

Effectiveness of giving edamame supplementation (*Glycine Max* L. Merrill) on improvement blood pressure in women of childbearing age with hypertension

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Abstract

Background: Women of childbearing age who have hypertension can continue or have the potential to experience hypertension in their pregnancy. The prevalence of hypertension in Indonesia tends to increase with age. Alternative treatment of hypertension with giving edamame (*Glycine Max* L. Merrill) which can reduce blood pressure.

Objective: This study aims to determine the effectiveness of giving edamame supplementation (*Glycine Max* L. Merrill) on improving blood pressure in women of childbearing age with hypertension.

Method: This research is a quasi-experimental with was the draft nonequivalent control group design. Data retrieval involved 40 respondents of women of childbearing age and still menstruating, selected through a technique non probability sampling with a method purposive sampling which was divided into 2 groups: the intervention group was given amlodipine drugs 5 mg / day and edamame extract (*Glycine max* L. Merrill) dose of 25 grams / day, while the control group was only given amlodipine 5 mg / day. Results: The results t test showed a significant difference with the mean systolic p value of 0.003 (<0.05) and diastolic p value of 0.001 (<0.05) means that the intervention group is better at lowering blood pressure than the control group, with a systolic difference of 20.7 mmHg and diastolic 9.5 mmHg.

Conclusion: Giving of edamame supplementation (*Glycine Max* L. Merrill) 25 grams / day for 30 days is very effective in reducing blood pressure in women of childbearing age with hypertension.

Keywords: edamame supplementation (*Glycine Max* L. Merrill), hypertension, women of childbearing age

1. Introduction

High blood pressure is a state of increased blood pressure, with systolic pressure increasing ≥ 140 mmHg and diastolic blood pressure increasing ≥ 90 mmHg, this occurs on two examinations. Measurements are taken when the patient is calm. Various health problems to complications can occur if this condition is not treated or get treatment. Complications and health problems will occur if hypertension is left without treatment. Parts of the brain will cause a stroke. Part of the eye causes retinopathy to blindness. Causes coronary heart disease in the heart. Causing chronic kidney disease and terminal kidney failure. The amount of hypertension continues to increase due to uncontrolled blood pressure [1].

Women of childbearing age who have hypertension can continue or have the potential to experience hypertension in their pregnancy. Women have an important role in the family and in the social environment. As many as 52% of women from all over the world are included in the fertile age category. Fertile age is a time when women become very vulnerable to nutritional problems due to various biological conditions such as menstruation, pregnancy, and breastfeeding [2]. Pregnancy hypertension can be chronic. The pathophysiology of pregnancy itself, the process of cardiovascular changes in pregnant women and other adaptations, can worsen the condition of the mother. Existing hypertension can continue in the state of preeclampsia, eclampsia, to gestational hypertension, where hypertension persists for up to 3 months post-partum [3].

High blood pressure is owned by approximately one billion

people in the world. Two-thirds are from developing countries. Estimated in 2025, hypertension occurs in 1.56 adults. Every year around 8 million people worldwide die from hypertension. Southeast Asia region, hypertension occurs approximately 35% of the number of adults. Every year 1.5 million deaths are 9.4% of the total deaths caused by hypertension [4].

The prevalence of hypertension in Indonesia tends to increase with age. The prevalence of hypertension in the range of 18-24 years is 13.2%, ages 25-34 years are 20.1%, 35-44 years are 31.6%, 45-54 years are 45.3%, 65-74 years are 63.2% and the age group >75 years by 69.5%. In men as much as 31.3%, while in women as many as 36.9% [5].

Central Java, non-communicable diseases, especially hypertension in 2014, which occurred as much as 57.89% which is the main period. Likewise, with subsequent years, hypertension still remains a major problem of non-communicable diseases [6]. Every year it does not decrease, but it increases. In 2016 hypertension in Central Java increased by 60.00% [7]. An increase of 64.83% for the problem of hypertension in Central Java Province in 2017. The increase in hypertension in Central Java Province every year cannot be said little so that this case needs to be followed up and re-evaluated considering the causes that can occur from various factors [8].

Central Java Province in 2016 20.16% of people at risk of hypertension are people aged >18 years blood pressure checked. As many as 11.55% had hypertension based on this examination. 11.85% of women experience

hypertension and 11,16% for men. Based on these data shows that more women experience hypertension. Jepara and Demak are the highest districts with hypertension 100% of the total blood pressure level [7].

