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EFFECT OF COMBINATION OF CORN (ZEA MAYS L) AND STEVIA (STEVIA REBAUDIANA) LEAVES AND ANTIHIPERTENSIVE MEDICINE ON REDUCTION OF BLOOD PRESSURE IN HIPERTENSIVE PATIENTS IN MAROS DISTRICT

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ABSTRACT:

Background: Hypertension is the number one cause of death in the world each year and is more common in low- and middle-income countries.

Objective: This study aims to analyse the effect of a combination of corn hair herbal tea and stevia leaves and antihypertensive drugs on blood pressure reduction in hypertensive patients in Maros Regency.

Methodology: The type of research used in this study is quantitative with the Experimental Research method.

Results: The intervention group (herbal tea combination of corn hair and stevia leaves and antihypertensive drugs) $p = 0.0000$ with a difference in blood pressure reduction before and after treatment of 18.3 mmHg while the control group (antihypertensive drugs) $p = 0.0024$ with a difference in blood pressure reduction before and after treatment of 7.9 mmHg.

Conclusion: The comparison of the percentage of blood pressure reduction between the intervention group was 8.57% and the control group was 5.64%. PROLANIS participants who suffer from hypertension are expected to use a combination of corn hair herbal tea and stevia leaves and antihypertensive drugs as alternative ingredients for healthy food processing, treatment, and use it as an alternative for people with hypertension who want to lower their blood pressure faster.

Keywords: Blood pressure, hypertension, corn hair, stevia

1. INTRODUCTION

The global target for non-communicable diseases is to reduce the prevalence of hypertension by 33% between 2010 and 2030. According to WHO data in 2021, hypertension is one of the NCDs that doubled between 1990 and 2019, from 650 million to 1.3 billion. Almost half of people with hypertension worldwide are currently unaware of their condition and more than three-quarters of adults with hypertension live in low- and middle-income countries. By 2019, an estimated 1.28 billion adults aged between 30 and 79 years are expected to be affected by hypertension worldwide, with hypertension prevalence of 32% in women and 34% in men.¹

The prevalence of hypertension in Indonesia is 25.8 per cent, this figure shows an increase compared to 2018 of 34.11%. The estimated number of hypertension cases in Indonesia is 63,309,620 people, while the death rate in Indonesia due to hypertension is 427,218 deaths.² According to Disease Prevention and Control (P2P) data, hypertension early detection coverage in Indonesia based on SIPTM and ASIK data is 13.57% (28,364,181 people out of 208,982,372 population aged 15 years). South Sulawesi Province ranks seventh with the lowest hypertension early detection coverage at 17.36%.³

Data from the South Sulawesi Provincial Health Office in 2022 found that Maros Regency was in fifth position with a prevalence of 1.37%. The first position is occupied by the working area of Marusu Health Centre with 9,141 cases, second is Turikale Health Centre with 8,920 cases and third is Mandai Health Centre with 6,413 cases.⁴

Not all of these cases are reached by health services, both from casefinding and treatment management. Treatment of hypertension can be done pharmacologically and non-pharmacologically. Pharmacological treatment is carried out by administering drugs while non-pharmacological by using natural ingredients. One of the plants used by the community as herbal medicine is corn hair.⁵

Research on corn hair tea with the addition of stevia leaves has been tested on patients with type 2 diabetes mellitus, but there has been no research on the use of corn hair processed in the form of herbal tea as an alternative functional drink with the addition of stevia leaves for people with hypertension.⁶ This encourages researchers to conduct research on the effect of corn hair tea on blood pressure in patients with hypertension with the addition of stevia as a safe natural sweetener in Maros Regency by taking samples at two health centres, namely Puskesmas Marusu and Puskesmas Mandai with the aim of knowing the effect of the combination of corn hair tea and stevia leaves on the blood pressure of PROLANIS who suffer from hypertension in Maros Regency.

2. METHODOLOGY

The type of research used in this study is quantitative with the Experimental Research method.

The population in this study were all PROLANIS participants in the working area of Puskesmas Marusu and Puskesmas Mandai Maros Regency who suffered from hypertension. The two health centres were selected based on the increase in hypertension cases in the previous year. The intervention group was Puskesmas Marusu and the control group was Puskesmas Mandai. The number of PROLANIS from both health centres was

51 people. Based on Federer's formula,

20 samples were obtained for each research group consisting of 20 intervention groups (Puskesmas Marusu) and 20 samples for the control group (Puskesmas Mandai), so that the total number of samples in this study was 40 respondents.

The dependent variable in this study was the blood pressure of PROLANIS participants, while the independent variable in this study was the combination of corn hair tea and stevia leaves and antihypertensive drugs.

