Window of Health Jurnal Kesehatan
journal homepage : www.jurnal.fkmumi.ac.id



ARTICLE RESEARCH

URL artikel: http://jurnal.fkmumi.ac.id/index.php/woh/article/view/woh8103

Tempe Juice And Yogurt's Efficacy On Pregnancy Hypertension

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ABSTRACT

Hypertension is one of the non-communicable diseases that cause most deaths. In the last six months, there have been ten cases of hypertension in pregnant mothers at the South City Health Center. Age, genetic factors, and parity can cause hypertension in pregnant mothers. This study aims to determine whether tempe yogurt and tempe spice juice help reduce hypertension in pregnancies in the South Puskesmas Working Region. The quantitative study was conducted from April to September 2023 and used a quasi-experimental design of two groups of pretest and posttest. Purposive sampling of 40 individuals was used to collect the samples. The results of the study showed that respondents in group A were over 35 years old (35%), group B were 20-35 years old (45%), and group A had a parity of 2 and 4 years (55%), and group B had a Parity of 2 to 4 years (80%). No history of hypertension in groups A and B (75%, 70%). It can be concluded that consuming tempe yogurt and tempe spice juice regularly is shown as one way to reduce hypertension during pregnancy.

Keywords: Hypertension; Juice; Spices; Tempe; Yogurt

PUBLISHED BY :
Faculty of Public Health
Universitas Muslim Indonesia
Address :
Jl. Urip Sumoharjo Km. 5 (Kampus II UMI)
Makassar, Sulawesi Selatan.
Email :
jurnal.fkm@umi.ac.id

Article history :
Received 17 April 2024
Received in revised form 21 July 2024
Accepted 17 December 2024
Available online 25 January 2025

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INTRODUCTION

Non-communicable diseases (NCDs), also referred to as public health issues, are becoming a major global, national, regional, and local concern. Non-communicable diseases (NCDs) have killed 40 different types of diseases worldwide, according to a 2019 WHO report. This NCD is responsible for over 60% of all fatalities worldwide and causes suffering for 43% of the world's population. An estimated 1.56 billion persons worldwide are expected to have hypertension in 2020. In Indonesia, one of the leading causes of death is hypertension. Based on the 2019 Riskesdas data, 34.1% of Indonesians had hypertension, with a ratio of 35.9% for women and 32.3% for males.[1] After bleeding, the second most common cause of maternal death in Indonesia during pregnancy is hypertension. In this instance, hypertension during pregnancy is brought on by severe preeclampsia, which raises the mother's risk of problems and even death. In Indonesia, the number of pregnant women with hypertension is rising. The result is that this illness accounts for over 30% of maternal fatalities in this nation. Maternal deaths are caused by bleeding, particularly in pregnancy. On the other hand, Indonesia's rates of maternal mortality have increased in tandem with the rise in the number of instances of hypertension during pregnancy.[2]

According to information from the South City Health Center, 20 of the 224 pregnant women in 2022 had hypertension; ten pregnant women with hypertension will be pregnant between January and April of 2023. When a person's diastolic blood pressure is greater than 90 mmHg and their systolic blood pressure is greater than 140 mmHg, they are deemed to be at risk of hypertension. There are two categories of risk factors for hypertension: the first category includes modifiable risk factors, like age, gender, genetics, and pregnancy-related parity. Risk factors that are unchangeable, such stress, obesity, alcoholism, smoking, and salt intake, make up the second category.[3]

There are two approaches to treating hypertension: either with specialized medications or with non-pharmacological approaches. There is an alternative that may be thought about in order to have the desired result, which is ingesting processed tempeh that is turned into a drink for hypertensive pregnant women. The study findings indicate that there is a noteworthy distinction between the mean systolic and diastolic blood pressure of pre-eclamptic pregnant women who received yogurt and those who did not. Pregnant women who drink yogurt can avoid preeclampsia. Additionally, studies have shown that feeding tempe juice has a substantial impact on total cholesterol, LDL cholesterol, HDL cholesterol, and triglyceride cholesterol levels ($p<0.05$).[4,5]

