

The Effect of Administrating “MAPIA” Date Juice (Phoenix dactylifera L.) Mixed with Ambon Bananas (Musa paradisiaca var. Sapientum Linn) on Blood Pressure Reduction in Hypertensive Patients

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ABSTRACT

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Background: Hypertension is a vascular disorder that impedes the supply of oxygen and nutrients. This condition requires special attention as hypertension is a significant factor in the occurrence of stroke, coronary heart disease, and kidney disease. One way to increase potassium intake is through the consumption of fruits and vegetables. The intervention using food ingredients such as dates and Ambon bananas is expected to enhance patients' potassium intake, thereby helping to monitor and manage blood pressure.

Research Methods: The study employed a quasi-experimental design with a non-equivalent control group. The intervention involved administering Mapia juice to the intervention group for 7 days, whilst a control group was selected based on inclusion criteria using a regional approach. This was done to determine whether there were differences between the intervention and control groups.

Research Results: The Mann-Whitney test results revealed significant differences in systolic blood pressure between pre- and post-intervention measurements in the intervention group (10.9 ± 0.36 mmHg) compared to the control group (1.3 ± 1.35 mmHg), with a p-value of 0.000. Similarly, diastolic blood pressure showed significant differences between the intervention group (7.95 ± 2.42 mmHg) and the control group (0.1 ± 0.24 mmHg), with a p-value of 0.000.

Conclusion: The results indicate a significant effect between the intervention and control groups on both systolic and diastolic blood pressure measurements.

BACKGROUND

Hypertension is a global health issue, often referred to as the ‘silent killer’ as it generally shows no early symptoms. This condition is a disorder of the blood arteries that disrupts the supply of oxygen and nutrients by the blood. Consequently, the body lacks nutrients and oxygen, forcing the heart to work harder and placing it at high risk of heart failure, myocardial infarction, and stroke (Goleman et al., 2020) .

The World Health Organization (WHO) reported in 2023 that the global prevalence of hypertension reached 33%, meaning that 1 in 3 people worldwide suffer from hypertension. Meanwhile, the national prevalence of hypertension reached 30.8% in 2023. In West Nusa Tenggara (NTB) Province, the Indonesian Health Survey (SKI) found that 25.9% of the adult population had hypertension, (Indonesian Ministry of Health, 2023) . In 2022, West Nusa Tenggara Province recorded 282,970 cases of hypertension among those aged 18 years and over, with 272,150 individuals (96.2%) having undergone screening. Meanwhile, in West Lombok, the average number of people with hypertension was 2,231.85 (Provincial Health Office Profile,

2022). One of the community health centres (puskesmas) with a higher-than-average incidence of hypertension in West Lombok is the Perampuan Community Health Centre.

There are two types of hypertension management: non-pharmacological and pharmacological. The recommendation (PERSAGI & ASDI, 2019) for dietary management of hypertensive patients is the DASH diet, with a recommended potassium intake of 4,700 mg/day.

One fruit that is beneficial for patients with hypertension is the date (*Phoenix dactylifera* L.). In addition to dates, fruits with a high potassium content include the Ambon banana (*Musa paradisiaca*). Based on research by Fazzli et al. (2024) at the Tebing Tanjung Balai Karimun Community Health Centre, targeting hypertensive patients in the adult and elderly age groups (45–74 years), an intervention involving the provision of 118 grams of Ambon bananas twice daily was administered every day for seven days, resulting in a reduction in blood pressure within the intervention group.

Recognising the great potential of these two ingredients, this study aimed to combine dates (*Phoenix dactylifera* L.) and Ambon bananas (*Musa paradisiaca* var. *Sapientum* Linn) in the form of date and Ambon banana juice (Mapia Juice), which was administered to outpatients diagnosed with hypertension to lower their blood pressure at the Perampuan Community Health Centre in West Lombok Regency.

