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THE EFFECT OF GREEN TEA CONSUMPTION ON BLOOD PRESSURE: EVIDENCE BASED CASE REPORT

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Abstract

Background: Cardiovascular disease (CVD) remains the leading cause of mortality worldwide. Hypertension is one of the most prevalent forms of CVD. Although systemic therapies have substantially advanced, adjunctive interventions are still needed to improve clinical outcomes. Green tea, owing to its antioxidant and anti-inflammatory properties, has been extensively investigated as a potential adjunctive therapy in the management of CVD. **Objective:** To evaluate the effect of green tea consumption on blood pressure. **Methods:** A systematic literature search was conducted using the PubMed, Cochrane Library, and Scopus databases, focusing on publications from 2020 to 2025. Eligible studies included randomized controlled trials (RCTs), systematic reviews, and meta-analyses involving adult patients with cardiovascular disease who consumed green tea. Study quality was assessed using the criteria of the Oxford Centre for Evidence-Based Medicine (CEBM). **Results:** Three studies, consisting of one RCT and dua systematic review with meta-analysis of RCTs, met the inclusion criteria. The systematic review and meta-analysis of RCTs by Rezaei et al and Renfan et al. reported a significant effect on the improvement of both systolic and diastolic blood pressure. In contrast, the RCT by Pathania et al. demonstrated improvement only in systolic blood pressure, with no comparable effect on diastolic pressure in the intervention group. These studies reported inconsistent findings, with much of the available evidence derived from observational data lacking clearly defined dosages. Major limitations included small sample sizes, heterogeneous populations, and inconsistent outcome reporting **Conclusion:** Green tea consumption may reduce both systolic and diastolic blood pressure. However, stronger evidence from large-scale clinical trials is required to confirm its efficacy and support clinical implementation.

Keywords: blood pressure, cardiovascular disesase, endothel, green t

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Introduction

Cardiovascular disease (CVD) remains a major global health problem. It ranks as the leading cause of morbidity, mortality, and disability worldwide. According to data from the Global Burden of Disease 2023, the incidence of CVD has increased by approximately 1.4-fold from 1990 to 2023.[1] It is estimated that there are 20.5 million deaths attributable to CVD, accounting for approximately one-third of all global deaths.[1,2] In Indonesia, CVD-related mortality reaches 651,481 deaths annually, comprising 331,349 deaths due to stroke, 245,343 due to coronary heart disease, and 50,620 due to hypertensive heart disease. Data from the 2018 National Basic Health Research (Riskesdas) indicate an increase in hypertension prevalence from 25.8% to 34.1%, while the prevalence of coronary heart disease has not shown a significant decline.[3] The risk factors for hypertension are multifactorial, including age, sex, genetic predisposition, dietary patterns, and lifestyle. The management of hypertension has advanced considerably, encompassing systemic therapeutic approaches.[4] However, additional adjunctive therapies are required to support the management and prevention of hypertension. Such strategies may help reduce the healthcare burden associated with hypertension and CVD, as well as improve clinical outcomes in patients.[2,4]

Lifestyle modification has been proven effective as one of the strategies to support the management of hypertension.[5] Green tea, derived from the plant *Camellia sinensis*, contains flavonoid compounds, including epicatechins, epicathecin gallate, epigallocatechin and epigallocatechin gallate. The type of green tea that has the most dominant effect on hypertension is epigallocathecins. The mechanism of action of green tea, in addition to its antioxidant properties, also confers cardiovascular benefits.[6] In vitro studies have demonstrated that catechins exert cardioprotective effects, including inhibition of oxidative processes, vascular inflammation, and thrombogenesis, as well as improvement of endothelial dysfunction. Animal studies have further shown that green tea influences nitric oxide production and promotes vasodilation, thereby improving endothelial function and reducing blood pressure.[3,6]

However, findings from several studies investigating the effects of green tea on CVD remain inconclusive. A systematic review and meta-analysis of randomized controlled trials (RCTs) reported that green tea significantly reduced both systolic and diastolic blood pressure (MD: −2.99, 95%