Tempeh is a fermented food that lasts longer than other comparable items, is easy to eat, and may be made into drinks. This product lasts longer and is easier to use because to its two primary advantages. Soybean protein contains the amino acid arginine, which functions as a precursor to nitric oxide (NO), which dilates blood vessels. One of nitric oxide's properties is its ability to prevent blood platelets from clumping together, promoting fluid blood flow. Magnesium, calcium, and potassium are found in dairy products like yogurt. Blood pressure can be effectively lowered by the body when potassium, calcium, and magnesium intake are balanced.[6]

The purpose of this study is to ascertain if offering tempeh yogurt and tempeh spice juice in the South City Health Center Working Area will effectively prevent pregnancy-related hypertension. The result of processed tempeh, which is used as a foundation for beverages acceptable for pregnant women to consume, such as tempeh yogurt drinks and tempeh spice juice, is what makes this research innovative.

METHOD

Quantitative research methodologies were applied in this study using a two-group pretest-posttest quasi-experimental research design. The study was conducted at the South City Health Center from April to September of 2023. The independent variables in this study were tempeh yogurt and tempeh spice juice. For three days, 200 cc of tempeh yogurt and juice were administered. The study's dependent variable was the prevalence of hypertension among expectant mothers. All of the women in the South City Health Center Work Area who are pregnant and come for pregnancy checks make up the population. In this study, forty individuals served as samples. Purposive sampling was the technique used for the sample. The device used to measure blood pressure is called a sphygmomanometer or blood pressure monitor. In addition, questionnaires about age, parity, and heredity as well as blood pressure monitoring sheets were utilized to gather data on the history of hypertension in expectant mothers. Shapiro-Wilk test, Paired t-test, and Independent t-test were the statistical tests employed in this study's normalcy test. On August 24, 2023, the Gorontalo Health Polytechnic ethical committee (DP.01.01/KEPK/201/2023) conducted an ethical test for this research.

RESULTS

Table 1. Characteristics of Pregnancy Hypertension in South City Health Centers

Mother's Age	Group A		Group B	
	f	%	f	%
<20 Years	4	20	5	25
20-35 Years	9	45	9	45
>35 Years	7	35	6	30
Total	20	100	20	100

Table 1's findings revealed that, of the respondents in groups A and B, 9 (45%) were between the ages of 20 and 35, whereas 4 (20%) and 5 (25%) of the respondents under 20 years old were in group A. Six (30%) and seven (35%) of the respondents in group B and A were over 35 years old.

Table 2. Characteristics of Pregnancy Hypertension Based on Parity in South City Health Centers

Parity	Group A		Group B	
	f	%	f	%
2-4	9	45	16	80
<2- >4	11	55	4	20
Total	20	100	20	100

Table 2 presented the findings, which indicated that 9 (45%) of group A and 16 (80%) of group B had parity 2-4, whereas 11 (55%) of group A and 4 (20%) of group B had <2->4.

Table 3. Characteristics of Pregnancy Hypertension Based on Hereditary History At the South City Health Center

Ancestral History	Group A		Group B	
	f	%	f	%
Yes	5	25	6	30
No	15	75	14	70
Total	20	100	20	100

Table 3 presented the results, which indicated that 5 (25%) of the pregnant women in group A and 6 (30%) of group B had a history of hypertension, while 15 (75%) of the pregnant women in group A and 14 (70%) of group B did not.

Bivariate Analysis

The study employed pariate t test and independent t test analysis. The results were first tested using the Shapiro Wilk test; before the intervention, the systole and diastole were 0.124 and 0.500, respectively, and after the treatment, they were 0.119 and 0.223, respectively, indicating a normally distributed sample.

