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Use of cucumber as a complementary intervention for preventing complications in hypertension

Uso del pepino como intervención complementaria para la prevención de complicaciones en la hipertensión

Jujuk Proboningsih[1a], Mohammad Najib[2a], Sriyono[3b], Mohammad Zamroni[4a]

SUMMARY

Introduction: *Most people use herbal medicine as a complementary treatment for chronic diseases. However, the need for optimal services for individuals with chronic diseases is paramount to help them maintain a healthy lifestyle consistently. This study aims to evaluate the effectiveness of the use of cucumber as a complementary intervention to prevent complications in patients with hypertension in Surabaya.* **Methods:** *The research design is a quasi-experimental pre-post test with a control group. The sample size in this study was 50 respondents in accordance with the criteria set by the researcher, that is, those who were not below 50 years old and suffered from hypertension for more than one year. And exclusion if there are complications from hypertension. The 50 samples were divided into two groups, with 25 receiving complementary cucumber treatment and 25 as control samples receiving regular drug administration.* **Results:** *The results showed that cucumber intervention significantly impacted the systolic and diastolic variables with p-values of 0.0001 and 0.001, respectively. This suggests a significant difference between pre-and post-intervention in the intervention group.* **Conclusion:** *A complementary-based nursing module intervention using effective herbal medicine like cucumber can help prevent hypertension complications. This approach represents a novel model in health literature and can serve as a valuable reference for medical education and nursing practice.*

Keywords: *Complementary nursing intervention, hypertension, cucumber.*

RESUMEN

Introducción: *La mayoría de las personas utilizan la medicina herbaria como tratamiento complementario para las enfermedades crónicas. Las personas con enfermedades crónicas necesitan recibir servicios óptimos que les ayuden a mantener un estilo de vida saludable de manera constante. Este estudio tiene como objetivo evaluar la efectividad del uso del pepino como una intervención complementaria para prevenir complicaciones en pacientes con hipertensión, en Surabaya.* **Métodos:** *El diseño de la investigación es un pre-post test cuasi-experimental con un grupo control. El tamaño de la muestra fue de 50 encuestados de acuerdo con los criterios establecidos, es decir, edad no inferior a 50 años, con hipertensión arterial desde hace más de un año. Y exclusión si hay complicaciones*

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ORCID ID: 0000-0002-2062-4481[1]
ORCID ID: 0000-0002-5258-1228[2]
ORCID ID: 0000-0002-6533-1973[3]
ORCID ID: 0009-0002-9662-4477[4]

[a] Poltekkes Kemenkes Surabaya
[b] Universitas Airlangga

*Corresponding Author: Jujuk Proboningsih
E-mail: jujuk@poltekkesdepkes-sby.ac.id

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de la hipertensión. Las 50 muestras se dividieron en 2 grupos, de los cuales 25 recibieron tratamiento complementario con pepino y 25 como muestras de control que recibieron administración regular del fármaco. **Resultados:** *Los resultados mostraron que la intervención con pepino tuvo un impacto significativo en las variables sistólica y diastólica con valores de p de 0.0001 y 0.001, respectivamente. Esto sugiere una diferencia significativa entre el pre y el post-intervención en el grupo de intervención.* **Conclusión:** *Proporcionar una intervención en el módulo de Enfermería utilizando hierbas medicinales complementaria como el pepino puede ayudar a prevenir las complicaciones de la hipertensión. Este enfoque representa un modelo novedoso en la literatura en salud y puede servir como una referencia valiosa para la educación médica y la práctica de enfermería.*

Palabras clave: *Intervención complementaria de enfermería, hipertensión arterial, pepino.*

INTRODUCTION

Indonesian Heart Association established that the goal of managing hypertension in patients with cardiovascular disease is to improve symptoms and signs, lower the frequency and duration of myocardial ischemia, and avoid death, myocardial infarction, and stroke. The blood pressure target recommended by various studies for hypertensive patients with cardiovascular disease is systolic blood pressure < 140 mmHg and/or diastolic blood pressure < 90 mmHg (1). Surabaya is one of the cities with the highest prevalence of hypertension in Indonesia, with 45 015 sufferers. The prevalence of hypertension based on measurements in the population aged 18 years is 34.1 %. From this prevalence, it is known that 8.8 % were diagnosed with hypertension (2).

As a health education institution, the Surabaya Ministry of Health Polytechnic strives to implement the tri-dharma of higher education, promoting healthy living and facilitating its staff to seek breakthroughs to support the community toward a healthy Indonesia. The concept of the tri-dharma of higher education in Indonesia establishes that the roles that academics must take in a creative economy ecosystem are: 1. Research, innovation, and product downstream. Academics have an important role in conducting research and innovation that can be applied in industry and society. Academics can conduct solution-oriented research on problems faced by industry and society. 2. Education and training. Academics can help improve the quality of human resources by providing education and training to students and the workforce. Academics can also help develop curricula and training programs that suit the needs of industry and society (https://www.researchgate.net/figure/The-concept-of-the-tri-dharma-of-higher-education-in-Indonesia-That-way-some-of-the_fig3_380237471).