Processing and analysis in this study using *Excel* and *Stata* version 14. If the data is normally distributed, the t- dependent test will be used. If the blood pressure results in the group were not normally distributed, the Wilcoxon test was used. In the analysis results, statistical significance is determined by the p value <0.05.

Research Ethics Approval: This study was approved by the Health Research Ethics Committee of Hasanuddin University with a recommendation for ethical approval number: 532/UN4.14.1/TP.01.02/2024 dated 23 February 2024.

3. RESULTS

Table 1: Frequency Distribution of General and Clinical Characteristics of Respondents at Puskesmas Marusu and Puskesmas Mandai, Maros Regency, 2024

General Character of Respondents	Intervention		Control		Total	
	n	%	N	%	n	%
Gender						
Male	5	25,00	5	25,00	10	25,00
Women	15	75,50	15	75,00	30	75,00
Age (years)						
45-59	7	35,00	9	45,00	16	40,00
≥60	13	65,00	11	55,00	24	60,00
Body Mass Index (BMI)						
Normal	6	30,00	6	30,00	12	30,00
Fat	8	40,00	10	50,00	18	45,00
Obesity	6	50,00	4	20,00	10	25,00
Medication Swallowing Supervisor						
Husband/Wife	7	35,00	9	45,00	16	40,00
Children	12	60,00	10	50,00	22	55,00
More	1	5,00	1	5,00	2	5,00

Source: Primary Data, 2024

Table 1 shows that there were more female respondents, 30 respondents (75.00%) with the same proportion in the intervention and control groups, 15 respondents (75.50%).

The age of respondents in this study was mostly in the age group ≥ 60 years, namely 24 respondents (60.00%). In the age group ≥ 60 years, more respondents were found in the intervention group, namely 13 respondents (65.00%) while in the control group 11 respondents (55.00%).

The IMT status of the respondents was mostly in the obese IMT category, namely 18 respondents (45.00%). Obese IMT status was more in the control group with 10 respondents (50.00%) compared to the intervention group with 8 respondents (40.00%).

Supervision of Swallowing Medication (PMO) in this study was mostly carried out by children, namely 22 respondents (55.00%).

Supervision/assistance of swallowing medicine carried out by the respondent's child was more in the intervention group, namely 12 respondents (60.00%) compared to the control group of 12 respondents (50.00%).

Table 2. Distribution of Mean Blood Pressure Systole Diastole of Intervention Group Before and After Treatment at Puskesmas Marusu and Puskesmas Mandai Maros Regency in 2024

Blood Pressure	Variables	Mean (mmHg)	Min	Max	□ SD
Sistol	Before	141,90	128	161	11,097
	After	123,60	114	141	6,692
Diastole	Before	88,65	81	98	3,19
	After	83,45	74	89	3,92

Source: Primary Data, 2024

Based on Table 2, it can be seen that the average systolic blood pressure in the intervention group before treatment was higher at 141.90 mmHg, min/max value = 128/161 and SD = 11.097 and after treatment the average blood pressure decreased to 123.60 mmHg. The min/max value = 114/141 and SD = 6.692, so there was a decrease in blood pressure by 12.90%. Meanwhile, diastolic blood pressure in the intervention group before treatment was higher at 88.65 mmHg, min/max value = 81/98 and SD = 3.19 and after treatment the average blood pressure decreased to 83.45 mmHg. The min/max value = 74/89 and SD = 3.92, so there was a decrease in blood pressure by 5.87%.

Table 3. Distribution of Mean Blood Pressure Systole Diastole of Control Group Before and After Treatment at Puskesmas Marusu and Puskesmas Mandai Maros Regency Year 2024

Blood Pressure	Variables	Mean (mmHg)	Min	Max	□ SD
Sistol	Before	143,50	124	182	14,240
	After	135,60	116	158	12,115
Diastole	Before	91,85	81	104	5,57
	After	86,35	80	99	4,67

Source: Primary Data, 2024

Based on Table 3, it can be seen that the average systolic blood pressure in the control group before treatment was higher at 142.50 mmHg, min/max value = 124/182 and SD = 14.240 and after treatment the average blood pressure decreased to 135.60 mmHg. The min/max value = 116/158 and SD = 12.115, so there was a decrease in blood pressure by 4.84%. Meanwhile, diastolic blood pressure in the control group before treatment was higher at 91.85 mmHg, min/max value = 81/104 and SD = 5.57 and after treatment the average diastolic blood pressure decreased to 86.35 mmHg. The min/max value = 80/99 and SD = 4.67, so there was a decrease in blood pressure by 5.99%.