Table 4. Variations in blood pressure among expectant mothers in the Tempeh Yogurt Intervention group (A)

	Pre Test		Post Test		VALUE p-Value
	Mean	Standard Deviation	Mean	Standard Deviation	
Systole	139	7.88	122	6.15	0,000
Diastole	97	7.32	83	8.12	0,000

Changes in group A's blood pressure can be seen both before (pretest) and after (posttest) the intervention, according to the data from Table 5. The average systolic blood pressure was 139 mmHg with a standard deviation of 7.88 prior to the intervention, and it was 122 mmHg with a standard deviation of 6.15 following the intervention. With a p value of less than 0.05 ($p<0.05$), this indicates a significant difference and indicates that group A's systolic blood pressure decreased significantly both before and after the intervention. In the meantime, the diastolic pressure was 87 mmHg with a standard deviation of 7.32 before treatment. Following therapy, group A's average diastolic blood pressure was 83 mmHg, with a standard deviation of 8.12 and a p-value of 0.000 ($p < 0.05$), according to the results. This suggests that group A's diastolic blood pressure significantly decreased.

Table 5 presents changes in group B's blood pressure before (pretest) and after (posttest) the intervention. The systolic blood pressure was 140 mmHg on average before the intervention, with a standard deviation of 7.94, and 116 mmHg on average after the intervention, with a standard deviation of 4.84. This demonstrates a substantial difference, with a p-value of less than 0.05 ($p<0.05$), indicating

that group B's systolic blood pressure significantly decreased before and after the intervention. In the meantime, the diastolic pressure was 97 mmHg with a standard deviation of 7.16 before treatment.

Table 5. Variations in Blood Pressure Among Expectant Mothers Receiving Tempeh Spice Juice in Group (B)

	Pre Test		Post Test		
	Mean	Standard Deviation	Mean	Standard Deviation	VALUE p-value
Systole	140	7.94	116	4.84	0,000
Diastole	97	7.16	80	7.59	0,000

Table 6 data indicate that there was a significant difference in the reduction in systolic blood pressure between groups A and B after receiving tempeh yogurt and tempeh spice juice. A p-value of 0.0023, or $p < 0.05$, was found for systolic blood pressure in each group.

Table 6. Variations in Systolic and Diastolic Blood Pressure in Groups A and B Following the Administration of Tempeh Yogurt and Tempeh Spice Juice

Group	Blood pressure		Mean	Devuiation Standards	P Value
Group A	Systole	Posttest	122	6.15	0.0023
Group B	Systole	Posttest	116	4.48	

DISCUSSION

Pregnancy hypertension is the leading cause of mother and child death. Ten million women suffering from pregnancy hypertension that leads to preeclampsia occurs around 5-10% every year worldwide.[7] Pregnancy hypertension is the occurrence of an increase in blood pressure of 140mmHg or more after the previous 20 weeks of pregnancy being normal, or a rise in systolic blood pressure 30 mmHg and diastolic pressure of 15mm Hg above normal values. Pregnancy hypertension occurs in about 5-15% of pregnancies and is one of the three causes of mortality and pain in mothers.[8]

One of the three primary causes of maternal death, along with hemorrhage and infection, is hypertension, which frequently occurs during pregnancy. 10% or so of pregnancies are impacted by hypertension, which raises the risk of maternal and neonatal mortality. Given that pregnant women do not exhibit any particular symptoms, hypertension can be a serious condition. This could result in the mother and unborn child's deaths.[9] A higher risk of developing hypertensive disorders of pregnancy was linked to nulliparity, old age, obesity, family history of hypertension, history of hypertensive disorders of previous pregnancy in multiparous women, personal/family history of chronic hypertension/diabetes mellitus, high energy diet, gestational diabetes, mental stress during pregnancy, long intervals between pregnancies, lower socioeconomic status, and inadequate antenatal care.[10] Pregnancy hypertension can disrupt organ function, especially vital organs such as the heart, kidneys and eyes. Pregnant women who have hypertension in their initial pregnancy are more likely to develop

preeclampsia in later pregnancies. Serious consequences such placental abruption, cerebrovascular illness, organ failure, and intravascular coagulation are most likely to occur in pregnant women with hypertension.[11]

Table 6 data revealed that the p-value for the systolic blood pressure in groups A and B was 0.0023 or P<0.005, indicating a statistically significant difference in the lowering of systolic blood pressure following the consumption of tempeh yogurt and tempeh spice juice. This study is consistent with previous studies that suggested that giving a drink from Tempe significantly tends to lower systolic blood pressure.[12]