CI: −3.77 to −2.22; Z = 7.57; P < .00001; I^2 = 0%; MD: −0.95, 95% CI: −1.62 to −0.27; Z = 2.75; P = .006; I^2 = 0%).[6] Furthermore, studies by Feng et al.[7] and Peng et al.[8] reported that green tea consumption was associated with reductions in blood pressure, whereas a study by Li Daxiang et al.[9] found that the effects of tea consumption on blood pressure control remained inconclusive. Therefore, this Evidence-Based Case Report (EBCR) aims to evaluate the role of green tea in cardiovascular disease.

Case Ilustrasi

A 47-year-old woman presented to the nutrition outpatient clinic with a history of hypertension for the past five years. She is employed as an office worker in a private company, with predominantly sedentary activities, spending most of her time seated in front of a computer. Her blood pressure readings are consistently around 150/90 mmHg. Laboratory investigations revealed results within normal limits. The patient reported having read an online article suggesting that regular consumption of green tea may help improve blood pressure. She subsequently inquired with the physician nutrition specialist regarding whether green tea truly has a role in the management of blood pressure. The patient was already receiving routine hypertension therapy from the doctor.

Methods

Clinical Question

The clinical question was formulated based on the Population, Intervention, Comparison, and Outcome (PICO) framework. The clinical question is: *"Does green tea consumption provide benefits in patients with cardiovascular disease?"*

P (Population): Patients with hypertension

I (Intervention): Green tea consumption

C (Comparison): No consumption of green tea

O (Outcome): Improvement in blood pressure control

Research strategy

The literature search was conducted using a combination of Medical Subject Headings (MeSH) terms and Title/Abstract keywords across three major databases: PubMed, the Cochrane Library, and Scopus. The search was performed on April 10, 2026. The keywords used in the search strategy were

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adapted to the PICO components and included the following terms: “green tea,” “*Camellia sinensis*,” “catechins,” “cardiovascular disease,” “heart disease,” “coronary artery disease,” and “blood pressure.” The detailed search strategy is presented in Table 1. Identified articles were screened for duplicates and assessed for relevance to the present case based on the PICO framework. Articles that met the clinical question criteria were included for critical appraisal using tools from the Centre for Evidence-Based Medicine (CEBM). Duplicate removal was performed using Covidence. The articles were further evaluated for eligibility based on PICO and predefined inclusion criteria (Figure 1), resulting in the selection of three articles. The study characteristics of the included articles are summarized in Table 2. The levels of evidence are presented in Table 3, and all included articles were deemed relevant in addressing the clinical question (Table 4).

Eligibility Criteria

The inclusion criteria comprised subjects aged over 18 years with cardiovascular disease, regular consumption of green tea, and studies with designs including systematic reviews/meta-analyses, randomized controlled trials (RCTs), and clinical trials. Only articles published within the last 10 years and written in English were included. The exclusion criteria comprised studies not conducted in humans, articles with unavailable full text, and publications in languages other than English.

Tables and Figures

Table 1. Literature search strategy

Database	Search strategy	Hits	Eligible
Pubmed **A**	# 1 (((green tea[MeSH Terms]) OR (green tea[Title/Abstract])) OR (Camellia sinensis[MeSH Terms])) OR (Camellia sinensis[Title/Abstract]) #2 (((((hypertension[MeSH Terms]) OR (hypertension[Title/Abstract])) OR (blood pressure[MeSH Terms])) OR (blood pressure[Title/Abstract])) OR (high blood pressure[MeSH Terms])) OR (high blood pressure[Title/Abstract]) #3 (((cardiovascular disease[MeSH Terms]) OR (cardiovascular disease[Title/Abstract])) OR (Heart Disease[MeSH Terms])) OR (Heart Disease[Title/Abstract]) #1 AND #2 AND #3	5	2
Cochrane Library	#1 MeSH descriptor: [Tea] explode all trees #2 ("green tea"):ti,ab,kw OR (Green teas):ti,ab,kw	25	1

