

The effectiveness of consuming Mosatabaf Cookies on blood pressure in hypertension patients within the Prolanis program

Efektivitas Konsumsi Cookies Mosatabaf terhadap Tekanan Darah pada Pasien Hipertensi Program Prolanis

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ABSTRACT

Background: Hypertension is a major health problem with a continuously increasing prevalence and a high risk of serious complications. Its management involves not only pharmacological treatment but also nutritional interventions, such as increasing potassium and fiber intake. The use of local foods, such as mocaf and kepok bananas, in the form of Mosatabaf cookies, has the potential to serve as an alternative approach to help reduce blood pressure in individuals with hypertension.

Objective: This study aimed to see the effect of giving Mosatabaf cookies on blood pressure in pre-hypertensive patients.

Methods: The type of research used was a quasi-experiment to find a causal relationship between variables with a pretest and posttest design with two groups. The research was conducted for 7 days. The research sample was prolanis patients suffering from hypertension at the Talang Ubi Health Center, totaling 60 people, consisting of 30 intervention groups and 30 control groups who had checked their blood pressure and nutritional intake. Samples were selected using purposive sampling.

Results: Based on statistical tests in the treatment group, the p-value of systolic 0.012 and diastolic 0.001 <0.005 with an average difference in systolic pressure reduction of 0.77 mmHg and diastolic 3.33 mmHg.

Conclusion: Based on these results, it can be concluded that there is an effect of giving Mosatabaf cookies on reducing systolic and diastolic blood pressure in Prolanis patients who experience hypertension.

Keywords: cookies, hypertension, kepok banana flour, mocaf flour

ABSTRAK

Latar belakang: Hipertensi merupakan masalah kesehatan utama yang prevalensinya terus meningkat dan berisiko menimbulkan komplikasi serius. Pengendalian tidak hanya melalui obat, tetapi juga melalui intervensi gizi, seperti peningkatan asupan kalium dan serat. Pemanfaatan pangan lokal seperti mocaf dan pisang kepok dalam bentuk cookies Mosatabaf berpotensi menjadi alternatif untuk membantu menurunkan tekanan darah pada penderita hipertensi.

Tujuan: Penelitian ini bertujuan untuk melihat adanya pengaruh pemberian cookies Mosatabaf terhadap tekanan darah pada pasien prolanis yang mengalami hipertensi.

Metode: Jenis penelitian yang digunakan adalah quasi experiment untuk mencari hubungan sebab akibat antara variabel dengan rancangan pretest dan posttest with two group. Waktu penelitian dilakukan selama 7 hari. Sampel penelitian adalah pasien prolanis yang menderita Hipertensi di Puskesmas Talang Ubi berjumlah 60 orang terdiri dari 30 kelompok perlakuan dan 30 kelompok pembandingan yang telah dilakukan pengecekan tekanan darah dan asupan zat gizi. Sampel dipilih dengan menggunakan purposive sampling.

Hasil: Berdasarkan uji statistik pada kelompok perlakuan didapatkan nilai p-value sistolik 0,012 dan diastolik 0,001 < 0,005 dengan rata-rata selisih penurunan tekanan sistolik 0,77 mmHg dan diastolik 3,33 mmHg.

Kesimpulan: Ditinjau dari hasil tersebut, maka dapat disimpulkan bahwa terdapat pengaruh pemberian cookies Mosatabaf terhadap penurunan tekanan darah sistolik dan diastolik pada Pasien Prolanis yang mengalami Hipertensi.

Kata kunci: cookies, hipertensi, tepung pisang kepok, tepung mocaf

INTRODUCTION

The most dominant health problem currently, which needs to be watched out for in Indonesia, is cardiovascular system disorders such as hypertension.¹ Hypertension is a condition where a person experiences elevated blood pressure above the normal limits of 120 mmHg systolic and 80 mmHg diastolic. Hypertension can trigger other diseases such as stroke, diabetes, heart disease, and kidney failure. Hypertension can reduce a person's quality of life, not only physically but also psychologically, socially, and environmentally.

