The Effect of Giving Avocado (*Persea Americana)* Leaf Decoction on Blood Pressure in Patients with Hypertension: A Review Article

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Abstract. Various kinds of herbal plants are frequently used by the Indonesian community for treating hypertension, such as avocado (*Persea americana*) leaves. It is believed that the plant has an antihypertensive effect. This study, therefore, aims to review the effect of giving avocado leaf decoction on blood pressure levels in patients with hypertension. The research employed *a review article* based on selected research articles published in journals indexed by the Sinta 1–4 Indonesian journal indexation. Google Scholar, Garuda, and One Search databases were searched for articles using the terms "avocado leaf decoction," "blood pressure," and "hypertension." As a result, only full-text articles were included in the review. Based on the five papers reviewed in this study, the findings revealed that giving avocado leaf decoction significantly lowered the respondents' blood pressure levels, with a p-value of <0.05. Thus, administering avocado leaves boiled in water to patients with hypertension reduce their blood pressure levels.

Keywords: Avocado leaves · blood pressure · hypertension

1 Introduction

Hypertension is a cardiovascular disease frequently experienced by the community. It has been reported that in 2015, around 1.13 billion people worldwide suffered from hypertension. The number continues to increase yearly; it is estimated that by 2025, there will be 1.5 billion people affected by hypertension, and 9.4 million people will die from hypertension and its complications [1]. Hypertension can be defined as an increase in systolic and diastolic blood pressure exceeding normal limits. An individual can be said to have hypertension if they have a systolic blood pressure $>$ 140 mmHg and a diastolic blood pressure above 90 mmHg calculated on two measurements within five minutes with sufficient rest conditions [2]. According to the Institute for Health Metrics and Evaluation, in a total of 1.7 million deaths in Indonesia, hypertension contributes to 23.7%.

Patients with hypertension can be treated with pharmacological therapy by antihypertensives drugs, e.g., diuretics, alpha-blockers, beta-blockers, vasodilators, calcium

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antagonists, ACE-inhibitors, or angiotensin-II-blockers [4]. Non-pharmacological management can also be conducted by adjusting lifestyle, including regular exercise, diet, and weight reduction for obese patients. Likewise, herbal therapy [5] by consuming plants believed to have antihypertension effects can be performed [6].

In this case, avocado (*Persea americana*) leaves have been a traditional or complementary medicine since ancient times to replace antihypertensive drugs [7]. Empirically, the leaves are believed as diuretics, which can increase the amount of urine released during urination so that they can lower blood pressure. The chemical composition of the avocado leaves responsible for these effects includes flavonoids [8] and quercetin compounds [9]. Flavonoids play a role in improving blood circulation and preventing blockages in blood vessels [10]. Moreover, it has fewer side effects and more than one pharmacological effect, making it suitable for treating metabolic and degenerative diseases [11]. Specifically, a decoction of avocado leaves has a slightly bitter taste but is not too thick, so it can be removed by drinking water [12].

Several studies have reported the effectiveness of avocado leaves in treating hypertension [13]. Nevertheless, the research reviewed on using avocado leaves in Indonesia for treating hypertensive patients remains limited. Hence, this study aims to review the effects of giving avocado leaf decoction on the blood pressure of individuals with hypertension based on studies performed in Indonesia.

2 Method

This review article was conducted by sequential activities, starting from articles searching by keywords of avocado leaves, blood pressure, and hypertension in three databases, including Garuda, *Google Scholar,* and *One Search.* Articles' selection/identification was based on the applied inclusion and exclusion criteria, and the selected articles were then reviewed. Inclusion criteria used were full articles written in Indonesia or English and published in a nationally indexed journal called Sinta 1–4 or an internationally indexed journal, Scopus quartile 1–4 from 2011 to 2022; the study employed a quasi-experiment method; the research subjects were patients with hypertension. According to the criteria, five articles were included in this review (Fig. 1).

3 Results and Discussion

Characteristics of the respondents in the selected studies are presented in Table 1. Of the five selected studies, the participants in the three studies were elderly (Awaluddin & Gusri, 2018; Priyanto & Masithoh, 2018; Ishak & Nurdin, 2022); the rest were adults (Setiawan, 2018; Nomiyah *et al*., 2019). The data, in accordance with the 2018 Indonesian basic health research data, reported that the hypertension incidence rate is higher in the elderly group. In addition, the respondents' education levels and occupations varied from no formal education background to college or academy and housewife to worker, respectively. Related to that, someone with a lower level of education is 2.9 times more at risk of developing hypertension than those with a higher level of education.

