

The Application of Boiled Celery Leaf (*Apium graveolens* L.) Preparation to Reduce Blood Pressure in Patients with Hypertension

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Abstract: Hypertension is a condition characterized by an increase in systolic blood pressure ≥ 140 mmHg and diastolic blood pressure ≥ 90 mmHg, which may lead to complications such as heart disease, stroke, and kidney disorders. One of the non-pharmacological interventions that can be used to help reduce blood pressure is the administration of celery leaf decoction. Celery contains active compounds such as phthalides and flavonoids that play a role in vasodilation mechanisms and help control blood pressure. This study aimed to describe the application of celery leaf decoction in reducing blood pressure among patients with hypertension. The research employed a descriptive method with a case study approach using observation and interview techniques. The study was conducted in the working area of Puskesmas Ulee Kareng, Banda Aceh. The research involved two subjects over a period of five days. The results showed that before the intervention, Subject I had a blood pressure of 144/93 mmHg, and after the administration of celery leaf decoction, it decreased to 129/82 mmHg. Meanwhile, Subject II had a blood pressure of 145/87 mmHg before the intervention, which decreased to 125/71 mmHg after the administration. It can be concluded that celery leaf decoction is effective in helping to reduce blood pressure in patients with hypertension. Celery leaf decoction can be considered an alternative non-pharmacological intervention for blood pressure management.

Keywords: Hypertension, Celery Leaf Decoction, Blood Pressure.

INTRODUCTION

Hypertension is a progressive cardiovascular disorder caused by various interrelated risk factors. It is characterized by a persistent elevation in arterial blood pressure. According to the Indonesian Ministry of Health, Directorate of Prevention and Control of Non-Communicable Diseases, hypertension is diagnosed when an individual's, systolic blood pressure exceeds 140 mmHg and/or the diastolic blood pressure exceeds 90 mmHg. Hypertension is one of the leading risk factors for severe health complications, including myocardial infarction, stroke, heart failure, and kidney

failure, which contribute significantly to morbidity and mortality worldwide (Yolanda et al., 2024).

According to the World Health Organization (WHO), approximately 22% of the world's population is affected by hypertension. Among those with hypertension, fewer than one in five individuals have their blood pressure adequately controlled. The highest prevalence of hypertension is found in the African Region (27%), while the South-East Asia Region ranks third, with a prevalence of 25% of the total population. Furthermore, it is estimated that approximately 80% of the annual increase in hypertension cases will occur in developing countries. The global number of

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hypertension cases which was estimated at 639 million. in 2000 is projected to increase to 1.15 billion by 2025 (WHO, 2019).

The prevalence of hypertension in Indonesia is 31.7%, indicating that nearly one in three adults aged 18 years and older has hypertension. Based on the 2018 Basic Health Research (Riskesdas), the prevalence of hypertension among individuals aged 18 years and above is 34.1%, with the highest prevalence reported in South Kalimantan (44.1%) and the lowest in Papua (22.2%). Hypertension is most prevalent among individuals aged 55–64 years (55.2%), followed by those aged 45–54 years (45.3%) and 31–44 years (31.6%). Various factors, including genetic predisposition and lifestyle-related behaviors such as physical inactivity, excessive consumption of salty and high-fat foods, smoking, and alcohol consumption, contribute to the increasing prevalence of hypertension (Riskesdas, 2018).

According to data from the Banda Aceh City Health Office, there were 11,836 cases (100%) of hypertension, comprising 4,352 cases (37%) among males and 7,484 cases (63%) among females. In 2020, the total number of hypertension cases decreased to 11,486, consisting of 4,716 cases (41%) among males and 6,770 cases (59%) among females (Banda Aceh City Health Office, 2020). Meanwhile, in Aceh Province, the prevalence of hypertension reached 276,862 cases (32%). In 2020, the number of hypertension cases increased to 329,985 (88.4%) (Dinas Kesehatan Aceh, 2021).

Hypertension can be managed through two main approaches: pharmacological and non-pharmacological interventions. Pharmacological management of hypertension includes several classes of antihypertensive medications, such as diuretics, beta-blockers, angiotensin-converting enzyme (ACE) inhibitors, angiotensin II receptor blockers (ARBs), and calcium channel blockers (CCBs). Commonly prescribed antihypertensive medications include chlorothiazide, chlorthalidone, hydrochlorothiazide (HCT), indapamide, metolazone, amiloride, nifedipine, diltiazem, verapamil, amlodipine, felodipine, and nicardipine (Lukito et al., 2022).