As a main ingredient, soybeans are a type of functional food that contains nutrients like isoflavones, saponins, lecithin, and phytosterols. These nutrients have vasorelaxant properties that can lower the risk of heart disease. Giving soy milk can lower systolic and diastolic blood pressure in men and women with hypertension.[13][14][15] Drinking soya-based ingredients can lower blood pressure (a potential vasodepressor, a precursor to nitric oxide (NO) vasodepressor, and enhance Na and K secretion in the urine) with the right formulation and quantity. The protein content (amino acid arginin, tryptophan), isoflavone as an antioxidant, and potassium in soybeans can lower blood pressure in hypertensive patients.[16] Peptides from proteins such as those found in soybeans have the ability to modulate the Renin-Angiotensin System to decrease the activity of the renin that acts as an enzyme modifying the Angiotenzin Converting Enzyme (ACE), enhance the synthesis of the endothelial nitric oxide to increase the levels of Nitric Oxide (NO) in the walls of the blood vessels, increase vasodilatation, and block the intersection between Angiotensin II and the receptors of angiotensin that contribute to decreased blood pressure.[17]

When compared to soybeans, tempeh provides a number of benefits, including higher vitamin content, improved mineral bioavailability, and better protein, carb, and fat digestion. The process of germination might raise the amount of protein. Proteins and a few other complex molecules can be hydrolyzed into simpler forms like amino acids and peptides during the fermentation process by R. oligosporus that turns soybeans into tempeh. Tempeh bioactive peptides, which have the ability to function as ACE (Angiotensin Converting Enzyme) inhibitors, are another factor contributing to the hypotensive qualities of tempeh. Angiotensin I is changed into angiotensin II by the enzyme ACE. Angiotensin is a major factor in blood pressure elevation. Thus, eating food made with tempeh can help decrease blood pressure.[18]

CONCLUSIONS AND RECOMMENDATIONS

The results of the study show that tempe yogurt and tempe spice juice are useful for reducing hypertension in pregnancy. Tempeh offers several advantages, including as increased vitamin content, enhanced mineral bioavailability, and improved digestion of fat, protein, and carbohydrates. The amount of protein may increase during the germination process. During the fermentation process that converts soybeans into tempeh, R. oligosporus has the ability to hydrolyze proteins and some other complex compounds into simpler forms like amino acids and peptides. The hypotensive properties of tempeh are

also attributed to its bioactive peptides, which can act as ACE (Angiotensin Converting Enzyme) inhibitors. The ACE enzyme converts angiotensin I into angiotensin II. One of the main causes of elevated blood pressure is angiotensin. Consequently, consuming tempeh-based cuisine can lower blood pressure.

From the results of this study, the researchers suggested that further researchers should conduct a more in-depth analysis of the confounding factors in order to obtain more accurate results.

ACKNOWLEDGMENTS

We would like to express our gratitude to the head of the Gorontalo Health Polytechnic's Center for Research and Community Service as well as the director of the Gorontalo Ministry of Health Polytechnic for helping us with this project. Thank you to everyone on the team, including the coordinating midwife, respondents, and head of the South City Community Health Center, for your support and assistance in setting up the implementation site, getting participants ready, and carrying out this activity. Hopefully, it will be beneficial to all of us.