	#3 MeSH descriptor: [Blood Pressure] explode all trees #4 ("blood pressure"):ti,ab,kw OR ("systolic pressure"):ti,ab,kw OR (diastolic pressure):ti,ab,kw #5 MeSH descriptor: [Hypertension] explode all trees #6 ("hypertension"):ti,ab,kw OR (High blood pressure):ti,ab,kw #7 #1 OR #2 #8 #3 OR #4 #9 #5 OR #6 #10 #7 AND #8 AND #9 #11 #10 in Trials		
Scopus	TITLE-ABS-KEY (“green “tea OR “camellia “sinensis) AND TITLE-ABS-KEY (“blood pressure” OR “systolic blood pressure” OR “diastolic blood pressure”) AND TITLE-ABS-KEY (“hypertension OR “high “blood pressure” OR “cardiovascular disease”)	23	2

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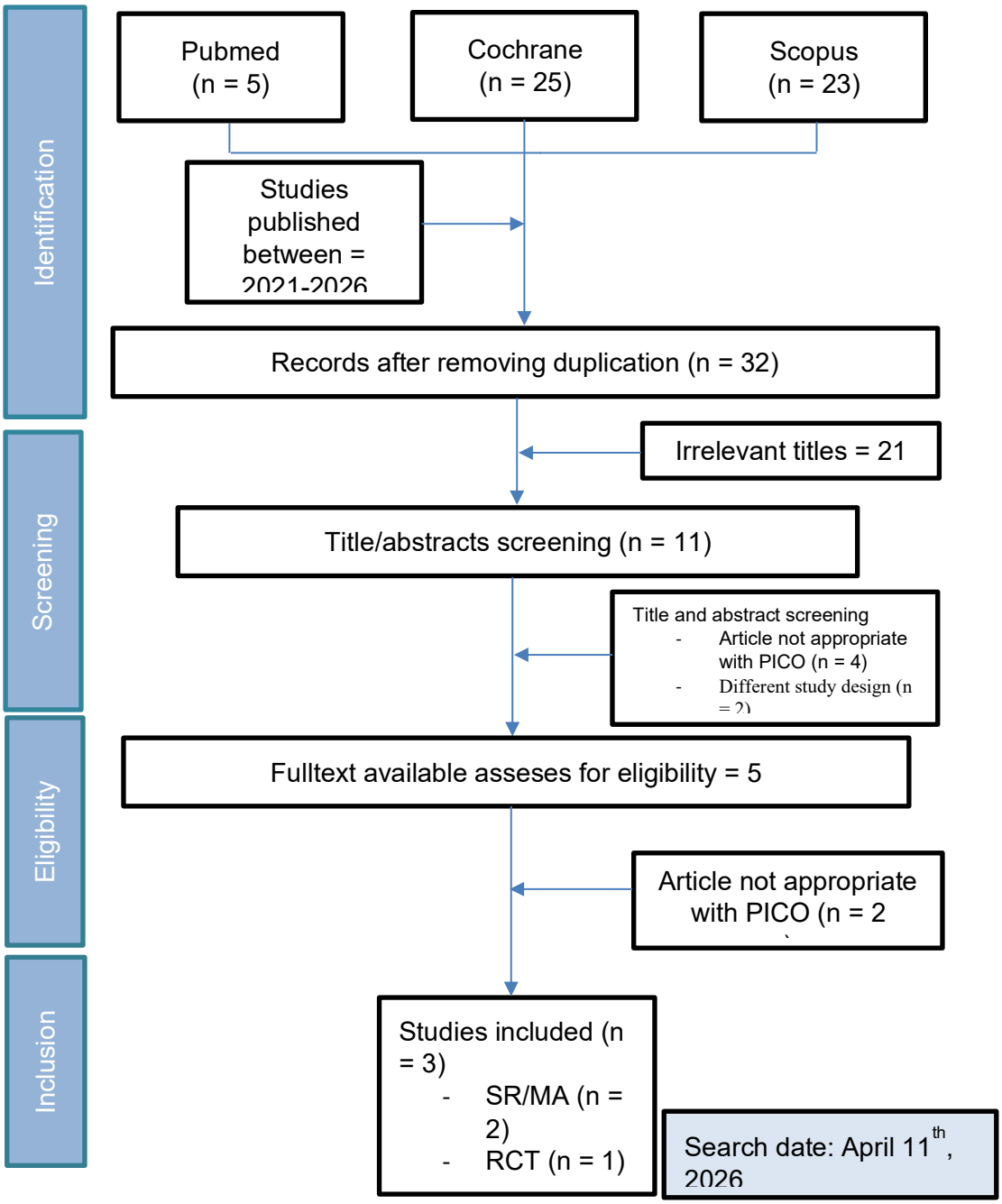