The incidence of hypertension in 2018 in Jepara Regency was 41,082 cases, with the highest region experiencing hypotension, namely the Mlonggo Public Health Center Region with 336 cases of hypertension [9]. The population in the Mlonggo Public Health Center is 4450 residents. Where blood pressure was measured in 100% of the population aged > 18 years with a hypertension rate of 7% in the male population and 7% in the female population. Visit in November 2019, there were 69 special essential hypertensions in women of childbearing age at Mlonggo Public Health Center [10].

The existence of free radicals, possibly can cause hypertension. Free radicals produced by our body cause cell damage in the body. Damage to body cells that occur can result in cancer, diabetes and heart disease. These antioxidants function to repair damaged cells and remove free radicals in the body [11].

Antioxidants are found in foods, and those that contain the most antioxidants are fruits and vegetables. One food that contains antioxidants is soy. Evidenced by Handayani's research which showed a decrease in blood pressure in patients who have hypertension by giving soy milk where each portion contains 25.5 g of soy powder [12]. The results of Francine K. Welty's research show lowering LDL levels and systolic and diastolic blood pressure in women who are hypertensive by giving soy for 8 weeks by 25 gram [13]. The study of Maryam Sadat Miraghajani *et al* said that 240 cc of soy milk was given within 4 weeks of decreased systolic blood pressure compared to cow's milk [14].

Soybeans contain a lot of isoflavones. One type of soybean is edamame (Glycine max L. Merrill). One study contained 80.7 - 213.6 mg / 100 gram of isoflavones. Research says that higher adamame consumption can reduce the risk of death from gastric, colorectal, and lung cancer and ischemic cardiovascular disease. The group given edamame consumption, with its isoflavone content, had a 10% lower risk of causing death compared to those in the low category of edema intake [15].

Hypertension can also be treated with essential antihypertensive drugs that have been widely circulating in the market. Antihypertensive drugs can not only reduce blood pressure but have side effects. Side effects of antihypertensive drugs are influenced by the body's tolerance for drugs and compliance in taking them. Antihypertensive drugs can cause other problems for the user's body. The study concluded that the side effects of enalapril type hypertension drugs experienced dry cough in most patients (66.7%) and dry cough and dizziness experienced by one patient (6.7%). In the use of atenolol the side effects experienced, namely bradycardia, dizziness, and insomnia experienced by patients (14.3%). Then the use of amlodipine, side effects experienced were peripheral edema (23%), flushing (2.6%), dyspnea (2.6%), headache (5.1%), dizziness (2.6%), palpitations (2.6%) and insomnia (2.6%) [16].

With this in mind, a study is needed to determine whether the administration of edamame supplementation (Glycine

max L. Merrill) can provide changes in blood pressure in women of childbearing age?

3. Methods

This type of research uses quasi experimental with the draft nonequivalent control group design. Researchers arranged two groups: the intervention group was given amlodipine 5 mg / day and edamame extract (Glycine max L. Merrill) dose of 25 grams / day, while the control group was only given amlodipine 5 mg / day without edamame extract (Glycine max L. Merrill). Therapy Edamame supplementation (Glycine Max L. Merrill) is given for 30 days. Systolic and diastolic blood pressure measurements can be performed using a digital tensimeter instrument and recorded on the observation sheet. Measurement of the blood pressure of respondents who have hypertension that is before (pretest) and after the action of the therapy (posttest). The population in this research were all women of childbearing age and still menstruating hypertension at the Mlonggo Public Health Center in Jepara Regency. Determination of the minimum number of samples using techniques non probability sampling with the method of purposive sampling and based on inclusion and exclusion criteria as many as 40 respondents divided into two groups with 20 respondents each in the intervention group (amlodipine drug 5 mg therapy with edamame extract (Glycine max L. Merrill) and 20 respondents in the control group (therapy drug amlodipine 5 mg without edamame extract (Glycine max L. Merrill)).

In this research, researchers conducted data collection by means of observation, identification, interviews and filling in the observation sheets. The data collected was analyzed through the IBM SPSS program version 21.0, and continued with different tests, namely parametric and non-parametric tests (Paired t test, Wilcoxon Test and Mann Witney). The processed data is used as a basis for discussing statement matters, which are then presented in tabular form so that conclusions can be drawn.