Hypertension can disrupt the distribution of oxygen and nutrients carried by the blood to the body's tissues that need them. This condition is often dubbed a silent killer because it can cause serious or even fatal complications without causing obvious symptoms beforehand. Based on an analysis conducted by Imperial College London in collaboration with the WHO regarding the prevalence and control of hypertension, the number of hypertension sufferers aged 30–79 years has increased significantly, from 650 million to 1.28 billion in the last 30 years. This increase is caused by population growth, the aging process, and low public awareness of hypertension screening and treatment.² Hypertension disease based on age is most common in the 45-54 year age group (45.3%) and the 55-64 year age group (55.2%), while the incidence of hypertension in Southeast Asia was 39.9% in 2020.³ In Southeast Asia, the prevalence of hypertension in 2020 was recorded at 39.9%. In 2023, the WHO determined that people aged 65 and over were at high risk of developing hypertension. Globally, the WHO reports that approximately 972 million people, or 26.4% of the world's population, suffer from hypertension, and this figure is expected to continue to rise.^{4,5}

The 2018 Basic Health Research (RISKESDAS) stated that the prevalence of hypertension in Indonesia was 34.1% increased from 2013, when it was only 25.8%. The prevalence of hypertension in South Sumatra province was 30.44%.⁶ The research location conducted at the Talang Ubi Community Health Center (2022), reported that the percentage of hypertension sufferers reached 5% or as many as 703 people from the target number of 13,895 people increased in 2023 by 10.82% or as many as 1508 people from the target number of 13,933 people and among them elderly people were suffering from hypertension as many as 304 people or as many as 2.18%.⁷

Mosatabaf cookies is an abbreviation for modified cassava (*Musa acuminata* balbisiana) flour cookies, or banana flour and mocaf flour cookies. This product was developed by modifying local raw materials, namely cassava and kepok bananas, which are abundant but whose utilization among farmers is still limited. Both foods are rich in potassium and fiber, thus providing good health benefits. Mocaf flour is flour obtained from cassava (cassava) through a fermentation process. Mocaf flour contains 403 mg of potassium per 100 grams and 6 g of fiber per 100 grams.⁸ The high potassium content in mocaf flour helps lower blood pressure. Furthermore, the potassium in kepok bananas helps dilate blood vessels and inhibit renin secretion.⁹

Mocaf flour and banana flour can be used in making cookies that have functional properties, because both of these flours are rich in potassium and fiber, which are beneficial for health. Therefore, the author is interested in combining mocaf flour and

banana flour as cookies to lower blood pressure in prolans patients with the aim of knowing the effect of Mosatabaf snack cookies on blood pressure in prolans patients who experience hypertension in the working area of Talang Ubi Community Health Center in 2024. This study aimed to examine the effect of administering Mosatabaf cookies on Prolans patients with hypertension. Prolans (Chronic Disease Management Program) patients are BPJS Kesehatan patients who can undergo routine health checks focused on type 2 diabetes and hypertension.¹⁰

METHODS

Study design

This study employed a quasi-experimental design with a pretest–posttest approach involving two groups. The study was conducted in the working area of the Talang Ubi Community Health Center, Penukal Abab Lematang Ilir Regency, in March 2024 for a duration of 7 days.

Data source and sampling procedure

The study sample consisted of 60 prolans patients with hypertension at the Talang Ubi Community Health Center, divided into 30 participants in the treatment group and 30 participants in the comparison group. The treatment group received cookies along with blood pressure measurements, while the comparison group only underwent blood pressure measurements. The sampling technique used was purposive sampling. Mostabaf cookies were administered to respondents twice daily, in the morning and afternoon, with a total of 10 pieces (100 grams) per day for 7 consecutive days.

Inclusion criteria included prolans patients diagnosed with grade 1 or grade 2 hypertension, possessing good communication skills, willing to participate in the study, and regularly taking antihypertensive medication. Exclusion criteria included patients with depression, complications, or those undergoing fasting.