Table 2 reveals the research methods used in the selected studies. Two articles employed pre-experimental research (Awaluddin & Gusri, 2018; Setiawan, 2018),

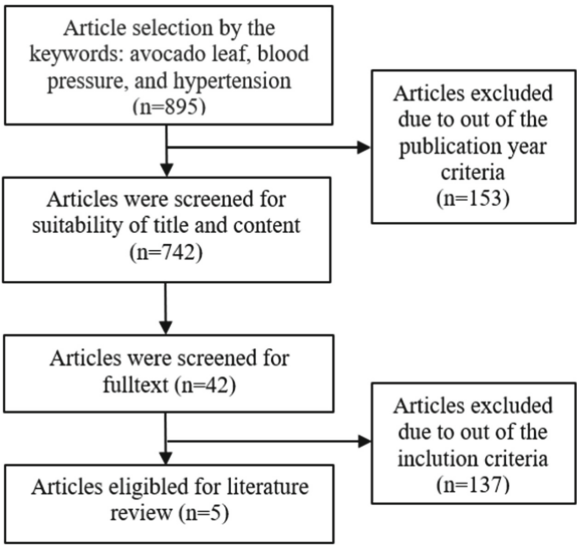

Fig. 1. Article selection process

and three articles used a quasi-experimental (Priyanto & Masithoh, 2018; Naomiyah *et al*., 2019; Ishak & Nurdin, 2022). Here, pre-experimental research is an experiment that uses one group and does not have a control group [14]. Meanwhile, quasi-experimental research is an experiment that places the smallest unit in the experiment in the experimental group, and the control group is not done randomly [15].

In the sampling technique indicator, four articles utilized purposive sampling techniques (Awaluddin & Gusri, 2018; Priyanto & Masithoh, 2018; Setiawan, 2018; Ishak & Nurdin, 2022), and one article used a probability sampling technique with random sampling (Naomiyah *et al*., 2019). The purposive sampling technique takes samples using specific considerations in accordance with the desired criteria, so the number of samples to be studied can be determined. On the other side, probability sampling provides equal opportunities for each element (member) of the population to be selected as a sample member. Moreover, simple random sampling is part of probability sampling, a random sampling of the population without regard to population strata [16].

In the intervention indicator, three articles mentioned the intervention of being given avocado leaf decoction along with its composition and method of preparation, and three articles mentioned different doses. The duration of the intervention was varied among the selected studies, including three days (Setiawan, 2018), seven days (Priyanto & Masithoh, 2018; Naomiyah *et al*., 2019; Ishak & Nurdin, 2022), and 30 days (Awaluddin & Gusri, 2018).

In terms of a decrease in blood pressure after giving avocado leaves, all the selected studies reported significant reductions (Table 3). The decrease in blood pressure is probably because avocado leaves contain flavonoids such as quercetin, which has good antioxidant activity and antihypertensive effects. The quercetin-mediated antihypertensive effect has been studied by Elbarbry *et al.* (2020). They concluded that the

Table 1. Respondents' characteristics of the selected studies

Authors	Respondents	Gender		Age (year)		Education background		Job/daily activity	
		Control	Treatment	Control	Treatment	Control	Treatment	Control	Treatment
Awaluddin & Gusri, 2018	Elderly with hypertension in the Simpang Tiga Pekan Baru health center	n/a	M: 9 (45) F: 11 (55)	n/a	< 60: (100)	n/a	E: 12 (60) JHS: 5 (25) HS: 2 (10) U/A: 1 (5)	n/a	Farmers: 2 (10) Housewife: 8 (40) Trading: 10 (50)
Priyanto & Masithoh, 2018	Elderly with mild-hypertension and taking antihypertensive drugs in the Donorojo village	M: 25 (73.5) F: 9 (26.5)	M: 26 (76.5) F: 8 (23.5)	60–70: 24 (70.6) 71–80:10 (29.4)	60–70: 22 (64.7) 71–80: 12 (35.3)	NS: 12 (35.3) E: 19 (55.9) JHS: 2 (5.9) HS: 1 (2,9)	NS: 15 (44.1) E: 15 (44.1) HS: 4 (11.8)	Farmers: 23 (67.6) Housewife: 4 (11.8) Self-employed: 6 (17.6) Labor: 1 (2.9)	Farmers: 24 (70.6) Housewife: 8 (23.5) Labor: 1 (2.9) Civil servants: 1 (2.9)
Setiawan, 2018	Hypertension individuals aged 36–45 years in Teritip village, East Balikpapan	n/a	M: 9 (45) F: 11 (55)	n/a	36–38:5 (25) 39–41:9 (45) 42–45:6 (30)	n/a	NS: 3 (15) E: 8 (40) JHS: 3 (15) HS: 4 (20) U/A: 2 (10)	n/a	n/a
Naomiyah *et al.*, 2019	Adults aged 26–45 years at the Siwalankerto public health center Surabaya	M: 3 (20) F: 12 (80)	M: 4 (26.7) F: 11 (73.3)	26–35:1 (6.7) 35–45:14 (93.3)	26–35:5 (33.3) 35–45:10 (66.7)	E: 2 (13.3) JHS: 2 (13.3) HS: 10 (66.7) U/A: 1 (6.7)	E: 1 (6.7) JHS: 4 (26.7) HS: 7 (46.7) U/A: 3 (20)	Self-employed: 6 (40) Housewife: 7 (46.7) Unemployed: 2 (13.3)	Self-employed: 6 (42.9) Housewife: 9 (57.1)