In addition to pharmacological management, non-pharmacological interventions have become increasingly popular because they are relatively easy to implement, cost-effective, and associated with minimal adverse effects. Non-pharmacological approaches to hypertension management include adopting a low-sodium diet, engaging in regular physical activity, reducing alcohol consumption, quitting smoking, and using complementary and alternative therapies, including herbal medicine. Although herbal therapies generally require a longer duration of use to produce therapeutic effects, they are associated with relatively few side effects when used appropriately, making them a preferred option for many individuals with

hypertension. Several medicinal plants have been investigated and shown to have antihypertensive effects, including celery (*Apium graveolens* L.), sweet star fruit (*Averrhoa carambola* L.), cucumber (*Cucumis sativus* L.), roselle (*Hibiscus sabdariffa* L.), Java tea (*Orthosiphon aristatus*), dewa leaf (*Gynura pseudochina*), aloe vera (*Aloe vera*), tempuyung (*Sonchus arvensis* L.), sambiloto (*Andrographis paniculata*), and brotowali (*Tinospora crispa*) (Suryarinilsih et al., 2021).

One of the non-pharmacological approaches to controlling blood pressure is the consumption of celery (*Apium graveolens* L.) leaf boiled. Celery leaves contain several bioactive phytochemicals, particularly phthalides, which help relax the smooth muscles of arterial walls, improving blood flow. In addition, apigenin, another active compound found in celery, exhibits pharmacological effects similar to those of beta-blockers by reducing heart rate and decreasing the force of cardiac contraction. Consequently, cardiac output is reduced, leading to a decrease in blood pressure (Widyastuti, 2023).

The findings of the study demonstrated that celery (*Apium graveolens* L.) leaf boiled was effective in reducing blood pressure among patients with hypertension. A significant difference was observed in the participants' blood pressure before and after the intervention, indicating a reduction in blood pressure following the administration of celery leaf decoction for five consecutive days (Mairoel, 2024).

This finding is further supported by another study, which demonstrated that consuming 200 mL of celery (*Apium graveolens* L.) leaf boiled one day, divided into 100 mL in the morning and 100 mL in the evening, for five consecutive days, was effective in reducing blood pressure among patients with hypertension (Laora Windari et al., 2025).

Based on the aforementioned background and supporting evidence, the researcher is interested in conducting a study entitled "The Application of Boiled Celery (*Apium graveolens* L.) Leaf Water in Reducing Blood Pressure Among Patients with Hypertension in the Working Area of Puskesmas Ulee Kareng Banda Aceh."

METHOD

The case study employed a descriptive research design using a case study approach. This study was conducted to describe the application of boiled celery (*Apium graveolens* L.) leaf water in reducing blood pressure among patients with hypertension. This study involved two participants with hypertension in the working area of Puskesmas Ulee Kareng, Banda Aceh. Fresh celery leaves weighing **40 g** were washed thoroughly and boiled with **400 mL of water** until the volume was reduced to **200 mL**. The intervention consisted of administering **200 mL** of the boiled celery

leaf water daily, divided into **100 mL in the morning and 100 mL in the evening**, for five consecutive days. The study was conducted from **December 25 to 30, 2025**. Blood pressure was measured before the intervention (pre-test) and after the intervention (post-test) each day to evaluate the effectiveness of boiled celery leaf water in reducing blood pressure.

The instruments used in this study included an informed consent form, an assessment form, a standard operating procedure (SOP) for blood pressure measurement, a standard operating procedure (SOP) for the preparation of boiled celery (*Apium graveolens* L.) leaf water, an observation sheet, a digital blood pressure monitor, and the equipment and materials required for preparing the boiled celery leaf water.

