MEDISAINS
Jurnal Ilmiah Ilmu - Ilmu Kesehatan

Original Article

Cookies for hypertension patients

Nurul Herawati [1]✉, Suryati Kumorowulan [2], Masrifan Djamil [1]

[1] *Postgraduate Program in Applied Health, Poltekkes Kemenkes Semarang, Central Java, Indonesia*
[2] *Magelang Health Research and Development Center, Central Java, Indonesia*

ARTICLE INFORMATION

Received: January 27, 2022
Revised: April 04, 2022
Available online: April 30, 2022

KEYWORDS

Carica; Apium; Blood Pressure; Hypertension

CORRESPONDENCE

Phone: +6281286332658

E-mail: nurulhrwt14@gmail.com

A B S T R A C T

Background: Papaya and celery leaves are usually consumed as cooked vegetables and have a bitter taste and distinctive aroma. The flavonoid antioxidants in papaya and celery can increase the dilation of blood vessels, thereby possibly lowering blood pressure. They have been made to make cookies easy to enjoy and liked by hypertensive patients.

Objective: Making and testing papaya combined celery leaf cookies to control blood pressure in hypertensive patients.

Methods: This is a true experimental pretest-posttest with a control group design. The respondents are 34 women of reproductive age who have hypertension, divided into 17 respondents in the treatment group and 17 respondents in the control group. The cookies are made from papaya and celery leaves, and 5 mg of Amlodipine are given every day (for two weeks). Furthermore, blood pressures are measured on days 1, 5, 10, and 15.

Results: Hypertension patients consuming papaya combined celery leaf cookies and amlodipine 5 mg had lower blood pressure than those consuming only 5 mg amlodipine ($p<0.05$).

Conclusion: Papaya leaf cookies with a combination of celery are suitable for consumption by hypertensive patients because they can lower blood pressure.

INTRODUCTION

Papaya leaf is one of the vegetables that function as an antihypertensive, hypoglycemic, antifertility, and antitumor.[1,2] The content of flavonoids in papaya leaves can reduce the risk of various diseases, especially for its antihypertensive effect. Flavonoids as ACE inhibitors in regulating blood pressure are proven to suppress the angiotensin-converting enzyme's work effectively.[3] Following ingestion, most flavonoids interact with the gut microbiome, resulting in modulation of both the gut microbiome and the flavonoid structures, which are catabolized into metabolites with increased bioactivity.[4,5] Celery is also one of the herbal therapies that can treat hypertension and is usually consumed as a vegetable and as a food flavoring agent.[6] In addition to the flavonoid, celery apigenin can prevent constriction of blood vessels and high blood pressure.[7] Apigenin, a natural flavonoid, affects smooth muscle contractility of blood vessels.[8]

One of the risks of hypertension is a lack of fiber intake. Papaya and celery leaves contain high levels of fiber, so researchers apply them in food products, namely cookies. Cookies were chosen because apart from being liked by the public, they can also be consumed anytime and anywhere as a snack. The advantage of consuming cookies is that they are durable in storage and become a companion in fulfilling nutrition in patients with hypertension with the DASH diet approach. The DASH (Dietary Approaches to Stop Hypertension) diet places more emphasis on increasing the consumption of fruits, vegetables, and consumption of processed products.[9]

Previous research provided the preparation of cookies from spinach vegetable ingredients. Although cookies enriched with amaranth-hydrolyzate can reduce systolic blood pressure spontaneously, this study has only been carried out on hypertensive rats.[10] Currently, there are no studies using cookies made from papaya and celery leaves for hypertension in women of reproductive age. However, close-related studies mentioned that 100 mg of

https://doi.org/10.30595/medisains.v20i1.12880

papaya leaf extract and 200 mg of celery leaf extract could reduce the blood pressure in the test subjects (that were animals).[11,12]

Hypertension affects people of all ages, especially women of childbearing age. In previous studies, papaya leaf and celery were consumed raw in hypertensive patients and proved to be effective, such as giving celery juice more effective in lowering blood pressure in hypertensive patients.[13] However, nothing has been made into a cookie, so it needs to be tested again for its effectiveness. So the purpose of this study was to make and test papaya leaf cookies with a combination of celery to lower blood pressure in women of reproductive age with hypertension.