Figure1. PRISMA flow chart

Result

The flow diagram of the literature search is illustrated in Figure 1. 43 articles were initially identified from the 3 databases. After removing 32 duplicate articles, 11 articles were screened for eligibility based on abstract and full text. There were 1 RCT articles already included in a SR-MA article thus they were excluded. Finally, 3 full text articles of 2 SR-MA and 1 RCT article were selected for the critical appraisal. Characteristic of selected articles in presented in table 2. The selected articles were critically appraised to review the validity, importance and applicability. Summary of critical appraisal result of each article is presented in table 3, 4 and 5.

Table 2. Characteristics of included studies

Author (year)	Study design	N	Population	Intervention	Comparation	Outcome
Rezaei et al.[10](2025)	Systematic review and meta-analysis	36 RCT: 2038	People with elevated baseline blood pressure	Green tea (dose varies)	Placebo	Blood pressure
Pathania et al.[11] (2024)	Double-blind, randomized controlled trial	60	People with hypertension	Green tea (one cup/day)	Placebo	Blood pressure
Renfan et al.[12] (2020)	Systematic review and meta-analysis	24 RCT:1697	People with elevated baseline blood	Green tea (dose varies)	Placebo	Blood pressure

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Table 3. internal validity of included RCT study

Author (year)	Randomised treatment	Similar characteristics betwen groups	Equally treatment on both groups	All patients accounted	Double-blinded objective measurement
Pathania et al.[11] (2024)	+	+	-	+	+

Table 4. internal validity of included SR-MA studies

Author (year)	PICO question addressed clearly	No relevant studies missed	Eligibility criteria appropiate	Included studies valid	Similar results from study to study
Rezaei et al.[10](2025)	+	+	+	+	-
Renfan et al.[12](2020)	+	+	+	+	-

Table 5. Importance and applicability of included studies

Author (year)	Importance			Applicability		Level of evidence
	Large treatment effect, not coincidence	Precised estimated treatment effect, slinically significant	Patients similarities to my patients that results can apply	Treatment feasibility in my setting	Potential benefits will outweight the harm of treatment for my patients	
Rezaei et al.[10] (2025)	+	+	+	+	+	1
Pathania et al.[11] (2024)	+	-	+	+	+	2
Renfan et al.[12] (2020)	+	+	+	+	+	1

Discussion

A systematic review and meta-analysis by Rezaei et al,[10] included 36 studies comprising a total of 2,038 patients with hypertension. The pooled data indicated that the mean age of participants ranged from 22.6 to 81.8 years. The dosage of green tea supplementation varied between 99 mg/day (green tea extract) and 10 g/day (green tea leaves), while the duration of intervention ranged from 4 to 48 weeks across the included studies. Among these studies, one had an intervention duration of 12 months, one lasted six months, one lasted four months, 12 studies had a duration of three months, and the remaining studies were conducted for less than three months. A total of 36 randomized controlled trials (RCTs) reported that green tea reduced systolic blood pressure (SBP) (WMD: −1.08 mmHg; 95% CI: −1.98 to −0.18; I^2 = 85.0%) and diastolic blood pressure (DBP) (WMD: −1.09 mmHg; 95% CI: −1.67 to −0.50; I^2 = 74.0%). Stronger effects were observed among participants with higher baseline blood pressure (SBP ≥120 mmHg), those consuming <500 mg/day of green tea, studies with a duration ≤8 weeks, Asian populations, and female participants.[10]