REFERENCES

1. Katanna G, Agustina W, Afiif A. Faktor-Faktor Yang Mempengaruhi Kejadian Hipertensi Pada Masa Menopouse. Prof Heal J. 2022;4(1):103–13.
2. Marlina Y, Santoso H, Sirait A. Faktor-Faktor yang Berhubungan dengan Hipertensi pada Ibu Hamil di Wilayah Kerja Puskesmas Padang Panyang Kecamatan Kuala Pesisir Kabupaten Nagan Raya. J Healthc Technol Med. 2021;6(1):383–92.
3. Jayanti R, Nasution AS, Nuraida I, Fauzia NS, Putri DL. Determinan Kejadian Hipertensi Pada Ibu Hamil Trimester Kedua Dan Ketiga Di Wilayah Puskesmas Tanah Sereal, Kota Bogor. Maj Kesehat. 2022;9(2):86–91.
4. Evrianasari N, Yuviska IA, Suprihatini S. Effect Of Yogurth Adduction In Blood Pressure Degression On Pregnant Woman With Hypertension. J Kebidanan dan Kesehat Tradis. 2019;4(2):7.
5. Mulyani NS, Rafiqa R. Pemberian Sari Tempe Terhadap Profil Lipid Pada Penderita Hiperkolesterolemia Rawat Jalan Di Rumah Sakit Avicenna Bireuen. Sel J Penelit Kesehat. 2018;5(1):36–42.
6. Misnawati, Muzakar, Eddy Susanto, A. Sadiq P. Jurnal Gizi dan Kesehatan (JGK) Volume 1 No . 2 , Desember 2021 Efektifitas Minuman Ritemjeri (Sari Tempe Jelly Seledri) Terhadap Tekanan Darah Pasien Hipertensi di Puskesmas Punti Kayu Kota Palembang The Effectiveness of Drink Tempe Juice and Celery. 2021;1(2):78–87.
7. Sello L, Dkk M. Pengaruh Pemberian Kurma Ajwa (Phoenix Dactylifera L) Terhadap Hasil Luaran Perinatal Pada Wanita Risiko Preeklampsia Article history : Accepted 10 Juli 2020 Address : Available online 25 Juli 2020 Email : Phone : lainnya . Antioksidan mungkin penting u. Wind Heal J Kesehat. 2020;3(3):267–72.

8. Masriadi M, Idrus HH, Baharuddin A. Determinan Epidemiologi Kejadian Hipertensi Kehamilan. Wind Heal J Kesehat. 2022;5(2):592–601.
9. Nurfatimah N, Mohamad MS, Entoh C, Ramadhan K. Gambaran Faktor Risiko Kejadian Hipertensi dalam Kehamilan pada Ibu Hamil Trimester III. Poltekita J Ilmu Kesehat. 2020;14(1):68–75.
10. Lieskusumastuti AD, Hanifah L, Setyorini C, Delimasari TH, Handayani RT. The Risks of Hypertension in Pregnant Women: A Meta-Analysis. ICPHmaternal. 2022;721–34.
11. Arikah T, Rahardjo TBW, Widodo S. Kejadian Hipertensi pada Ibu Hamil. J Penelit dan Pengemb Kesehat Masy Indones. 2020;1(2):115–24.
12. Ansarullah A, Hardinsyah H, Marliyati SA, Astawan M. Efek Intervensi Minuman Tempe Terhadap Tekanan Darah Pada Penderita Hipertensi Dan Hiperkolesterolemia. J Gizi dan Pangan. 2017;12(2):101–8.
13. Rivas M, Garay RP, Escanero JF, Cia P, Cia P, Alda JO. Soy milk lowers blood pressure in men and women with mild to moderate essential hypertension. J Nutr. 2002;132(7):1900–2.
14. Handayani F, Yahya G, Darmawan S, Fayasari A. Pengaruh Pemberian Susu Kedelai terhadap Tekanan Darah Pasien Hipertensi di Rumah Sakit Islam Jakarta Pondok Kopi. Ilmu Gizi Indones. 2017;1(1):19.
15. Mosallanezhad Z, Mahmoodi M, Ranjbar S, Hosseini R, Clark CCT, Carson-Chahhoud K, et al. Soy intake is associated with lowering blood pressure in adults: A systematic review and meta-analysis of randomized double-blind placebo-controlled trials. Complement Ther Med [Internet]. 2021;59(January):102692. Available from: https://doi.org/10.1016/j.ctim.2021.102692
16. Putri BM, Novia Y. Minuman Berbahan Dasar Kedelai sebagai Antihipertensi. Nutr Diaita. 2020;12(01).
17. Aluko RE. Antihypertensive peptides from food proteins. Annu Rev Food Sci Technol. 2015;6:235–62.
18. Astawan M, Wresdiyati T, Ichsan M. Karakteristik Fisikokimia Tepung Tempe Kecambah Kedelai (Physicochemical Characteristics of Germinated Soybean Tempe Flour). J Pangan dan Gizi. 2016;11(1):35–42.