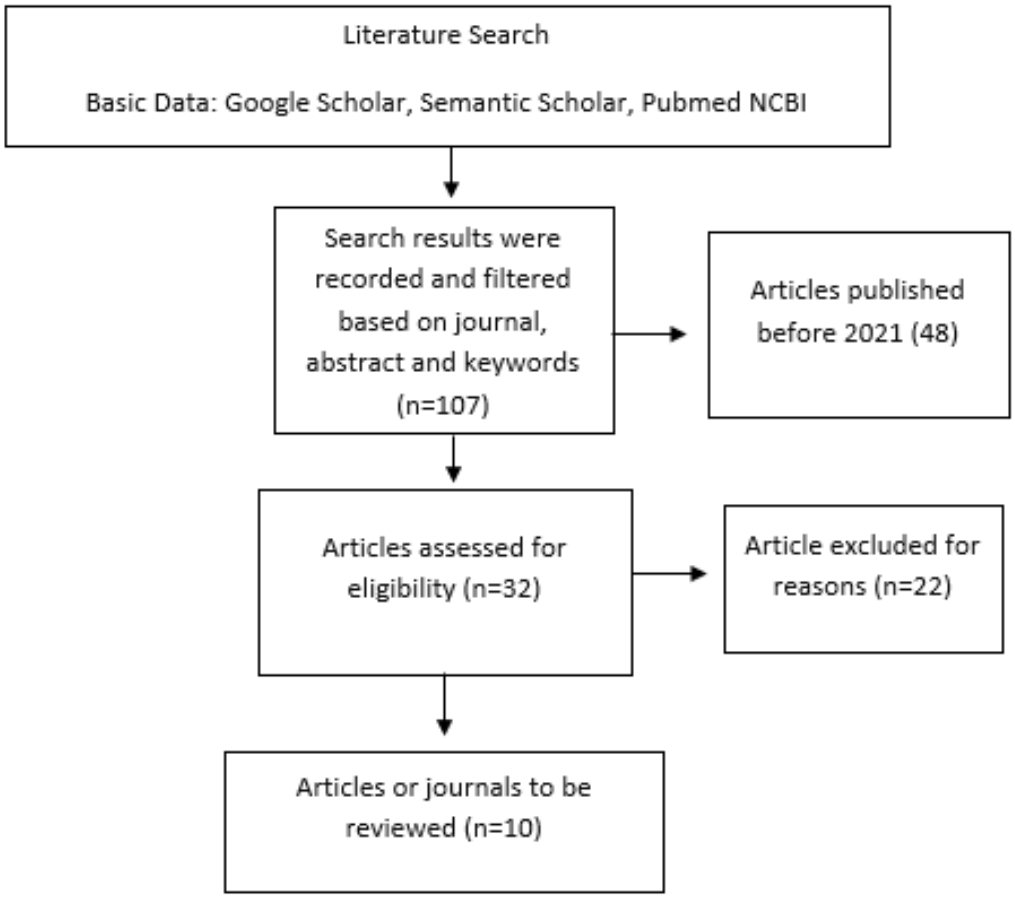

Figure 1. Research Flow

Inclusion and Exclusion Criteria

Studies were included if they met the following criteria: they were published between 2021 and 2026, available as full-text articles, and written in English or Indonesian. Eligible studies evaluated the effects of turmeric (*Curcuma longa* L.) or curcumin on inflammatory biomarkers, particularly C-reactive protein (CRP) and/or Interleukin-6 (IL-6). The review included original research articles, randomized controlled trials, experimental studies, systematic reviews, and meta-analyses investigating the anti-inflammatory effects of turmeric or curcumin in inflammatory conditions, including chronic kidney disease, type 2 diabetes mellitus, obesity, bronchial asthma, rheumatoid arthritis, systemic lupus erythematosus, and metabolic-associated fatty liver disease.

Studies were excluded if they were published before 2021, were not available in full text or were inaccessible, represented duplicate publications, or did not investigate the effects of turmeric or curcumin on CRP and/or IL-6.