Variables of the study

The independent variable in this study was the administration of Mostabaf cookies, while the dependent variable was blood pressure.

Measurement and instruments

The instruments used in this study included an organoleptic test form, a respondent identity form, an informed consent form, and a 24-hour food recall form for data collection, as well as a sphygmomanometer and a computer program for blood pressure measurement. Mostabaf cookies are snacks made from mocaf flour (20–40 grams), kepok banana flour (40–60 grams), wheat flour (20–100 grams), stevia sugar drops (1 gram), chicken egg yolk (30 grams), margarine (50 grams), cornstarch (15 grams), and almonds (30 grams), intended to help lower blood pressure. The preparation process involved forming the dough by mixing the ingredients until creamy; combining kepok banana flour, mocaf flour, wheat flour, and cornstarch until smooth; shaping the dough into sheets of approximately ± 1 cm thickness; arranging the molded dough onto a baking tray; baking; and allowing the cookies to cool before packaging.

Data collection

The data used in this study consisted of primary and secondary data. Primary data were obtained through measurements and interviews with respondents regarding identity, nutritional intake, and blood pressure. Secondary data were obtained from general descriptions of the research location.

Ethical considerations

This study received ethical approval from the Research Ethics Committee (KEPK) with the number: 0362/KEPK/Adm2/III/2024.

Data analysis

Data analysis was conducted using univariate and bivariate approaches.

Univariate analysis was used to describe the characteristics of the independent and dependent variables, presented in the form of frequency distribution tables and supported by narrative explanations. Bivariate analysis was performed to evaluate the relationship between variables and was presented in tabular form with descriptive explanations. The statistical test used was the paired t-test (dependent t-test), with a significance level of 95%, to determine whether a statistically significant relationship existed. Interpretation of the results was based on the p-value, where $p > 0.05$ indicated no significant relationship, while $p < 0.05$ indicated a significant relationship.

RESULTS

Nutritional Value Analysis of Mosatabaf Cookies

Nutritional analysis was conducted to determine the macronutrient composition, potassium, sodium, and fiber of Mosatabaf cookies. The simple results are the results of the first test conducted on one sample, while the duplo results are the results of the second test by repeating measurements on the same sample to increase data accuracy and reliability, to avoid measurement errors, and ensure consistent test results. The average result in the laboratory test is the average value of two simple and duplo measurements conducted on the same sample. Laboratory results will be compared with the SNI (Indonesian National Standard).

Table 1. Nutritional content of Mosatabaf cookies

No.	Parameter	Results			SNI
		Simple	Duplo	Average	
1.	Ash Content (%)	1.57	1.52	1.54	Maximum 1.5
2.	Fat (%)	36.43	37.48	36.95	Minimum 9.5
3.	Water content (%)	6.45	6.23	6.34	Maximum 5
4.	Energy (Kcal/100g)	550.07	556.40	553.23	Minimum 400
5.	Carbohydrates (%)	47.38	46.38	46.88	Minimum 70
6.	Protein (%)	8.17	8.39	8.28	Minimum 5
7.	Potassium (mg/100 g)	361.40	360.59	360.99	
8.	Sodium (mg/100 g)	19.98	19.79	19.88	
9.	Crude Fiber (%)	0.57	0.58	1.15	

Source: PT. Saraswati Indo Genetech

The sources of macronutrients from Table 1, which consist of energy, carbohydrates, protein, and fat, are in accordance with the quality requirements for cookies based on SNI 2973:2022, namely fat in cookies is at least 9.5%, energy is 553.23 kcal/100 g, protein is at least 5%, and carbohydrates are at least 70%.¹¹ Mosatabaf cookies' sodium content (19.88 mg/100 g) makes them a low-sodium food, contributing 1.80% of the daily requirement for seniors aged 65-80 years. The fiber content in Mosatabaf cookies is 1.15%. Compared to the Recommended Daily Intake (RDA) of fiber for women aged 65-80 years, which is 25 g/day, one serving of Mosatabaf cookies can contribute approximately 4.6% of the daily fiber requirement.¹²