Subgroup analyses demonstrated that beneficial effects of green tea on SBP were observed in studies involving participants with baseline SBP ≥120 mmHg, female participants, individuals younger than 45 years, those with a BMI <30 kg/m², studies with a duration ≤8 weeks, participants consuming <500 mg/day of green tea, studies using brewed green tea as the intervention, and studies conducted in Asian countries. Furthermore, improvements in DBP were observed across all subgroups, except in studies where baseline DBP was <80 mmHg, trials with a duration >8 weeks, studies conducted in healthy individuals, and studies involving only male participants. These subgroup differences may be attributable to heterogeneity among studies, including variations in the form and dosage of green tea supplementation. Although the findings varied, most studies demonstrated a positive effect of green tea supplementation in reducing both systolic and diastolic blood pressure.[9,10] However, the evidence remains inconclusive regarding the optimal dosage of green tea extract, which may introduce potential bias in the results. Additionally, the wide variation in intervention duration and differences in study populations—none of which specifically represent the Indonesian

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population—highlight the need for further research with broader and more representative populations.

A double-blind randomized controlled trial (RCT) conducted by Pathania et al.[11] included patients who had been diagnosed with hypertension for at least six months. Green tea supplementation was administered at a dose of one tea bag. The study subjects were divided into two groups: Group A (intervention group) and Group B (control group), each group consists of 30 participants. Group A received the intervention in the form of one cup of green tea daily before breakfast, whereas Group B did not consume green tea. A total of 30 participants were included in Group A, all of whom received the same dosage over a 15-day period. At baseline, the mean systolic blood pressure (SBP) in Group A and Group B was 136.17 ± 7.273 mmHg and 136.33 ± 8.899 mmHg, respectively, while the mean diastolic blood pressure (DBP) was 90.67 ± 5.208 mmHg in Group A and 90.00 ± 4.997 mmHg in Group B. There were no statistically significant differences between the two groups at baseline in terms of systolic ($p = 0.937$) and diastolic blood pressure ($p = 0.937$). After 15 days of intervention, a significant reduction in mean systolic blood pressure was observed in Group A compared with Group B ($p = 0.003$). However, no significant difference was found between the two groups in terms of diastolic blood pressure after 15 days ($p = 0.706$).[11]

A systematic review and meta-analysis by Renfan et al.[12] included 24 studies comprising a total of 1,697 patients with hypertension. The pooled data indicated that the mean age of participants ranged from 22 to 74 years. The dosage of green tea supplementation varied between 208–1344 mg/day (green tea extract), categorized into higher median doses (>615 mg/day) and lower median doses (<615 mg/day). The duration of intervention ranged from 3 to 16 weeks and was categorized into short-term (<16 weeks) and long-term (>16 weeks) interventions. The study reported that green tea significantly reduced systolic blood pressure (SBP; MD: −1.17 mmHg; 95% CI: −2.18 to −0.16 mmHg; P = 0.02) and diastolic blood pressure (DBP; MD: −1.24 mmHg; 95% CI: −2.07 to −0.40 mmHg; P = 0.004). However, several limitations were identified in this systematic review and meta-analysis. The optimal dosage of green tea for improving blood pressure remains inconclusive. Variability in study characteristics, including a wide range of catechin doses (208–1344 mg/day), complicates the assessment of a true dose–response relationship between tea consumption and blood pressure reduction. In terms of safety, no serious adverse effects were reported in the included trials.