RESEARCH METHODS

A quasi-experimental study with a non-equivalent control design was employed in this research. The intervention involved administering Mapia juice to the intervention group over a 7-day period from 21 to 27 February 2025, with a control group serving as a comparison.

Sample characteristic data were obtained from interviews, whilst nutritional status data were derived from anthropometric measurements. Sample dietary intake levels were obtained from food recall interviews conducted twice: before and during the intervention. Sample blood pressure data were obtained from blood pressure measurements taken before and after the intervention was administered.

The statistical tests used for the sample characteristics and intake levels were the chi-square test and the Wilcoxon test; the independent t-test was used for blood pressure data; and the Mann-Whitney test was used for blood pressure data before and after the intervention to determine whether there was an effect of the administration of mapia juice before and after the intervention.

RESULTS

Sample Characteristics

Table 1. Distribution of Gender, Age, History of Medication Use and Nutritional Status Sample Groups.

Variable		Intervention		Control		p
		n	%	n	%	
Age	50–55	6	30	6	30	0.424
	55–60	5	25	2	10	
	61–64	9	45	12	60	
	Total	20	100	20	100	
Gender	Male	11	55	6	30	0.200
	Women	9	45	14	70	
	Total	20	100	20	100	
	Total	20	100	20	100	
Medication Intake	Yes	20	100	20	100	1,000
	No	0	0	0	0	
	Total	20	100	0	100	
History of regular medication use	Regular	20	100	20	100	1,000
	No	0	0	0	0	
	Total	20	100	0	100	
Type of	Amlodipine	20	100	20	100	1,000

Medication	Total	20	100	20	100	
Nutritional Status	Obesity	6	30	6	30	0.190
	Fat	5	25	2	10	
	Normal	8	40	6	30	
	Underweight	1	5	6	3	
	Very thin	0	0	0	0	
	Total	20	100	20	100	

Note: *Chi-square* test results

There were 11 males (55%) and 14 females (70%) in the control group. The statistical test showed $p=0.200$. Regarding medication history, all participants in this study were taking antihypertensive medication (100%) in both sample groups. The type of medication consumed by both sample groups was *Amlodipine*. The statistical test results showed a p -value of 1.000. The nutritional status of the samples in the intervention group was predominantly 'Normal', comprising 8 individuals (40%), whilst in the control group, the most common nutritional statuses were 'Obesity' and 'Normal', comprising 6 individuals (30%) and 6 individuals (30%) respectively. The statistical test results showed that $p=0.190$.

Nutritional intake of the sample

Table 2. Nutrient Intake Before and During the Intervention in the Sample.

Nutrient	Intervention (n=20)		Control (n=20)		p
	Mean	SD	Mean	SD	
Energy					
Before	1479.15	438.52	1,175.07	267.28	0.012*
During	1,592.74	307.27	1,128.07	16.04	0.000*
Protein					
Before	76.49	19.30	52.75	17.26	0.000**
During	62.57	17.26	60.77	16.04	0.735*
Fat					
Before	59.63	91.66	31.81	13.96	0.093**
During	34.30	14.03	34.63	11.77	0.936*
Carbohydrates					
Before	203.37	68.73	157.80	31.29	0.004**
During	256.27	55.46	151.97	22.67	0.000*
Sodium					
Before	2931.175	412.149	2,616.910	574.908	0.054*
During	2,340,325	385,919	2,617.600	665.838	0.115*
Potassium					
Before	1,722.86	756.91	1334.70	524.82	0.107*
During	2,984	401.49	1,600.72	730.15	0.014*
Magnesium					
Before	305.15	133.82	233.16	95.61	0.079**
During	265.12	96.14	246.92	81.95	0.0523*

Notes: *: *Independent t-test*, **: *Mann-Whitney test*

The results of the *independent t-test* and *Mann-Whitney* tests indicate that there is a significant difference ($p<0.05$) in energy, protein and carbohydrate intake between the intervention and control groups prior to the intervention, and a p -value of <0.05 was found for energy, carbohydrate and sodium intake, indicating a significant difference between the intervention and control groups during the intervention.