RESULT and DISCUSSION

Based on the findings of the study, the blood pressure of Participant I and Participant II after the administration of boiled celery (*Apium graveolens* L.) leaf water was as follows:

Subject I:

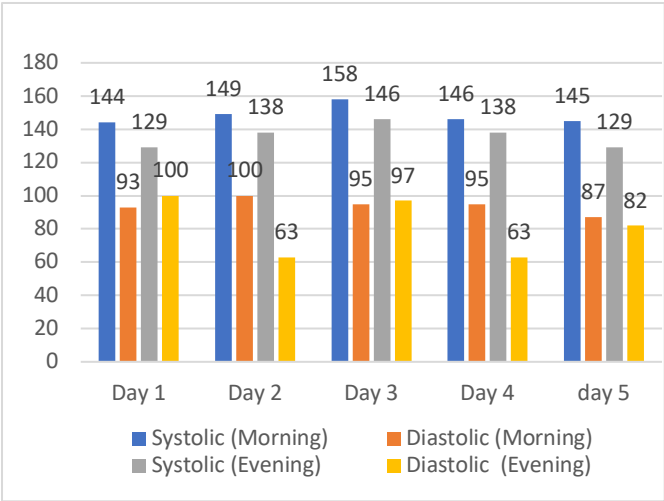


Figure 1: Pre- and Post-Intervention Blood pressure Levels in Subject I.

Based on the diagram above, the participant's blood pressure decreased from 144/93 mmHg on the first day to 129/82 mmHg after receiving boiled celery (*Apium graveolens* L.) leaf water for five consecutive days.

Subject II:

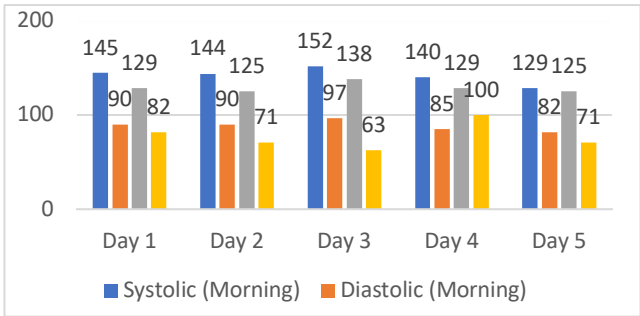


Figure 2: Pre- and Post-Intervention Blood pressure Levels in Subject II.

Based on the diagram above, the participant's blood pressure decreased from 145/90 mmHg on the first day to 125/71 mmHg after receiving boiled celery (*Apium graveolens* L.) leaf water for five consecutive days.

The findings of this study demonstrated that the application of boiled celery (*Apium graveolens* L.) leaf water was effective in reducing blood pressure in both participants with hypertension. A reduction in blood pressure was observed in both participants following the intervention compared with their baseline measurements. Participant I's blood pressure decreased from 144/93 mmHg on the first day to 129/82 mmHg on the fifth day. Similarly, Participant II's blood pressure decreased from 145/87 mmHg on the first day to 125/71 mmHg on the fifth day. The participants received 200 mL of boiled celery leaf water daily, divided into 100 mL in the morning and 100 mL in the evening, for five consecutive days. Post-test blood pressure measurements were performed in the evening after the second daily administration of the intervention.

The factors supporting the effectiveness of boiled celery (*Apium graveolens* L.) leaf water in reducing blood pressure included the participants' educational level, adherence to the intervention, and the frequency of therapy administration.

The first factor supporting the effectiveness of boiled celery (*Apium graveolens* L.) leaf water therapy was the participants' educational level. Educational level influences the effectiveness of the therapy. The findings of this study showed that Participant I had completed a Diploma IV (D4) degree, while Participant II had completed a Bachelor's (S1) degree. The researcher assumes that an individual's educational level influences their decision-making and health-related behaviors. Higher educational attainment is associated with greater knowledge acquired through both formal and non-formal education, which may contribute to better understanding of health information and improved adherence to therapeutic interventions.

This finding is consistent with the study conducted by Zhang et al. (2021), which reported that individuals with higher educational attainment are more likely to understand health-related information, recognize risk factors, and adhere consistently to therapeutic interventions, resulting in better blood pressure control. Theoretically, educational level influences health literacy, which refers to an individual's ability to obtain, understand, and apply health information to make appropriate health-related decisions.

Adherence was one of the key factors contributing to the effectiveness of boiled celery (*Apium graveolens* L.) leaf water therapy. Based on the findings of this study, both Participant I and Participant II demonstrated good

adherence by consuming the boiled celery leaf water according to the prescribed instructions for five consecutive days. The researcher assumes that adherence to the regular consumption of boiled celery (*Apium graveolens* L.) leaf water, as recommended, may contribute to reducing blood pressure in patients with hypertension. The greater the participants' adherence to the intervention, the greater the likelihood of achieving a reduction in blood pressure.