However, animal studies have shown that intraperitoneal injection of green tea catechins may increase plasma alanine transaminase levels and contribute to dietary oxalate load, suggesting caution in certain populations, such as patients with oxalate kidney stones. Furthermore, substantial heterogeneity was noted across studies in terms of trial duration, participant characteristics, catechin dosage, ethnic groups, types of green tea interventions, and baseline health status. Most of the included studies were conducted over relatively short durations (3–16 weeks), highlighting the need for further research to evaluate the long-term effects of green tea consumption on blood pressure.[12]

Catechins are polyphenolic compounds abundantly found in tea. They exhibit antioxidant and cardioprotective properties, including the reduction of atherosclerosis, lowering of systemic blood pressure, and improvement of flow-mediated dilation (FMD).[13,14] The mechanisms by which catechins reduce blood pressure involve multiple pathways. Catechins enhance nitric oxide (NO) bioavailability, thereby promoting vasodilation of blood vessels. In addition, their antioxidant properties enable them to neutralize reactive oxygen species (ROS), reduce inflammatory mediators, and attenuate vascular inflammation. Another proposed mechanism is the potential of catechins to reduce levels of angiotensin II and endothelin, leading to improved endothelial function and a subsequent reduction in systemic blood pressure.[6,15] In Indonesia, catechins can be obtained from various sources, including green tea, black tea, and oolong tea. Catechins represent the major polyphenolic constituents of tea. The concentration of catechins is higher in younger tea leaves. Due to their high water solubility, catechins are widely utilized in the form of tea extracts to facilitate consumption. In addition to tea leaves, gambier leaves (*Uncaria gambir*) are also a significant natural source of catechin compounds.[15]

A randomized trial (RT) conducted by Peng et al.[16] reported that green tea consumption significantly reduced systolic blood pressure (SBP) by −1.98 mmHg (95% CI: −2.94 to −1.01 mmHg; $P < 0.001$). Compared with the control group, green tea also demonstrated a significant reduction in diastolic blood pressure (DBP) in the intervention group (−1.92 mmHg; 95% CI: −3.17 to −0.68 mmHg; $P = 0.002$). Pre-specified subgroup analyses were performed

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to explore potential sources of heterogeneity among the included studies, including baseline blood pressure status, study design, type of intervention, duration, and dose of green tea polyphenols.[16] However, a study by Wang et al.[17] reported that green tea supplementation did not produce a significant effect on blood pressure in overweight and obese individuals. The duration and dosage of supplementation may influence therapeutic outcomes. Some studies have demonstrated statistically significant effects of green tea; however, these effects may not be clinically significant.[11] Therefore, longer follow-up observations over several months would be ideal to evaluate changes in blood pressure and to standardize the dosage and duration of intervention.[11] The optimal dose of green tea for lowering blood pressure remains uncertain. Several studies have shown that consuming one to two cups of green tea per day can have a positive effect on lowering blood pressure. However, the magnitude of this effect is influenced by individual characteristics, including the degree of hypertension, adherence to antihypertensive therapy, and kidney function. In individuals with impaired kidney function, especially those with hyperuricemia due to chronic hypertension, green tea consumption requires careful consideration because the metabolism and excretion of its bioactive compounds may be altered. Therefore, the efficacy of green tea consumption for lowering blood pressure requires consideration of the patient's clinical factors.

Conclusions and Recommendation

Green tea consumption shows potential as an adjunct therapy to help lower systolic and diastolic blood pressure in hypertensive patients. However, interpretation of these benefits requires caution, given that the included studies used highly variable formulations (brews and extracts), doses, and duration of supplementation, with most interventions lasting less than 8 weeks. Therefore, the currently available evidence is insufficient to recommend a specific dose of green tea consumption in clinical practice or as a basis for adjusting the dosage of antihypertensive medications. Although clinical trial results indicate a statistically significant reduction in blood pressure, further studies with more consistent designs, larger sample sizes, and longer follow-up durations are needed to determine the optimal formulation, dose, frequency, and duration of green tea consumption, and to evaluate its clinical significance on long-term blood pressure control and cardiovascular outcomes.

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Competing Interest

The authors declare that they have no conflict of interest.

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