Intake levels of the sample

Table 3. Distribution of Nutrient Intake Levels in the Sample.

Energy										
Category	Before				p	During				P
	Intervention		Control			Intervention		Control		
	n	%	n	%		n	%	N	%	
Advantages	3	15	2	10	0.696	6	30	0	0	0.005
Normal	10	50	7	35		11	55	7	35	
Mild deficit	2	10	5	25		1	5	6	30	
Moderate deficit	3	15	3	15		2	10	3	15	
Severe Deficit	2	10	3	15		0	0	4	20	
Total	20	100	20	100		20	100	20	100	
Protein										
Excess	14	70	5	25	0.010	6	30	7	35	0.842
Normal	0	0	6	30		9	45	9	45	
Mild deficit	6	30	6	30		1	5	2	10	
Moderate deficit	0	0	1	5		3	15	1	5	
Severe Deficit	0	0	2	10		1	5	1	5	
Total	20	100	20	100		20	100	20	100	
Fat										
Excess	2	10	4	20	0.699	4	20	3	15	0.451
Normal	1	5	3	15		2	10	7	35	
Mild deficit	4	20	3	15		4	20	3	15	
Moderate deficit	4	20	3	15		2	10	1	5	
Severe Deficit	9	45	7	35		8	40	6	30	
Total	20	100	20	100		20	100	20	100	
Carbohydrates										
Excess	1	5	0	0	0.675	7	35	0	0	0.000
Normal	7	35	5	25		10	50	3	15	
Mild deficit	4	20	4	20		2	10	4	20	
Moderate deficit	5	25	5	25		1	5	6	30	
Severe Deficit	3	15	6	30		0	0	7	35	
Total	20	100	20	100		20	100	20	100	
Sodium										
Excess	19	95	8	40	0.008	10	50	5	25	0.102
Good	5	5	12	60		10	50	15	75	
Total	20	100	20	100		20	100	20	100	
Potassium										
Good	0	0	0	0	1,000	1	5	0	0	0.311
Less	20	100	20	100		19	95	20	100	
Total	20	100	20	100		20	100	20	100	
Magnesium										
Good	1	5	0	0	0.311	0	0	0	0	1,000
Less	19	95	20	100		20	100	20	100	
Total	20	100	20	100		20	100	20	100	

Note: *Chi-square* test results

The results of the *Chi-square* test on the distribution of intake levels in the sample for this study showed $p < 0.05$ for protein intake ($p = 0.010$) and sodium intake ($p = 0.008$) prior to the intervention, and for energy intake ($p = 0.005$) and carbohydrate intake ($p = 0.000$) during the intervention, indicating that there were significant differences between the intake levels of the intervention group and the control group.

Sample Blood Pressure Before and After the Intervention

Table 4. Mean Blood Pressure Test for the Sample Groups

Blood Pressure	Systolic		Control		Diastolic		Control	
	Intervention				Intervention			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Before	157.25	16.66	157.60	9.64	106.10	11.13	93.50	7.91
After	146.35	16.30	156.30	8.29	98.15	13.55	93.10	9.15
P	0.000		0.319		0.000		0.868	

Note: Results of the *Wilcoxon* test

Systolic and diastolic blood pressure data were analysed using the *Wilcoxon* test with a p-value <0.05 in the intervention group, indicating a significant difference between pre- and post-intervention measurements.

The Effect of Mapia Juice on Sample Blood Pressure

Table 5. Results of the Mapia Juice Administration Test and its effect on blood pressure

Blood Pressure	n	Systolic Mean±SD	p	Diastolic Mean + SD	p
Δ pre-post intervention	20	10.9±0.36	0.000	7.95±2.42	0.000
Δ pre-post control	20	1.3±1.35		0.1±1.24	

Note: *Mann-Whitney* test results

Statistical analysis using the *Mann-Whitney* test with p<0.05 for systolic and diastolic blood pressure indicated a significant effect on blood pressure in the intervention group.