3. Results

Table 1: Frequency distribution of respondents from education and employment based on demographic data

Characteristics	Intervention (n=20)		Control (n=20)		P
	n	%	n	%	
Employment					
Work	5	25	7	35	0.187
Does not work	15	75	13	65	
Education					
Elementary school	7	35	3	15	0.688
Middle School	8	40	8	40	
High school	5	25	8	40	
College	0	0	1	5	
Total	20	100	20	100	

*Homogeneous test

Based on the above table, it is obtained that education and employment in the treatment and control groups have the same significant value p value >0.05 means same or homogeneous.

Table 2: Differences in mean systolic blood pressure before and after treatment in the intervention group and control group

Variable / Group	Mean	SD	Mean difference	P-value
Intervention Group				
Pre (systolic)	167.80	20.575	20.7	0.000*
Post (systolic)	147.10	20.235		
Control Group				
Pre (systolic)	164.90	19.625	10.75	0.000*
Post (systolic)	154.15	15.394		

*Wilcoxon test

The above table shows that there are differences in systolic blood pressure before and after the treatment given in the intervention group or the control group. However, the difference in systolic blood pressure reduction in the intervention group was greater than in the control group.

Table 3: Differences in mean diastolic blood pressure before and after treatment in the intervention group and control group

Variable / Group	Mean	SD	Mean difference	P-value
Intervention Group				
Pre (diastolic)	102.95	7.626	9.5	0.003*
Post (diastolic)	93.45	12.211		
Control Group				
Pre (diastolic)	105.40	5.968	6.5	0.001**
Post (diastolic)	98.90	6.025		

*Paired t test

**Wilcoxon test

The above table shows that there are differences in diastolic blood pressure before and after treatment given in the intervention group and the control group. However, the difference in diastolic blood pressure reduction in the intervention group was greater than in the control group.

Table 4: Analysis of mean difference in systolic blood pressure between the intervention group and control group

Variable	n	Mean rank	SD	p-value
Systolic intervention	20	15.00	21.642	0.003*
Systolic control	20	26.00	0.506	

*Man, Witney test

Based on the table above shows that there are differences a significant decrease in systolic blood pressure between the intervention group and the control group with a p value 0.003 (<0.05), in conclusion the intervention group was better at reducing systolic blood pressure than the control group.

Table 5: Analysis of mean difference in diastolic blood pressure between the intervention and control group

Variable	n	Mean rank	SD	p-value
Diastolic intervention	20	14.38	11.252	0.001*
Diastolic control	20	26.63	0.506	

*Man, Witney test

Based on the table above shows that there are difference a significant decrease in diastolic blood pressure between the intervention group and the control group with a p value 0.001 (<0.05), in conclusion the intervention group was better at reducing diastolic blood pressure than the control group.

4. Discussion

4.1 Differences in mean systolic and diastolic blood pressure before and after treatment in the intervention group and control group

The results of the paired t test systolic and diastolic blood pressure before and after treatment in the intervention group and control groups showed a significant difference before and after treatment in both the intervention group and control group. The intervention group decreased systolic blood pressure averaged 20.7 mmHg (p=0.000), decreased diastolic blood pressure averaged 9.5 mmHg (p=0.003). Whereas in the control group the decrease in systolic blood pressure was 10.75 mmHg (p=0.000), the decrease in diastolic blood pressure was 6.5 mmHg (p=0.001). This shows that there are differences in systolic and diastolic pressure before and after giving of edamame, the hypothesis is accepted.

Peel edamame packages containing 500 grams are stored in the refrigerator freezer before use. Edamame small plastic clip packaging was weighed using a digital scale according to the dosage of 25 grams (2 tablespoons). Edamame packs 25 grams put into a large plastic clip with the amount of 30 plastic for consumption in the next 30 days.

The content of isoflavones in edamame is esterogenic or estrogen-like in women. This esterogenic isoflavone can maintain a balance between antioxidant activity and free radicals. This will reduce MDA levels in women of childbearing age which are active compounds in the event of oxidative stress [17]. This is supported by a study that said consumption of isoflavones can improve systolic and diastolic blood pressure p <0.01 [18].