Table 2. Frequency Distribution of Respondents Based on Hypertension Category

Hypertension Category	Treatment				Comparator			
	Before		After		Before		After	
	n	%	n	%	n	%	n	%
Stage I Hypertension	18	60	20	66.7	18	60	18	60
Stage 2 Hypertension	12	40	10	33.3	12	40	12	40
Total	30	100	30	100	30	100	30	100

Based on Table 2, it shows that the most common type of hypertension found in stage I hypertension with the treatment group after the administration of mosatabaf cookies was 66.7% while for the comparison group, after treatment was 60%. In stage 2 hypertension for the treatment group, before being given treatment, there were 12 people (40%), and after being given treatment, there were 10 people (33.3%). Meanwhile, for the comparison group, there were 12 people (40%) with the same number both before and after treatment.

Table 3. Distribution of Average Frequency of Energy, Protein, Fat, Carbohydrate Intake, Before and After Treatment and Comparison Groups

Group	Nutritional Intake	Mark Min	Mark Max	Mean ± SD	p
Frequency Distribution of Average Energy Intake					
Treatment	Before	896.5	1763.9	1195.52 ± 248.01	0,000
	After	1036.5	2003.6	1398.90 ± 59.49	
Comparator	Before	940.5	1888.2	1338.14 ± 248.14	0,000
	After	1009.2	1980.7	1471.67 ± 254.80	
Frequency Distribution of Average Protein Intake					
Treatment	Before	30.5	54.5	45.27±7.55	0,000
	After	35.1	57.3	48.44±6.64	
Comparator	Before	32.5	54.3	47.38 ± 6.31	0.132
	After	33.7	55.3	48.31 ± 5.89	
Frequency Distribution of Average Fat Intake					
Treatment	Before	28.1	52.3	38.37±5.02	0,000
	After	30.4	53.6	40.58±4.82	
Comparator	Before	26.4	48.4	38.74 ± 5.32	0,000
	After	28.3	50.8	40.41 ± 5.38	
Frequency Distribution of Average Carbohydrate Intake					
Treatment	Before	117.4	278.5	185.28±29.21	0,000
	After	120.6	280.1	190±27.36	
Comparator	Before	115	272	192.61 ± 42.08	0.003
	After	116	274	203.78 ± 43.84	

Table 4. Frequency Distribution of Average Fiber, Potassium, and Sodium Intake Before and After Treatment and Comparison Groups

Group	Nutritional Intake	Mark Min	Mark Max	Mean ± SD	p
Frequency Distribution of Average Fiber Intake					
Treatment	Before	12.1	24.5	15.64±2.93	0,000
	After	13.5	27.6	18.07±3.03	
Comparator	Before	12.1	24.5	17.22 ± 3.54	0,000
	After	14.2	25.6	18.81 ± 3.39	
Frequency Distribution of Average Potassium Intake					
Treatment	Before	1950.4	3960.5	2886.33±563.93	0,000
	After	2200.4	4005.6	3603.98±524.80	
Comparator	Before	1860.5	3860.8	2681.83 ± 636.14	0,000
	After	2060.6	3960.9	3038.61 ± 689.55	
Frequency Distribution of Average Sodium Intake					
Treatment	Before	726.8	1359.7	998.75±184.82	0.016
	After	716.7	1349.6	978.40±178.14	
Comparator	Before	728.3	1355.3	977.33 ± 215.14	0.034
	After	716.2	1352.2	965.72 ± 213.53	

Tables 3 and 4 show that the results of the statistical test (t-dependent) produced a p value of 0.000 for the average intake of energy, fat, carbohydrates, fiber, potassium, and

sodium. This indicates a significant difference between intake before and after administration of antihypertensive drugs in the treatment and comparison groups. Meanwhile, the average protein intake in the comparison group obtained a p-value of 0.132 ($p > 0.05$), so it can be concluded that there is no significant relationship between the administration of antihypertensive drugs and changes in protein intake in that group.