Data Extraction

Relevant information was extracted from each eligible study, including the author, publication year, study design, study population, intervention characteristics, inflammatory biomarkers assessed (CRP and/or IL-6), principal findings, and study conclusions. These data were summarized in Table 1.

Data Analysis

The extracted studies were analyzed using a descriptive narrative synthesis. Findings were compared according to study design, disease characteristics, intervention, and reported effects on CRP and IL-6. Consistent and inconsistent findings across studies were identified to provide an overall interpretation of the effectiveness of turmeric/curcumin as an adjunctive anti-inflammatory therapy.

Result and Discussion

This research was conducted through a literature review, collecting data from several sources regarding the effectiveness of turmeric (Curcumin longa L.) on CRP and IL-6.

The 10 references obtained are then discussed and related to the research title. The most relevant references are presented in the table below:

Table 1. Summary of Previous Studies on the Effects of Curcumin Supplementation on Inflammatory Biomarkers (CRP and IL-6)

Year	Title	Methods	Author	Results	Conclusion
2022	Anti-inflammatory Response to Curcumin Supplementation in Chronic Kidney Disease and Hemodialysis Patients: A Systematic Review and Meta-analysis	Systematic review and meta-analysis	Elham Emami, Saeid Heidari-Soureshjani, Catherine M.T. Sherwin	Curcumin supplementation showed no significant effect on IL-6 ($p=0.221$), TNF-α ($p=0.480$), or hs-CRP ($p=0.093$) compared with the control group.	Curcumin supplementation in CKD and hemodialysis patients did not produce significant anti-inflammatory effects on hs-CRP, IL-6, and TNF-α.
2024	Acute Effect of Curcumin on Interleukin-6 (IL-6) Levels and C-Reactive Protein (CRP) Levels after High-Intensity Physical Exercises	Experimental study	Nining Widyah Kusnanik, Anton Komaini, Sapto Adi, Priya Yoga Pradana, Novadri Ayubi, Stephen P. Bird	No significant changes in IL-6 were observed ($p>0.05$), while serum CRP decreased significantly in the curcumin group ($p<0.05$).	Administration of 400 mg curcumin after high-intensity exercise effectively reduced CRP but had no effect on IL-6.
2023	Profiling Inflammatory Biomarkers following Curcumin Supplementation: An Umbrella Meta-Analysis of Randomized Clinical Trials	Umbrella meta-analysis	Navid Naghsh, Vali Musazadeh, Omid Nikpayam, Zeynab Kavyani, Amir Hossein Moridpour, Fatemeh Golandam,	Analysis of 10 studies (5,870 participants) showed significant reductions in CRP ($p<0.001$), IL-6 ($p<0.001$), and TNF-α after curcumin supplementation.	Curcumin has potential as an adjunctive therapy to reduce inflammation by lowering CRP and IL-6 in inflammatory diseases.