Table 4. Differences in Systolic Blood Pressure Reduction Before and After Treatment in Intervention and Control Groups at Puskesmas Marusu and Mandai Health Centres in Maros Regency in 2024

Group	Variables	Mean (mmHg)	Standard Deviation	□ Mean	P=Value
Intervention (n=20)	Before	141,9	11,09	18,3	0,0000
	After	123,6	6,69		
Control (n=20)	Before	143,5	3,18	7,9	0,0024
	After	135,6	2,70		

Description: Intervention and Control: Independent t-test Source: Primary Data, 2024

Based on Table 4, it can be seen that the *mean* value of systolic blood pressure in the intervention group decreased before and after consuming herbal tea, with a difference of 18.3 with a *p-value* of $0.0000 < \square 0.05$, which means that there is a significant difference in systolic blood pressure before and after consuming corn hair herbal tea and stevia leaves. The systolic blood pressure value in the control group also decreased with a difference of 7.9 with a *p-value* = 0.0024

< 0.05 , which means there is a significant difference in blood pressure before and after taking antihypertensive drugs. The percentage comparison of blood pressure reduction between the intervention group was 8.57% and the control group was 5.64%.

Table 5. Differences in Diastolic Blood Pressure Reduction Before and After Treatment in Intervention and Control Groups at Puskesmas Marusu and Mandai Health Centres in Maros Regency in 2024

Group	Variables	Mean (mmHg)	Standard Deviation	□ Mean	P=Value
Intervention (n=20)	Before	88,65	3,19	5,2	0,0000
	After	83,45	3,92		
Control (n=20)	Before	91,85	5,57	5,5	0,0000
	After	86,35	4,67		

Description: Intervention and Control: Independent t-test Source: Primary Data, 2024

Based on Table 5, it can be seen that the *mean* value of diastolic blood pressure in the intervention group decreased before and after consumption of herbal tea, namely with a difference of 5.2 with a *p-value* of $0.0000 < \square 0.05$, which means that there is a significant difference in diastolic blood pressure before and after consuming herbal tea corn hair and stevia leaves. The diastole blood pressure value in the control group also decreased by a difference of 5.5 with a *p-value* = $0.0000 < 0.05$, which means there is a significant difference in blood pressure before and after taking antihypertensive drugs. The percentage comparison of blood pressure reduction between the intervention group was 5.78% and the control group was 6.11%.

4. DISCUSSION

Gender

The characteristics of respondents according to gender in this study showed that most of the respondents were female who suffered from hypertension, namely 30 respondents (75.00%). The results of this study are in line with research conducted by Pebrisiana et al in Central Kalimantan which found that hypertension cases were more prevalent in women with a percentage of 72.7%.⁷ Different results were obtained from research conducted by Marasabesy et al in Ambon which found that the percentage of hypertension cases tended to occur more in men with a percentage of 60%. This study explains that the most cases of hypertension occur in men, this is due to hormonal problems. In men, the hormone estrogen is very little or even absent. The estrogen hormone has a function, if the estrogen hormone is low or even absent, then the risk of developing hypertension is higher.⁸

Hypertension can occur in all groups, but the results of this study concluded that women experience more hypertension. This is due to a decrease in estrogen levels in women who have experienced menopause. This opinion is in line with the theory put forward by Podungge which states that women who have not experienced menopause are protected by the hormone estrogen which plays a role in increasing High Density Lipoprotein (HDL) levels.⁹

Age Group

The age group category of respondents in this study was dominated by the age group ≥ 60 years with 24 respondents (65%). These results indicate that PROLANIS at the puskesmas in this study tends to occur at a non-productive age. The results of this study are in line with research conducted by Nurhayati et al which showed that there was a significant relationship between age and the incidence of hypertension in patients at PKU Muhammadiyah Bantul Hospital.¹⁰ Other results obtained that are in line with this study are research conducted by Hidayah which shows that older respondents have a 5.5 times greater chance of experiencing hypertension compared to younger respondents.¹¹

Blood pressure in the elderly (elderly) will tend to be high so that the elderly are more at risk of hypertension (high blood pressure). Increasing age causes blood pressure to increase, because the walls of blood vessels in old age (elderly) will experience thickening which results in the accumulation of collagen in the muscle layer, so that blood vessels will gradually narrow and stiffen.

Body Mass Index (BMI)

Based on the Body Mass Index (BMI) category in this study classified into four groups, namely, thin, normal, obese and obese, the results showed that respondents tended to belong to obese BMI, namely 18 respondents (45.00%).