METHOD

Study Design

This is a true experimental study design with pre-post and control group design.

Setting and Respondents

This research was conducted in Puskesmas Srondol, Semarang, from June to July 2021. The respondents are women of reproductive age who have hypertension. The number of samples is 34 respondents, divided into treatment groups (n=17) and control groups (n=17). The criteria for becoming a respondent are: women of reproductive age with systolic blood pressure > 140 mmHg and diastolic blood pressure > 90 mmHg, 15-49 years old and still menstruating, not in current use of other complementary therapies, not allergic to drugs, and compliant with taking the antihypertensive drug (Amlodipine) without other therapy. Exclusion criteria are pregnant women and patients with heart disease, diabetes mellitus, or other complications.

Making the Cookies

The cookies were made using the 'flour-form' of papaya and celery leaves. The researchers have conducted content testing at Laboratorium Analisa CV. Chem- Mix Pratama. The tools to make the cookies are a digital food scale, dough bowl, plastic spatula, spoons, mixer, oven, dehydrator, and food grinder.

Wash the papaya and celery leaves with freshwater, choose only the fresh leaves (remove those wilted and yellow), and dry them with a dehydrator at 60°C. After that, grind them into flour with a 40-60 mesh food grinder. Weigh all of the necessary ingredients according to the weight of the ingredients in the recipe. Add 90 grams of margarine and 50 grams of granulated sugar; then mix with a mixer for 5 minutes. Then, add one egg white and mix again with a mixer until the dough becomes completely smooth. After smooth, add two tablespoons of the "Pisang Ambon" food flavoring agent. Once they are mixed, add 175 grams of flour, 2 grams of papaya and 2 grams of celery leaves flour, 3 grams of baking soda, 1 gram of salt, and 15 grams of skim milk bit by bit. After that, stir until the dough is smooth, then mix again until they blend perfectly. Next, preheat the oven for 20 minutes. The 'smooth dough' weight can be measured now, then shaped around, and flattened afterward. Next, place it on a baking sheet that has been lined with parchment paper or greased with butter to prevent sticking. Bake it in the oven at 60°C for 60 minutes.[14] Put out the cookies from the oven afterward and wait for a while. Once they have started to cool down, we can start packaging them.

These cookies made from papaya and celery leaves were made in Laboratorium Teknologi Pangan Poltekkes Kemenkes Semarang. The treatment group was given a combination of 2 grams of this particular cookie once a day (1 cookie for each day) and took 5 mg of the antihypertensive drug (Amlodipine) once a day for two weeks. Meanwhile, the control group was only given 5 mg of antihypertensive drug (Amlodipine) once a day for two weeks.[15]

The Variables, Instrument, and Measurement

The variables measured in this study were systolic and diastolic blood pressure, measured using a digital sphygmomanometer. Measurements were made on days 1, 5, 10, and 15.

Statistical Analysis

Analysis was done using Independent T-Test and Repeated Measures ANOVA to determine the difference in blood pressure between the respondents in the treatment and control groups.

Ethical Consideration

This research has been registered in Komisi Bioetika Penelitian RSUD Dr. Moewardi, Surakarta, with Ethics Permit number 538/IV/HREC/2021.

RESULTS

Figure 1. Cookies Products

Figure 1 is an example product of papaya leaf cookies with combination celery.