			Amir Hossein Faghfouri		
2021	The Effect of Curcumin Adjuvant Therapy on Pulmonary Function and Levels of Interleukin-6 (IL-6) and Superoxide Dismutase-3 (EC-SOD3) in Patients with Chronic Bronchial Asthma	Experimental study	Sura Abbas Khdair, Manal Khalid Abdulridha, Mostafa Abdalfatah Shafek	After two months, IL-6 levels decreased significantly ($p<0.05$), lung function improved, and asthma control scores increased ($p<0.01$). No increase in EC-SOD3 was observed.	Curcumin is effective as an adjunct therapy in chronic asthma by reducing IL-6 and improving pulmonary function.
2021	The Potential Effect of Natural Compounds from Indonesian Spices in Alleviating Inflammation due to the Coronavirus Disease (COVID-19): A Narrative Review	Narrative review	Yuliana	Curcumin was reported to downregulate IL-6 and TNF-α through anti-inflammatory mechanisms, although CRP and IL-6 were not directly measured.	Curcumin has potential as an adjunct anti-inflammatory therapy, but further clinical studies are needed.
2026	Curcumin Supplementation Reduces Inflammation, Neutrophil-to-Lymphocyte Ratio (NLR), and Antioxidant Status in Obese Patients with Type 2 Diabetes: A Randomized Controlled Trial	Randomized double-blind placebo-controlled trial	Metha Yaikwawong, Khanittha Kamdee, Somlak Chuengsamarn	Curcumin significantly reduced IL-6 ($p<0.001$) and hs-CRP ($p<0.05$), while improving antioxidant status and glycemic parameters.	Curcumin effectively reduces IL-6 and hs-CRP in obese patients with type 2 diabetes and may serve as an adjunct anti-inflammatory therapy.
2023	The Effect of Antioxidants Supplementation on Oxidative Stress and Proinflammatory Biomarkers in Patients with Chronic Kidney Disease: A Systematic Review and Meta-Analysis	Systematic review and meta-analysis	R. Supriyadi, M.I.A. Koswara, M.A. Soelaeman, I. Huang	Curcumin/turmeric significantly reduced CRP (SMD −0.5238; $p=0.05$), but not IL-6 ($p=0.22$).	Curcumin is effective in reducing CRP in CKD patients, while evidence for IL-6 reduction remains inconclusive.
2024	Efektivitas Curcuma longa sebagai Herbal Preventif dalam Bidang Obstetri-Ginekologi, Pediatri, dan	Systematic review	Fransiska Mochtar, Saddam Muhdi, Hengky Ardian, Siska Silviana	Curcumin demonstrated anti-inflammatory and immunomodulatory effects by modulating inflammatory pathways, although CRP and IL-6 were	*Curcuma longa* has preventive potential through anti-inflammatory mechanisms, but clinical evidence on CRP and IL-6 remains limited.

	Patologi Anatomi: Kajian Sistematik			not directly measured.	
2022	Senyawa Kurkumin dengan Efikasinya Mempengaruhi Parameter Biokimia pada Metabolic-Associated Fatty Liver Disease (MAFLD)	Literature review	Erlita Kusuma Wardani, Evi Kurniawati, Oktadoni Saputra	Curcumin may improve metabolic and inflammatory conditions in MAFLD, although specific data on CRP and IL-6 are lacking.	Curcumin has potential as an adjunct therapy in MAFLD, but evidence regarding CRP and IL-6 is still limited.
2026	Effects of Curcumin and Curcuma longa Extract on Inflammatory Biomarkers in Patients with Rheumatoid Arthritis (RA) and Systemic Lupus Erythematosus (SLE): A Systematic Review and Meta-Analysis of Randomized Controlled Trials	Systematic review and meta-analysis	Ang-Jun Liu, Po-Chang Wu, Yu-Pei Chen, Hsueh-Ting Chu, Hen-Hong Chang	No significant effect on CRP (SMD = −1.65; 95% CI: −3.88 to 0.58). Effects on inflammatory biomarkers were inconsistent, and IL-6 outcomes were not specifically reported.	Curcumin showed limited and inconsistent effectiveness on inflammatory biomarkers in RA and SLE; further well-designed RCTs are required.

Turmeric (*Curcuma longa* L.), a tropical medicinal plant from the Zingiberaceae family, has high antioxidant potential through its content of curcumin and its derivatives. Turmeric extracts or their active compounds, curcuminoids, have various biological activities, including hepatoprotective, cardioprotective, antifungal, and antioxidant effects. Studies show that curcumin has antioxidant properties, acts as a superoxide scavenger, and is able to inhibit lipid peroxidation. In addition, curcumin also functions as a scavenger of reactive oxygen species and reactive nitrogen species, which helps protect DNA from free radical damage and protects hepatocytes from various toxins (Anwar & Romli, 2024). One mechanism of action of curcumin is to inhibit inflammatory pathways by suppressing the activation of nuclear factor-kappa B (NF-κB), inhibiting cyclooxygenase-2 (COX-2), and reducing the production of pro-inflammatory cytokines such as interleukin-6 (IL-6), tumor necrosis factor alpha (TNF-α), and C-reactive protein (CRP) (Wahyudi et al., 2025; Pasadena & Widiasari, 2025; Afriyana et al., 2023). Therefore, curcumin is one of the herbal ingredients widely studied for its effectiveness in reducing inflammatory biomarkers, particularly CRP and IL-6.