This finding is consistent with the study by Suryani et al. (2022), which demonstrated that regular consumption of boiled celery (*Apium graveolens* L.) leaf water over several days to weeks can reduce both systolic and diastolic blood pressure in patients with hypertension. The study also emphasized that regular consumption, or adherence to the intervention, is one of the key factors influencing the effectiveness of the therapy.

The frequency and intensity of therapy administration were also important factors contributing to the effectiveness of the intervention. Based on the findings of this study, both Participant I and Participant II received boiled celery (*Apium graveolens* L.) leaf water twice daily, in the morning and evening, for five consecutive days. The researcher assumes that the regular administration of boiled celery (*Apium graveolens* L.) leaf water may enhance the effectiveness of the intervention in reducing blood pressure among patients with hypertension. This effect is attributed to the bioactive compounds present in celery leaves, which have antihypertensive properties that support blood pressure reduction.

This finding is consistent with the study by Carey et al. (2022), which reported that successful blood pressure control is strongly influenced by the continuity of the intervention and adherence to the prescribed therapeutic regimen. Therefore, the frequency and consistency of the intervention are important factors supporting the effectiveness of the therapy, as they ensure that the therapeutic effects are maintained in an optimal, measurable, and sustained manner, thereby maximizing blood pressure reduction.

Based on the findings of this study, several factors were identified as contributing to the development of hypertension, including age, sex, stress, genetic predisposition, dietary habits, obesity, and physical inactivity.

Based on the assessment data obtained from both participants, age was identified as one of the factors contributing to the development of hypertension. The findings showed that Participant I was 46 years old, while Participant II was 54 years old. The researcher assumes that advancing age is associated with a gradual decline in physiological function, including reduced elasticity and increased stiffness of blood vessels. As a result, the heart must work harder to pump blood

throughout the body, leading to an increase in blood pressure.

This finding is consistent with the theory proposed by Manurung (2018), which states that blood vessels undergo structural changes with increasing age due to collagen accumulation within the vascular wall, causing progressive narrowing and reduced arterial elasticity. Consequently, systolic blood pressure tends to increase because of the decreased compliance of large arteries, particularly up to the seventh decade of life. In contrast, diastolic blood pressure generally increases until the fifth or sixth decade and then remains stable or gradually declines.

Based on the assessment data, both Participant I and Participant II were female. Sex was identified as one of the factors contributing to the development of hypertension. The researcher assumes that, in addition to age, sex may also influence blood pressure, particularly in women, due to hormonal changes associated with menopause to reduced insulin sensitivity in skeletal muscle and liver tissues, thereby increasing the risk of impaired glucose regulation.

This finding is supported by the theory proposed by Astuti (2019), which states that after puberty, women generally have lower blood pressure than men of the same age because of hormonal differences. However, following menopause, women are more likely to experience an increase in blood pressure as the protective effects of estrogen decline, thereby increasing the risk of developing hypertension.

Based on the assessment data, both Participant I and Participant II experienced work-related stress due to staying awake late at night to complete work tasks, while spending their daytime working in the office. The researcher assumes that stress is one of the factors contributing to the development of hypertension because of the body's physiological response to psychological stress. When an individual experiences stress, the sympathetic nervous system is activated, leading to the release of stress hormones such as adrenaline, noradrenaline, and cortisol. The release of these hormones increases heart rate, causes vasoconstriction, and elevates cardiac output, ultimately resulting in increased blood pressure.

This finding is supported by Ardian (2018), who stated that stress contributes to elevated blood pressure through mechanisms involving increased adrenaline secretion. Stress stimulates the sympathetic nervous system, resulting in increased cardiac output and elevated blood pressure.

Based on the assessment data obtained from both participants, genetic predisposition or family history was identified as one of the factors contributing to the development of hypertension. The findings revealed that both participants had a family history of hypertension. Participant I reported that her father had

hypertension, while Participant II reported that both parents (father and mother) had a history of hypertension. The researcher assumes that genetic predisposition or heredity may contribute to the development of hypertension because a family history of the disease is one of the major risk factors.