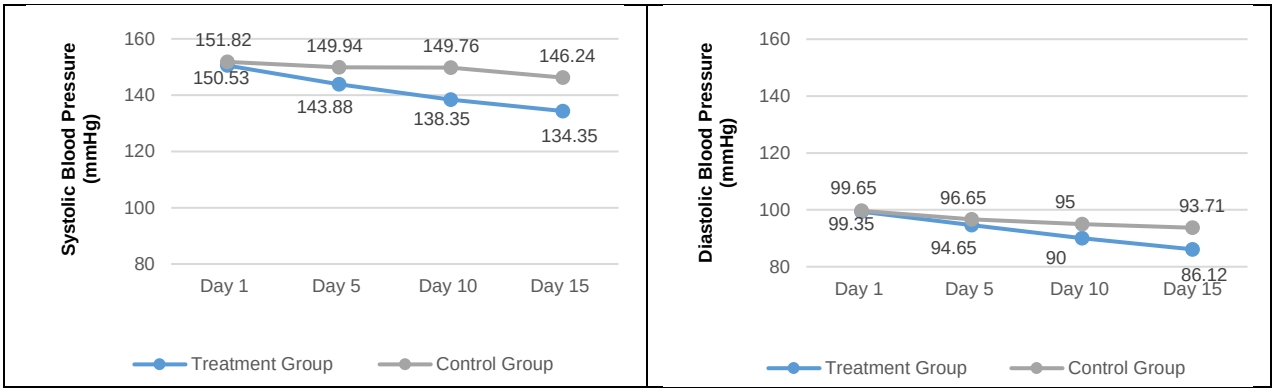

Figure 2. Average Decrease of Systolic Diastolic and Blood Pressure

The effect of papaya combined celery leaf cookies on reducing blood pressure in women of childbearing age with hypertension is shown by a decrease in systolic and diastolic. The systolic and diastolic blood pressure is measured on days 1, 5, 10, and 15. Figure 2 show that the difference in systolic blood pressure is 16.17 mmHg, meaning a higher decrease in the treatment group than in the control group. Similar to this, diastolic blood pressure shows a difference of 13.23 mmHg, meaning that there is also a higher decrease in the treatment group than in the control group.

The results of the Independent T-Test test showed a significant difference in systolic and diastolic blood pressure between the group given papaya leaf cookies with a combination of celery 18 grams/day and amlodipine 5 mg/day and the amlodipine 5 mg/day group ($p<0.05$). The Repeated Measures ANOVA test showed a change between days 1, 5, 10, and 15 ($p<0.05$).

DISCUSSION

In this study, cookies can reduce systolic and diastolic blood pressure in women of childbearing age with hypertension, consuming one piece of 18 grams of papaya leaf cookies with a combination of celery which contains 35.48 mg/day of flavonoids. The intake of flavonoids in Asian countries is minimal, especially in Indonesia. Based on another study involving research subjects aged 25-65 years in Kota Bogor, Jawa Barat, Indonesia, the total intake of flavonoids for women and men is estimated to be around 149.5 mg/day.[16] According to the Nurses' Health Study II, the highest average intake of flavonoids in women with hypertension is 36.2 mg/day.[17]

Hypertensive patients who eat foods according to the recommendations of DASH (Dietary Approaches to Stop hypertension), such as the consumption of fruits, vegetables, nuts, and seeds, can overcome high blood pressure. The content of foods in the DASH pattern, such as antioxidants, can overcome hypertension and cardiovascular problems.[18] The content of flavonoids in papaya leaf cookies has the potential as an antioxidant that plays a role in counteracting free radicals as an early stage of disturbances in the body system, including hypertension.[19] Flavonoid compounds are the main component in celery to act as a beta-blocker that can reduce heart contractions and slow down the heart rate so that less blood is pumped and blood pressure is reduced. In addition, apigenin in celery leaves will block Ca so that it can not blend with smooth muscle cells in blood vessels and the heart so that contraction does not occur. Blood vessels will dilate so that blood flows smoothly and blood pressure decreases.[13,20] In another study, there was a significant difference between blood pressure before and after administration of celery leaf boiled water as evidenced by the mean pretest systolic blood pressure of 142 mmHg and diastolic blood pressure of 94 mmHg and posttest systolic blood pressure of 136 mmHg and diastolic blood pressure of 87 mmHg. This shows a decrease in blood pressure after giving celery boiled water. [21]

In this study, giving papaya leaf flour cookies with a combination of celery acts as an alternative therapy that has the potential to coincide with Amlodipine, so it is necessary to prevent hypertension since pregnancy has not occurred during women of childbearing age. This is in line with the use of alternative medicine in developing appropriate interventions to lower blood pressure to improve the management of chronic diseases such as hypertension.[22]

This research was carried out in the preparation stage for organoleptic tests carried out by 30 panelists aged 23-27 years consisting of female and male panelists. Panelists were given an assessment sheet to assess two samples of cookies, including taste, color, texture, and aroma. It can be concluded that the panelists prefer the number 2 cookies sample, which has a preference level on taste, color, texture, and aroma compared to number 1 cookies. Based on the information of Nutrition facts, the cookies have a total energy of 70 kcal, 1 g of protein, 3 g of total fat, 0.5 g of saturated fat, and 10 g of carbohydrates. The composition does not exceed the standard diet for diabetes mellitus.[23] It contains 100 mg of sodium, 3% potassium, and