CRP is an acute-phase protein produced by the liver in response to systemic inflammation, particularly due to stimulation by pro-inflammatory cytokines such as IL-6. Elevated CRP levels are often used as an indicator of inflammation in the body, both acute and chronic. Meanwhile, IL-6 is a pro-inflammatory cytokine produced by macrophages, lymphocytes, and adipose tissue that plays a role in activating immune responses and inflammation. Elevated IL-6 levels are often found in various chronic disease conditions, such as diabetes mellitus, chronic kidney disease, rheumatoid arthritis, lupus, metabolic liver disease, and inflammatory respiratory diseases (Kang & Kishimoto, 2021; Wang et al., 2024; Han et al., 2024; Wardika & Sikesa, 2021). Therefore, reduced CRP and IL-6 levels can be used as indicators of the effectiveness of anti-inflammatory therapy, including the use of turmeric or curcumin (Olson et al., 2023; Marrena et al., 2023; Suardi et al., 2022).

Based on the results of a literature review, the effectiveness of turmeric/curcumin on CRP and IL-6 shows mixed results. Some studies show that curcumin supplementation is effective in

reducing levels of inflammatory biomarkers, while others show insignificant results. These differences in results may be influenced by the disease condition, curcumin dose, duration of administration, sample size, and the bioavailability of the curcumin used (Sudjarwo et al., 2023; Wilapangga & Arif, 2026).

Research by Naghsh et al. (2023), conducted through an umbrella meta-analysis of 10 studies with 5,870 participants, showed that curcumin supplementation significantly reduced CRP and IL-6 levels ($p<0.001$). This study suggests that curcumin has the potential to be an effective adjunct therapy in reducing inflammation in various chronic disease conditions. The effect on reducing inflammatory biomarkers was also greater in the age group over 45 years and in a larger sample size. These results support the hypothesis that curcumin has a potent anti-inflammatory effect through reducing the expression of pro-inflammatory cytokines (Naghsh et al., 2023).

Similar results were also found in a study by Yaikwawong et al. (2026) in obese patients with type 2 diabetes mellitus. This randomized, double-blind, placebo-controlled trial showed that 1500 mg/day of curcumin supplementation for 12 months significantly reduced IL-6 ($p<0.001$) and hs-CRP ($p<0.05$) levels. Furthermore, there was an improvement in the patients' antioxidant status and glycemic parameters. This study suggests that curcumin's effectiveness against CRP and IL-6 may provide additional benefits in chronic inflammatory conditions associated with metabolic disorders (Yaikwawong et al., 2026).

In a study by Khdair et al. (2021) in patients with chronic bronchial asthma, curcumin supplementation as an adjunct therapy for two months showed a significant reduction in IL-6 levels compared to the control group ($p<0.05$). This reduction in IL-6 levels was accompanied by improved lung function and asthma symptom control. This suggests that curcumin may help reduce airway inflammation by inhibiting proinflammatory cytokines, particularly IL-6 (Khdair et al., 2021).

Furthermore, a study by Kusnanik et al. (2024) on the acute effects of curcumin after high-intensity physical exercise showed that administration of 400 mg of curcumin effectively reduced serum CRP levels ($p<0.05$), but had no significant effect on IL-6 ($p>0.05$). The lack of a decrease in IL-6 is thought to be due to IL-6 levels having increased rapidly and peaked after high-intensity physical activity before the curcumin intervention. This finding suggests that curcumin's effectiveness on IL-6 may be influenced by the timing of administration and the inflammatory mechanisms involved (Kusnanik et al., 2024).