This finding is consistent with Sari (2019), who stated that hypertension is a complex genetic disorder. Essential hypertension is closely associated with genetic factors, in which multiple genes contribute to the development and progression of hypertension.

The next factor contributing to elevated blood pressure was dietary intake. Based on the assessment data, Participant I reported occasionally consuming foods high in fat and sodium, including fast foods such as French fries, fried chicken, and fried risoles, as well as goat meat and durian. The researcher assumes that these dietary habits may contribute to increased blood pressure because excessive intake of saturated fat and sodium is a well-established risk factor for hypertension.

The researcher assumes that the consumption of foods high in sodium and fat contributes to the development of hypertension. Excessive sodium intake increases the sodium concentration in the extracellular fluid, causing water to move out of the cells to maintain osmotic balance. As a result, blood volume increases, leading to elevated blood pressure.

This finding is consistent with the theory proposed by Mardani (2017), which states that hypertension is commonly associated with the thickening of arterial walls due to lipid accumulation, resulting in arterial stiffness, a condition known as arteriosclerosis. One of the major factors contributing to arteriosclerosis is elevated blood triglyceride levels caused by excessive fat intake, particularly saturated fats, which have detrimental effects on cardiovascular health. Furthermore, habitual consumption of high-fat foods may further increase the risk of developing hypertension.

Obesity was identified as one of the factors contributing to the development of hypertension. Based on the assessment data, Participant I weighed 70 kg with a height of 164 cm, resulting in a body mass index (BMI) of 26.1 kg/m² (obese). Participant II weighed 80 kg with a height of 160 cm, resulting in a BMI of 31.25 kg/m² (obese). The researcher assumes that obesity increases the risk of hypertension through several physiological mechanisms. As body mass increases, a greater volume of blood is required to supply oxygen and nutrients to body tissues, thereby increasing the workload of the cardiovascular system.

This finding is consistent with the study by Hasmar Fajriana (2023), which reported that greater body mass requires a larger blood volume to deliver oxygen and nutrients to tissues. Consequently, the increased circulating blood volume exerts greater pressure on the

arterial walls, leading to elevated blood pressure. Furthermore, obesity and excess body weight may play a significant role in impairing pressure natriuresis in the kidneys, thereby contributing to the development and persistence of chronic hypertension.

Another factor contributing to elevated blood pressure was physical inactivity. Based on the assessment data, Participant I reported engaging in physical exercise only twice per month, while Participant II exercised only three times per month, indicating a lack of regular physical activity.

The researcher assumes that physical inactivity is one of the factors contributing to the development of hypertension because physical activity has a direct effect on cardiovascular function. Regular physical activity improves cardiac efficiency, enhances blood circulation, and helps maintain the elasticity of blood vessels, thereby contributing to better blood pressure regulation.

This finding is consistent with Harahap et al. (2019), who reported that physical activity plays an important role in maintaining blood pressure stability. Individuals who are physically inactive tend to have a higher resting heart rate, causing the heart muscle to work harder during each contraction. As the heart exerts greater effort to pump blood, the pressure exerted on the arterial walls increases, leading to elevated peripheral vascular resistance and, consequently, increased blood pressure.

CONCLUSION

The findings of this study demonstrated that the application of boiled celery (*Apium graveolens* L.) leaf water was effective in reducing blood pressure among patients with hypertension. During the study period, both Participant I and Participant II showed a gradual reduction in blood pressure from the first to the fifth day of the intervention. Participant I's blood pressure decreased from 144/93 mmHg before the intervention to 129/82 mmHg after five days of treatment. Similarly, Participant II's blood pressure decreased from 145/87 mmHg before the intervention to 125/71 mmHg after five consecutive days of treatment. Several factors were identified as contributing to the effectiveness of the intervention, including the participants' educational level, adherence to the intervention, and the frequency of therapy administration. In addition, factors associated with the development of hypertension included age, sex, stress, genetic predisposition, dietary habits, obesity, and physical inactivity.

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AUTHOR CONTRIBUTIONS

The author was responsible for all aspects of the study, including conceptualization of the research, data collection, data analysis and interpretation, manuscript preparation, manuscript revision, and final approval of the version to be published

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Conflicts of Interest

The author declares that there are no conflicts of interest regarding the conduct and publication of this study. The author has no financial, professional, or personal interests that could have influenced the results, analysis, or interpretation of the research reported.

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