35.48 mg of flavonoids. Potassium in these cookies can regulate the balance of body fluids with sodium; hence it can prevent the release of renin and then vasodilate to reduce vasoconstriction, which will also decrease blood pressure. The mechanism of flavonoid compounds is the same as potassium through fluid absorption, namely electrolyte ions such as sodium in blood vessels.[24]

The mold test parameter on the cookies is 3×10^1, and the ALT test (bacteria) is 25×10^1, meaning they have met the microbiological quality requirements. Food production cannot be maximally free from microorganisms but can be controlled and minimized.[25] The cookies (which weighed 18g/piece) contain 35.48 mg of flavonoids and are given once a day for two weeks. They can reduce both systolic and diastolic blood pressures. This is based on the laboratory results conducted in Laboratorium Chem-Mix Pratama, which also shows that these cookies have 197.1579 mg/100g of flavonoids. The weakness in this study was that during the COVID-19 pandemic, blood pressure measurements were only carried out four times in 14 days, so they did not know the progress of the study subject's blood pressure reduction every day.

CONCLUSIONS AND RECOMMENDATION

Giving cookies made from papaya and celery leaves can effectively reduce their systolic and diastolic blood pressure. People with hypertension should enjoy healthy snacks such as papaya leaf cookies with a combination of celery because they can be proven to help control blood pressure.

REFERENCES

1. Anjum V, Ansari SH, Naquvi KJ, Arora P, Ahmad A. Development of quality standards of Carica Papaya Linn . leaves. *Der Pharm Lett*. 2013;5(July 2012):370-376.
2. Anitha B, Raghu N, Ts G, Karthikeyan M, Gk C, Km B. Medicinal Uses of Carica Papaya. *J Nat Ayurvedic Med*. 2018;2(6):1-11.
3. Widiasari S. Mekanisme Inhibisi Angiotensin Converting Enzym Oleh Flavonoid Pada Hipertensi. *Collab Med J*. 2018;1(2):30-44.
4. Cassidy A, Minihane AM. The role of metabolism (and the microbiome) in defining the clinical efficacy of dietary flavonoids. *Am J Clin Nutr*. 2017;105(1):10-22. doi:10.3945/ajcn.116.136051
5. Prado M. Dietary Flavonoids Added to Pharmacological Antihypertensive Therapy are Effective in Improving Blood Pressure. Published online 2015:57-64. doi:10.1111/bcpt.12360
6. Salehi B, Venditti A, Frezza C, et al. Apium Plants: Beyond Simple Food and Phytopharmacological Applications. *Appl Sci*. 2019;9(17). doi:10.3390/app9173547
7. Azizah NCN, Astuti D, Fanani Z, Karyati S, Kurnia W. The Influence of Celery Juice Againts Blood Pressure Reduction in Hypertension. *J Phys Conf Ser*. 2020;1477(6). doi:10.1088/1742-6596/1477/6/062009
8. Naqiyya N. Potensi Seledri (Apium Graveolens L) Sebagai Antihipertensi. *J Stikes Sitihajar*. 2020;2:160-166.
9. Utami RP. Efektivitas Diet DASH (Dietary Approaches to Stop Hypertension) pada Pasien Hipertensi: Literatur Review. *J Gizi Kerja dan Produkt*. 2021;2(2):8. doi:10.52742/jgkp.v2i2.11002
10. Ontiveros N, López-Teros V, Vergara-Jiménez M de J, et al. Amaranth-hydrolyzate enriched cookies reduce the systolic blood pressure in spontaneously hypertensive rats. *J Funct Foods*. 2020;64(September):103-613. doi:10.1016/j.jff.2019.103613
11. Brasil GA lexandr., Ronchi SN asciment., do Nascimento AM arque., et al. Antihypertensive Effect of Carica papaya Via a Reduction in ACE Activity and Improved Baroreflex. *Planta Med*. 2014;80(17):1580-1587. doi:10.1055/s-0034-1383122
12. Dianat M, Veisi A, Ahangarpour A, Fathi Moghaddam H. The effect of hydro-alcoholic celery (Apiumgraveolens) leaf extract on cardiovascular parameters and lipid profile in animal model of hypertension induced by fructose. *Avicenna J Phytomedicine*. 2015;5(3):203-209. doi:10.22038/ajp.2015.3839
13. Lasria S, Srilina BP, Zulkarnain BB. The Comparison Study of Celery Leaves in Juice and Celery Boiled Water to Reduce of Blood Pressure on Elderly Patients with Hypertension. *Proc First Int Conf Heal Soc Sci Technol (ICoHSST 2020)*. 2021;521:189-195. doi:10.2991/assehr.k.210415.041
14. Wijayanti K, Subagio HW, Kartasurya MI, Nugraheni SA. Saponin Maintaining and Dose Determining in Carica Papaya Leaf Cookies as a Breast Milk Booster (galactogogue). *Indian J Public Heal Res Dev*. 2019;10(9):730-734. doi:10.5958/0976-5506.2019.02521.X
15. Youssef G, Nagy S, El-gengehe A, Abdel Hamid M, Abdel Aal A. Once versus twice daily antihypertensive medications for the control of nocturnal blood pressure: a comparative study. *Egypt Hear J*. 2020;72(1). doi:10.1186/s43044-020-00045-5
16. Andarwulan N, Puspita NC. Antioxidants Such as Flavonoids and Carotenoids in the Diet of Bogor, Indonesia Residents. *MDPI*. Published online