DISCUSSION

Sample Characteristics

One of the factors that can influence blood pressure and lead to hypertension is gender. In this study, a significant number of women were found to have hypertension; this is because, upon reaching the end of their menstrual cycle or menopause, women become more susceptible to hypertension due to a decrease in oestrogen levels. However, cardiovascular disease can be prevented, as prior to *menopause* women are protected by the hormone oestrogen, which can increase *High-Density Lipoprotein (HDL)* levels. High *HDL* levels have a beneficial effect as they can prevent atherosclerosis (Adila & Mustika, 2023). Research by Yunus et al. (2021) indicates that there is no significant association between gender and the incidence of hypertension at the Haji Pemanggilan Community Health Centre in Anak Tuha District, Lampung Regency, in 2020 (Yunus et al., 2021).

The age of the sample in this study was grouped into three categories: 50–55 years, 56–60 years and 61–64 years. The results showed that the largest age group was 61–64 years, with 9 participants (45%) in the intervention group and 12 participants (60%) in the control group.

Advancing age can lead to changes in bodily functions, such as a reduction in the elasticity of blood vessels, which causes blood pressure to exceed normal limits. This also results in various health issues, such as changes in the structure of large blood vessels due to the ageing process, leading to narrowing of the lumen and the development of atherosclerosis in the blood vessels, thereby causing an increase in blood pressure (Adila & Mustika, 2023).

The history of regular medication use among the study sample was 19 people (95%) in the intervention group who took regular medication and 20 people (100%) in the control group who took regular medication.

The antihypertensive medication consumed by the sample was predominantly of the calcium channel blocker type, more commonly known by the brand name *Amlodipine*, which works by inhibiting the flow of calcium ions in the heart muscle and blood vessels, thereby causing the blood vessels to dilate and blood flow to increase (Tiyas, 2021) .

The nutritional status of the sample in this study showed that the majority had a normal nutritional status, comprising 8 people (40%) in the intervention group, whilst the control group comprised 6 people (30%) each with obesity, normal, and underweight nutritional statuses.

Intan et al. (2020) stated that obesity or excess body weight is one of several risk factors for the onset of hypertension; this is caused by an imbalance between the energy consumed and that expended by the body, resulting in excess energy being stored as fat within the body.

Nutritional Intake of the Sample

The difference in energy intake between the control group and the intervention group prior to the intervention was due to the fact that the majority of the intervention group still consumed sweetened coffee with 2–3 tablespoons of sugar per cup, drinking coffee more than twice a day. Consequently, the consumption of sweetened coffee contributed a greater amount of energy compared to the control group, the majority of whom preferred black coffee with 1–1.5 tablespoons of sugar per cup, consumed with the same frequency.

The difference in protein intake between the two sample groups prior to the intervention was due to the types of food consumed by the intervention group, which included slightly larger portions of protein-rich foods and more frequent consumption. Each day, the control group consumed 60–75 g of animal protein across three meals, thereby contributing a higher protein intake.

Fat intake prior to the intervention in the intervention group was 59.63g, higher than that of the control group at 31.81g, with $p=0.093$. Fat has many functions, including serving as a source of polyunsaturated fats (essential fats), aiding in the absorption of vitamins A, D, E and K, maintaining body temperature, and acting as a building block and precursor to prostaglandins. An increase in blood cholesterol levels can lead to plaque forming on blood vessel walls, which can block the vessels and affect their elasticity (Wati *et al.*, 2023) .

The difference in carbohydrate intake between the two sample groups during the intervention was due to the fact that the intervention consisted of mapia juice, which contains fewer carbohydrates than the sugar in coffee; furthermore, the source of sugar in mapia juice is superior, as it is derived from fruit sugar. During the intervention, participants who usually consumed coffee more than twice a day were able to reduce their coffee consumption, as the coffee they usually drank in the late morning was replaced with the provided mapia juice.