Similar results were also obtained in the study of Hossain et al in the South Asian population, namely in the regions of Bangladesh, India and Nepal, this study found a significant relationship between BMI and hypertension. The results showed that every increase in BMI by 5 kg/m² increased the risk of hypertension by 1.79 times in Bangladesh, 1.59 times in India, and 2.03 times in Nepal. This study states that overweight people have almost twice the chance of developing hypertension, while obese people have more than three times the chance of developing hypertension.¹²

A body mass index (BMI) that is too high is two to three times more likely to have high blood pressure compared to a normal or lean body mass index. The higher the body mass, the more blood is needed to provide oxygen and nutrients to the body tissues. This means the amount of blood flowing through the blood vessels increases, putting greater pressure on the

artery walls.¹³.

Medication Swallowing Supervisor

There are four factors that influence medication adherence, one of which is family support which plays an important role in the patient's healing process, especially in monitoring or supervising the supervision of taking medication.¹⁴.

Based on table 1, it was found that most respondents were accompanied by children, namely 22 respondents (55%). The role of PMO in this study is to help supervise or remind respondents about the consumption schedule of herbal tea and antihypertensive drugs and activities that can trigger an increase in blood pressure. In addition, the supervisor who takes this medicine actively communicates with researchers during home visits, communication by telephone is difficult to do because most PMOs only have mobile phones, but communication is still carried out to prevent unwanted things from happening at the time of consumption of corn silk stevia herbal tea, for example allergies, or hypotension occurs during consumption. Similar results were also found in research conducted by Muslims in the Poso region, obtained a p value of 0.02

<0.05, meaning that there is a relationship between family support and the occurrence of hypertension. Family support is an indispensable support for people with hypertension, both information support, instrumental support, and assessment support.¹⁵. Families are able to make the right decisions about health services, take their children to health services, help with medical expenses, remind children to take medicine, and provide and maintain a home atmosphere that is always conducive to health and emotional development.¹⁶.

Difference in Blood Pressure Before and After Intervention

A condition called hypertension occurs when blood pressure is in the above-normal category. Based on the results of table 2 and table 3, the results of consumption of corn silk tea and stevia leaves and antihypertensive drugs show that there are differences in the results of systolic and diastolic blood pressure before and after treatment in the intervention group. . And in the control group there were also differences in blood pressure results before and after treatment with an average value of systolic blood pressure of 18.3 mmHg and 7.9 mmHg, respectively, and an average diastolic blood pressure of 5.2 mmHg and 5.5 mmHg. So it is proven by statistical tests that there is a difference in blood pressure reduction in the intervention group which is higher than the control group.

Similar results occurred in a study conducted by Rabi et al. Their study found that corn hair extract can inhibit the activity of Angiotensin-I-Converting Enzyme (ACE) which plays an important role in regulating blood pressure. ACE converts angiotensin I into angiotensin II, a powerful vasoconstrictor, by inhibiting ACE, the formation of angiotensin II is reduced, thus helping to lower blood pressure.¹⁷.

Based on the observations of researchers during the field, the intervention group who consumed stevia corn silk herbal tea plus antihypertensive drugs obtained more results in lowering blood pressure compared to the control group who only consumed antihypertensive drugs, this is due to the main content of flavonoids in the combination of stevia corn silk herbal tea which plays an important role in controlling blood pressure in people with hypertension. In line with the theory in the study¹⁸. It is explained that the flavonoid content in corn hair and stevia makes these plants have natural antioxidant activity that can ward off free radicals and lower blood pressure. This is also supported by phytochemical tests conducted by researchers to determine the flavonoid content in corn silk stevia herbal tea, the results show that one teabag contains 13.57 flavonoids, if consumed twice a day for 14 days, the total flavonoid content contained in it is around 325.75 flavonoids.

In addition, the antihypertensive drugs consumed by respondents in this study were

amlodipine. Amlodipine works by inhibiting the entry of calcium into the blood vessels, where calcium is needed for muscle contraction. In smooth muscle if the calcium channel is blocked, calcium intake will be reduced so that muscle tone weakens and smooth muscle blood vessels widen, this relaxation is a form of vasodilation so that blood pressure can decrease. So that stevia corn hair herbal tea can be consumed regularly as an alternative in controlling and lowering blood pressure.

5. CONCLUSIONS

The intervention group (consumption of herbal tea combined with corn hair and stevia leaves and antihypertensive drugs) there was a decrease in blood pressure by 8.57% with a mean blood pressure value before treatment of 141.9 mmHg and after consumption of corn hair herbal tea and stevia leaves and antihypertensive drugs decreased to 123.5 mmHg. While in the control group (consumption of antihypertensive drugs), there was a decrease in blood pressure by 5.64% with a mean blood pressure value before treatment of 143.5 mmHg and after treatment of 135.6 mmHg.

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