Table 5. Differences in Average Blood Pressure Before and After in the Treatment and Comparison Groups

Group	Blood pressure	Initial Mean± SD	Final Mean± SD	p	n
Treatment	Systolic	157.87± 4.75	157.10± 4.56	0.012	30
	Diastolic	100.30± 3.92	96.97± 3.70	0.001	30
Comparator	Systolic	157.67± 5.02	157.23± 4.94	0.334	30
	Diastolic	99.83± 4.68	98.07± 3.87	0.090	30

The results of the dependent t-test in Table 5 show a decrease in blood pressure in the treatment group given Mosatabaf cookies and antihypertensive medication for seven consecutive days. Systolic blood pressure decreased from 157.87 ± 4.75 to 157.10 ± 4.56 mmHg ($p = 0.012$), while diastolic blood pressure decreased from 100.30 ± 3.92 to 96.97 ± 3.70 mmHg ($p = 0.001$). The average decrease in systolic blood pressure was 0.77 mmHg, while diastolic blood pressure was 3.33 mmHg.

In the comparison group receiving only antihypertensive medication, systolic blood pressure decreased from 157.67 to 157.23 mmHg (mean difference 0.44 mmHg), and diastolic blood pressure decreased from 99.83 to 98.07 mmHg (mean difference 1.76 mmHg). Analysis using a paired t-test showed that the decrease in blood pressure in the comparison group was not significant (systolic $p = 0.334$; diastolic $p = 0.090$).

DISCUSSION

Mosatabaf Cookies are a snack designed to meet the nutritional needs of seniors, with high potassium and fiber content and low sodium. This formulation is intended to help control blood pressure in people with hypertension, as potassium and fiber play a role in lowering blood pressure, while high sodium can trigger it.

Nutritional analysis shows that one serving of Mosatabaf contains 361.40 mg of potassium, meeting the Indonesian National Standard (SNI) standards for similar products. This amount meets approximately 10.63% of the daily potassium intake for elderly men and 13.90% of the RDA for elderly women. When consumed twice daily, the contribution increases to 21.26% of the RDA for elderly men and 27.80% of the RDA for elderly women. This content is considered high for a snack and aligns with findings by Rafika (2020) that high-potassium foods, such as kepok banana juice, effectively lower blood pressure through vasodilation and increased sodium excretion.¹³

The formula given to 60 respondents was divided into 30 people in the treatment group and 30 people in the comparison group. This number is in accordance with the recommendation for exploratory research, which suggests a minimum of 30 subjects per group, as used by Handayani et al. (2024) in a study of Morina cookies in hypertensive patients.¹⁴ However, research with a larger sample size would increase the power of the statistical analysis. The 7-day intervention was deemed too short to achieve the maximum effect of high-potassium and high-fiber functional foods, so the results of this study are still exploratory.

Hypertension is divided into two categories: stage 1 hypertension with systolic blood pressure between 140-159 mmHg and diastolic between 90-99 mmHg, and stage 2 hypertension with systolic blood pressure of 160 mmHg or more and diastolic blood pressure of 100 mmHg or more. The majority of respondents, namely 38 people (63.3%), experienced stage 1 hypertension. In the stage 1 hypertension group, there was an increase in the number of respondents who experienced a decrease in average blood

pressure, from 18 to 20 people. Meanwhile, in the comparison group, blood pressure did not show significant changes before and after the intervention.