The average sodium intake prior to the intervention was 2931.1175 mg for the intervention group and 2616.910 mg for the control group, with $p=0.054$. The average sodium intake in the intervention group during the intervention decreased to 2,340.325 mg in the intervention group, whilst there was a slight increase in the control group to 2,617.600 mg, with $p=0.115$. Patients already suffering from hypertension had begun to reduce their intake of sodium-rich foods, such as skipjack tuna and salted fish, so sodium consumption tended to be favourable.

Magnesium is a mineral that does not play a direct role in lowering blood pressure; however, magnesium regulates blood pressure by altering the tone of vascular smooth muscle and cardiac muscle function through the regulation of calcium concentration and stores. An increase in magnesium concentration reduces intracellular calcium stores, likewise, a reduction in magnesium concentration leads to the influx of calcium into the extracellular space; an increase in extracellular magnesium reduces this influx of calcium. When blood pressure rises, magnesium mineral stores can help blood vessels relax; a lack of magnesium stores in the blood will cause blood vessel muscles to contract and respond to vasoconstrictor activity,

thereby triggering a response in certain dilator organs that leads to increased peripheral resistance and elevated blood pressure (Wiani *et al.*, 2024) .

The effect of mapia juice administration on blood pressure

In this study, the intervention group experienced a reduction in systolic blood pressure of 10.9 mmHg, compared to 1.3 mmHg in the control group, and a reduction in diastolic blood pressure of 7.95 mmHg in the intervention group, compared to 0.1 mmHg in the control group. Following the administration of Mapia juice to 20 hypertensive patients in the catchment area of the Perampuan Community Health Centre, blood pressure prior to the intervention was 157.26/106.10 $\pm$ 146.35/98.15 mmHg.

The results of this study are consistent with the research by Ani et al. (2024) on the effect of date juice administration on patients with high blood pressure at the Pengarayaan Community Health Centre, showing a *Wilcoxon test* result with a *significance p-value* of $0.000 < 0.05$, proving Hypothesis 1 that there is a significant effect on the administration of date juice in reducing blood pressure in the elderly at the Pengarayaan Community Health Centre in 2023. Dates can be used as an alternative treatment for hypertension, as they are a fruit high in potassium and are therefore capable of normalising blood pressure (Syafriati & Ana, 2024) .

CONCLUSIONS

The majority of the sample were aged 61–64 years, comprising both men and women in both groups, with the majority having a normal nutritional status; almost all participants took antihypertensive medication regularly. A *chi-square* test with $p > 0.05$ found no association between blood pressure and sample characteristics.

The 2 x 24-hour *recall* results from both sample groups showed that prior to the intervention, energy intake (50%) and carbohydrate intake (35%) were within the normal range, whilst protein intake (70%) was excessive, fat intake (45%) was severely deficient, and potassium (100%) and magnesium (100%) were insufficient. During the intervention, energy intake (55%), protein (45%), and carbohydrates (50%) remained within normal ranges, fat (40%) remained severely deficient, sodium (50%) was adequate, but potassium (95%) and magnesium (100%) remained deficient.

The average blood pressure in the intervention group before the intervention was 157.25/106.10 mmHg and after the intervention was 146.35/98.15 mmHg, representing a decrease of 10.9/7.95 mmHg. The average blood pressure in the control group before the intervention was 157.60/93.50 mmHg, and after the intervention it was 156.30/93.10 mmHg, showing a decrease of 1.3/0.4 mmHg.

The results of the *Mann-Whitney U* test on blood pressure in the intervention and control groups, using $\alpha=0.05$, showed that there was a significant difference in both systolic and diastolic blood pressure between the intervention and control groups.

RECOMMENDATIONS

Hypertensive patients are advised to consume Mapia juice regularly to maintain normal blood pressure and thereby avoid the need for antihypertensive medication.

For healthcare providers, Mapia juice can be used to support non-pharmacological treatment, thereby helping to normalise blood pressure and improve health programmes.

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