2021:1-20. doi:https://doi.org/10.3390/antiox10040587

17. Lajous M, Rossignol E, Fagherazzi G, et al. Flavonoid intake and incident hypertension in women. *Am J Clin Nutr*. 2016;103(4):1091-1098. doi:10.3945/ajcn.115.109249
18. Ferreira-Santos P, Aparicio R, Carrón R, Sevilla MÁ, Monroy-Ruiz J, Montero MJ. Lycopene-supplemented diet ameliorates cardiovascular remodeling and oxidative stress in rats with hypertension induced by Angiotensin II. *J Funct Foods*. 2018;47(June):279-287. doi:10.1016/j.jff.2018.06.002
19. Hasimun P, Sulaeman A, Maharani IDP. Supplementation of Carica papaya Leaves (Carica papaya L.) in Nori preparation Reduced Blood Pressure and Arterial Stiffness on Hypertensive Animal Model. *J Young Pharm*. 2020;12(1):63-66. doi:10.5530/jyp.2020.12.12
20. Huwae G. Pengaruh Pemberian Air Rebusan Daun Salam (Syzygiumpolyanthum) Terhadap Penurunan Tekanan Darah Pada Penderita Hipertensi Di Wilayah Kerja Puskesmas Kairatu Kabupaten Seram Bagian Barat. *Biofaal J*. 2021;2(2):64-74.
21. Lazdia W, Rahma WA, Lubis AS, Sulastri T. Pengaruh Rebusan Daun Seledri Untuk Menurunkan Tekanan Darah Pada Penderita Hipertensi. *Empower Soc J*. 2020;1(1):26-32.
22. Adeniyi O, Washington L, Glenn CJ, et al. The use of complementary and alternative medicine among hypertensive and type 2 diabetic patients in Western Jamaica: A mixed methods study. *PLoS One*. 2021;16(2 February):1-15. doi:10.1371/journal.pone.0245163
23. Dhiyanti AY, Tanuwijaya LK, Arfiani EP. Analisis Kesesuaian Kandungan Energi dan Zat Gizi Makro Rencana Menu dengan Standar Diet untuk Pasien Diabetes Mellitus. *Amerta Nutr*. 2020;4(1):1. doi:10.20473/amnt.v4i1.2020.1-7
24. Aprianti NF. Pengaruh Pemberian Jus Buah Naga Terhadap Penurunan Tekanan Darah Pada Wanita Usia Subur Di Desa Barebali Wilayah Kerja Puskesmas Mantang. *J Med Hutama*. 2021;02(02):439-447.
25. Oladipo IC. Microbial And Nutritional Evaluation Of Biscuits Produced From Wheat And Quality Protein Maize Flour. 2019;(January):4-11.