On the other hand, several studies have shown that the effectiveness of turmeric/curcumin on CRP and IL-6 is inconsistent across disease states. A study by Emami et al. (2022) in patients with chronic kidney disease (CKD) and hemodialysis showed that curcumin supplementation had no significant effect on IL-6 levels ($p=0.221$) or hs-CRP ($p=0.093$). This is likely due to the severe chronic inflammatory conditions in CKD patients, which results in a suboptimal response to curcumin supplementation (Emami et al., 2022).

Similar findings were also found in a study by Supriyadi et al. (2023), where curcumin/turmeric supplementation in CKD patients only showed a significant reduction in CRP levels, but no significant effect on IL-6 ($p=0.22$). This suggests that CRP tends to be more responsive to curcumin therapy than IL-6, given that IL-6 regulation is influenced by various, more complex inflammatory pathways (Supriyadi et al., 2023).

Furthermore, a study by Liu et al. (2026) in patients with rheumatoid arthritis (RA) and systemic lupus erythematosus (SLE) showed that neither curcumin nor *Curcuma longa* extract supplementation had a significant effect on CRP levels. This study also did not report a specific effect on IL-6. The high heterogeneity between studies suggests that differences in dosage, duration of intervention, disease severity, and type of curcumin preparation may influence the effectiveness of therapy (Liu et al., 2026).

Studies by Yuliana (2021), Mochtar et al. (2024), and Wardani et al. (2022) also showed that curcumin has an anti-inflammatory mechanism through downregulation of proinflammatory cytokines, including IL-6. However, most of these studies have not directly measured the effectiveness of curcumin on CRP and IL-6 levels, so direct clinical evidence is still limited (Yuliana, 2021; Mochtar et al., 2024; Wardani et al., 2022).

Based on the various research results reviewed, it is understood that turmeric/curcumin has potential as an adjunct therapy in reducing inflammatory biomarkers, especially CRP and IL-6. However, this effectiveness still shows inconsistent results in certain disease conditions. Differences in study results are influenced by the curcumin dose, duration of administration, patient clinical condition, sample size, and curcumin bioavailability. In general, turmeric/curcumin shows more consistent results in reducing CRP than IL-6. Therefore, further clinical studies with more robust designs and larger sample sizes are needed to more specifically confirm the effectiveness of turmeric/curcumin on CRP and IL-6. Several studies have shown that curcumin doses of around 400–500 mg/day begin to produce anti-inflammatory effects on inflammatory biomarkers, particularly CRP, although effectiveness against IL-6 remains variable. Therefore, evaluating the relationship between dose and the magnitude of inflammatory biomarker reduction is crucial to identify the optimal dose range for producing clinically meaningful therapeutic effects (Kusnanik et al., 2024; Naghsh et al., 2023; Yaikwawong et al., 2026).

Conclusion

Turmeric (Curcuma longa) and its active compound, curcumin, have potential as natural anti-inflammatory agents that can help reduce inflammatory biomarkers, particularly C-Reactive Protein (CRP) and Interleukin-6 (IL-6), by inhibiting proinflammatory cytokines and regulating inflammatory pathways in the body. Based on the results of various reviewed studies, turmeric/curcumin supplementation shows varying effectiveness on CRP and IL-6 levels. Most studies indicate that curcumin is effective in reducing CRP levels, while its effectiveness on IL-6 remains inconsistent across specific clinical conditions. Factors such as dose, duration of administration, disease condition, and subject characteristics influence these effectiveness results. Based on the reviewed literature, it can be concluded that turmeric/curcumin has potential as an adjunctive therapy in reducing inflammation by reducing inflammatory biomarkers, particularly CRP and, in some studies, also IL-6. However, further clinical studies with more robust designs are needed to confirm its effectiveness and consistent benefits across various patient populations.

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