(*continued*)

Table 1. (*continued*)

Authors	Respondents	Gender		Age (year)		Education background		Job/daily activity	
		Control	Treatment	Control	Treatment	Control	Treatment	Control	Treatment
Ishak & Nurdin, 2022	Elderly with hypertension in the Tilango health center, Gorontalo	F: 28 (100)	F: 28 (100)	60:28 (100)	60:28 (100)	n/a	n/a	n/a	n/a

All data were represented as total numbers and percentages (n (%)). *n/a, not available; M, male; F, female; NS, no formal school background; E, elementary; JHS, junior high school; HS, high school; u/A, university/academy

Table 2. The research method used in the selected studies on the effect of avocado (*Persea Americana*) leaf decoction on the blood pressure of individuals with hypertension

Authors	Research design	Sampling technique	Intervention	Length of treatment (days)
Awaluddin & Gusri, 2018	Pre-experimental, one group pretest-posttest	Purposive sampling	150 mL of avocado leaf decoction obtained from 3–5 boiled avocado leaves in 175 mL water	30
Priyanto & Masithoh, 2018	Quasi-experimental, pretest-posttest with the control group	Purposive sampling	200 mL of avocado leaf decoction obtained from five boiled avocado leaves in 200cc water	7
Setiawan, 2018	Pre-experimental, one group pretest-posttest	Purposive sampling	n/a	3
Naomiyah *et al*., 2019	Quasi-experimental, one group pretest-posttest with control	Probability sampling with simple random sampling	100 cc avocado leaf decoction 2x/day (morning & evening) obtained from 5 pieces (25 g) avocado leaves in 3 cups water	7
Isahak & Nurdin, 2022	Two groups of quasi-experimental pretest-posttest	Purposive sampling	n/a	7

effect is associated with the kidney's arachidonic acid (AA) metabolism. The administration of quercetin affects the kidneys' AA metabolism by inhibiting the activity of enzyme cytochrome CYP4A in renal cortical microsomes of the kidney, indicated by a decrease in the rate of AA metabolites formation, i.e., hydroxy eicosatetraenoic acids (20-HETE) and inhibition of the enzyme soluble epoxide hydrolase (sEH), demonstrating an antihypertensive effect [17].

Table 3. Blood pressure reduction reported in the selected studies on the effect of avocado (*Persea americana*) leaf decoction on blood pressure of individuals with hypertension

Authors	Average blood pressure (mmHg)					
	Before		After		The reduction	
	Systole	Diastole	Systole	Diastole	Systole	Diastole
Awaluddin & Gusri, 2018	163.0	85.60	154.80	80.55	8.2*	5.05**
Priyanto & Masithoh, 2018	T: 177.5	T: 98.5	T: 147.6	T: 83.2	T: 29.9**	T: 15 .3**
	C: 173.2	C: 100	C: 150.6	C: 88.8	C: 22.6**	C: 11.2**
Setiawan, 2018	150	93	140.5	85	9.5**	8**
Naomiyah *et al*., 2019	T: 153	T: 94.7	T: 123	T: 73.33	T: 30**	T: 21.37**
	C: 153.33	C: 87.33	C: 151.33	C: 82.60	C: 2	C: 4.73***
Ishak & Nurdin, 2022	T: 150 T: 95		T: 125 T: 82.5		T: 25** T: 12.5**	
	C: 150 T: 95		C: 150 T: 95		C: 0 C: 0	

p-value: *0.002, **0.000, ***0.025; T, treatment group; C, control group

4 Conclusion

Significant reductions in blood pressure in individuals with hypertension after consuming avocado leaf decoction have been reported in all selected papers in this review, both in the short and long duration of intervention. Consequently, the avocado leaf decoction can be used as an alternative medicine for patients with hypertension with low side effects.

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