The analysis test showed significant results in the group giving edamame and amlodipine 5 mg, this is because of the way amlodipine works by lowering the level of calcium ions, thus providing vasodilation effect on blood vessels. The control group that only received amlodipine therapy also showed a decrease in systolic blood pressure, but a decrease in systolic blood pressure in the intervention group was greater than 10.05 mmHg. Compared with systolic blood pressure in the control group which decreased by only 3.0 mmHg.

This is similar to other studies that use antihypertensive drugs as controls. Another study said that there were differences in the mean values of systolic and diastolic blood pressure before and after the intervention of respondents who were given additional boiling of dried roselle blossoms with therapy captopril with systolic mean before intervention by 170.67 mmHg and after the intervention being 151, 33 mmHg. The mean diastolic blood pressure before intervention was 97.67 to 87.67 mmHg [19].

4.2 Analysis of mean difference in diastolic blood pressure between the intervention and control group

Statistical tests between the intervention group and the control group there were significant differences in systolic blood pressure reduction of 147.10 mmHg ($p=0.003$) and in the reduction of diastolic blood pressure of 154.15 mmHg ($p=0.001$). This shows that the hypothesis is accepted. Blood pressure is a push in the arterial wall, systolic pressure occurs when ventricular contraction is at its peak. Diastolic pressure occurs when the heart is in rest, so the pressure is at its lowest position^[20]. Hypertension if systolic pressure >140 mmHg and diastolic pressure >90 mmHg^[21]. Alternative therapies for lowering blood pressure by providing edamame have proven to be effective in lowering blood pressure in women of childbearing age who have hypertension. The content of isoflavones and vitamin C compounds in helping the body's metabolism to lower blood pressure, both systolic and diastolic blood pressure.

The high vitamin C content in edamame has the effect of increasing nitric oxide so that it can prevent oxidative stress which can cause endothelial disorders. According to a study, where there are different levels of nitric oxide in people with hypertension and not hypertension. Nitric oxide levels in people with hypertension are lower than those without hypertension $p=0.023$. The lower the levels of nitric oxide, the higher the diastole or blood pressure of systole^[22].

This study is in line with research that states 100g soybean cookies a day can reduce systolic and diastolic blood pressure after being treated for 7 days^[23]. While in this study the mean systolic and diastolic blood pressure between the intervention group and the control group showed a significant difference ($p < 0.05$). Systolic blood pressure decreased at checking blood pressure (day 16) mean 157.75 mmHg until the 31 day by 147.1 mmHg in the intervention group, whereas in the control group on the 16th day 154.95, mmHg to the 31 day the mean value becomes 164.9 mmHg. Diastolic blood pressure decreased from the 16 day the mean value of 100.25 mmHg until the 31 day was 93.45 mmHg in the intervention group, whereas in the control group on the 16 day the mean value was 103 mmHg until the 31 day the mean value was 105.4 mmHg.

Other studies are in line with the provision of 200 ml of tomato juice per day. Done for 7 days. the result was a decrease in systolic blood pressure of $11.76 \pm 7,276$ mmHg and diastolic blood pressure of $8.82 \pm 3,321$ mmHg in the intervention group. It can be said that tomato juice can reduce systolic blood pressure and diastolic blood pressure^[24].

The results of this study are in line with studies using antihypertensive drugs as a control namely the influence of the consumption of ambon bananas on blood pressure reduction with the results of the analysis of the Man Whitney Test, systolic blood pressure and diastolic posttest between the intervention and control groups obtained systolic values ($p=0.000$) and diastolic ($p=0.004$). There was a significant influence between the intervention groups on systolic and diastolic blood pressure reduction^[25].

5. Conclusion

Based on data processing and analysis of edamame supplementation therapy (Glycine Max L. Merrill), it can be concluded that the average decrease in systolic blood pressure in the intervention group with a difference of 20.7 mmHg more than the average decrease in systolic blood

pressure in control group with a difference of 10.75 mmHg with a p value of 0.003 (<0.05). Whereas the decrease in diastolic blood pressure in the intervention group with a difference of 9.5 mmHg was more than the average decrease in diastolic blood pressure in the control group with a difference of 6.5 mmHg with a p value of 0.001 (<0.05).

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