Food recall results indicated a habit of consuming fried foods and coconut milk-based dishes, and after the intervention, a significant increase in fat intake was found ($p < 0.005$). According to Batubo et al. (2023), high fat consumption was associated with a 76% increased likelihood of hypertension (OR = 1.76; $p < 0.0001$) in West Africa.¹⁵ In addition, WHO emphasizes the maximum limit of saturated fat consumption at 10% of total daily energy and strongly recommends replacing it with unsaturated fat to reduce the risk of cardiovascular disease.¹⁶

The results of this study showed that 76% of subjects had carbohydrate intakes below their daily requirements. This condition is likely due to the decline in taste and smell in old age, which results in decreased appetite. Analysis of the frequency distribution of fiber intake revealed differences in fiber intake before and after administration of antihypertensive medication and Mosatabaf cookies. Research conducted by Khamis et al. (2019) showed that high-fiber diet therapy significantly reduced systolic and diastolic blood pressure in individuals with hypertension. Low fiber intake can lead to reduced bile acid excretion through feces, resulting in more cholesterol from bile residue being reabsorbed. Excessive cholesterol circulating in the blood vessels will impede blood flow, thus increasing blood pressure.¹⁷ Adding fiber affects blood pressure; the more fiber intake consumed, the lower the systolic and diastolic blood pressure.¹⁸ Research conducted by Cholifah and Sokhiatun (2022) showed that the implementation of a high-fiber diet reduced systolic and diastolic blood pressure in individuals with hypertension.¹⁹

An analysis of the frequency distribution of potassium intake among respondents in the treatment and comparison groups concluded that there was a difference in sodium intake before and after antihypertensive medication was administered. In this study, most respondents had low potassium intake, which was due to their low consumption of vegetables and fruit. Most respondents consumed vegetables in amounts that did not meet the standard daily serving of 100 grams, and even tended to be less than half the recommended amount.

A person's potassium intake can affect blood pressure. Low potassium levels in the body can cause increased blood pressure. Conversely, increased potassium intake is known to lower both systolic and diastolic blood pressure, which is associated with decreased vascular resistance. Vascular resistance is caused by blood vessel dilation and increased water and sodium loss from the body, resulting from the activity of the sodium and potassium pumps.²⁰

In both the treatment and comparison groups, sodium intake was mostly in the excessive category. Most respondents had a habit of consuming seafood such as tuna, canned sardines, and salted fish. Furthermore, their habit of consuming instant foods like noodles and traditional foods like model, tekwan, pempek, and meatballs, which contain excessive amounts of MSG, soy sauce, and sauces, also contributed to excessive sodium intake. The statistical analysis concluded that there was a difference in sodium intake before and after the intervention. This research aligns with research conducted by Aprilia (2016), which shows there was a decrease in systolic and diastolic blood pressure after consuming mocaf tempeh date biscuits ($p < 0.05$) because it was influenced by fat, sodium, zinc intake, and knowledge about hypertension.²¹

Mosatabaf cookies offer the advantage of being a functional snack for the elderly, boasting a high potassium content (361.40 mg/portion) in accordance with Indonesian National Standards (SNI), high fiber content, and low sodium. However, this study has limitations, including the short intervention duration, limited sample size, the use of

antihypertensive medications in both groups, and the lack of measurement of blood potassium levels, thus limiting the strength of the conclusions. Practically, Mosatabaf has the potential to be a functional snack for the elderly and can be developed for home and small-scale production. However, further research with a longer duration and larger sample size is needed.

CONCLUSION

Based on the research results, it can be concluded that the provision of Mosatabaf snack cookies has an effect on blood pressure in Prolanis patients with hypertension. According to the researchers, antihypertensive medication alone is not sufficient to treat hypertension in the elderly, requiring adequate nutritional intake, such as increasing potassium and fiber intake and limiting sodium.

Cookies Mosatabaf is a snack made from local products, namely mocaf flour and kepok banana flour. Mosatabaf cookies are highly suitable for consumption by patients with hypertension due to their high potassium and fiber content and low sodium content. This product is expected to be an alternative snack for those with hypertension and can help lower blood pressure.

Administration of Mosatabaf cookies for 7 days can statistically significantly reduce systolic and diastolic blood pressure in hypertensive patients with Prolanis. However, the clinical effect is still limited. Further studies with longer durations and tighter antihypertensive medication control are needed. It is hoped that this research can be a source of reference and also a source of recommendations for further research to overcome hypertension in the elderly.

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