It is acknowledged that many people use herbal medicine as a complementary treatment for chronic diseases. Hypertension treatment is lifelong and can be managed through non-pharmacological and pharmacological therapy (2). In patients with cardiovascular diseases, the goal of managing hypertension is to lower the frequency and duration of myocardial ischemia, alleviate symptoms, and avoid death and consequences such as myocardial infarction and stroke. Hypertensive patients, as chronic disease sufferers, require ideal services to help them maintain a healthy lifestyle consistently. This lifestyle must be followed regularly to prevent acute and long-term complications, necessitating service integration (3).

Thus, this study aimed to assess the effect of cucumber as a complementary nursing intervention to prevent complications in hypertension patients at the Pucang Sewu Community Health Center in Surabaya. A complementary approach in hypertension management means normal hypertension management is accompanied by herbal medicine (4). There is evidence that cucumbers have a hypotensive effect on blood pressure and a diuretic effect that lowers the amount of fluid circulating in the bloodstream, which can ultimately reduce the heart's workload. It can be said that therapy with cucumber extract works like blood pressure-lowering antihypertensive diuretic drugs (5). In addition, cucumber was chosen because it is easy to get, cheap, and commonly consumed by everyone in Indonesia.

METHODS

Study Design

This research uses a quasi-experimental design with a pre-post-test group design. It aims to analyze the effectiveness of implementing complementary nursing intervention with cucumbers to prevent complications in hypertension patients.

Participants

The population in this phase 2 study was hypertensive patients who visited the Pucang Sewu Community Health Center in Surabaya. The sample size was 50 respondents in accordance with the criteria set by the researcher, that is, those who were not below 50 years old and suffered from hypertension for more than one year. And exclusion if there are complications from hypertension. The 50 samples were divided into two groups, with 25 receiving complementary cucumber treatment and 25 as control samples (receiving regular drug administration).

Data Collection

The intervention group was given 50 grams of cucumber daily for three weeks. Respondents were asked not to consume other herbal products besides cucumber during this time. Anything consumed by respondents was noted daily, and there was also a reminder to eat cucumber daily. The cucumber given is of the *Cucumis sativus* kind, which is grated and extracted for the juice.

Ethical Consideration

This research has been ethically approved with ethical number EA/1532/KEPK-Poltekkes_Sby/V/2023.

Data Analysis

Data was analyzed through descriptive analysis using IBM SPSS.

RESULTS

This study examined gender, age, body weight, TB, duration of hypertension, history of taking antihypertensive drugs, and use of herbs (Table 1). Descriptive characteristics analyzed the data.

The distribution of characteristics for male gender in the cucumber group was four (8 %), and in the control group was eight (6 %), while

Table 1. Distribution of Characteristics of Hypertensive Patients in the Treatment and Control Groups

Demographic Characteristics	Group Cucumber (n=25)	Control (n=25)	Total (n=50)
Sex			
Man	4 (8 %)	8 (16 %)	12 (24 %)
Woman	21 (46 %)	17 (34 %)	38 (76 %)
Age (years)	52.28 ± 13.43	53.41 ± 10.61	55.18 ± 10.88
BW (kg)	66.12 ± 13.24	61.85 ± 11.11	61.79 ± 11.93
TB (cm)	158.28 ± 5.41	158.71 ± 5.37	158.09 ± 5.04
Duration of hypertension			
< 10 Years	21 (42 %)	22 (44 %)	43 (86 %)
>= 10 Years	4 (8 %)	3 (6 %)	7 (14 %)
Have you ever taken antihypertensive drugs?			
Once	12 (24 %)	4 (8 %)	16 (32 %)
No	13 (26 %)	21 (42 %)	34 (68 %)
Ever consumed herbs			
Once	2 (4 %)	2 (4 %)	4 (8 %)
No	23 (46 %)	23 (46 %)	46 (92 %)

BW: Body weight. TB:Body height.

the distribution of female gender in the cucumber group was 21 (42 %), and in the control group was 17 (34 %). Judging from the distribution of percentages of gender characteristics, it can be concluded that the majority or dominant gender in each group is female.

Based on the description in the age characteristics distribution, the mean ± SD value for the age of the cucumber group was 52.28 ± 13.43, and for the control group, it was 53.41 ± 10.61. It can be concluded that the age distribution for each group is, on average, 52 to 53 years. In the distribution of BW characteristics, BW in the cucumber group was 66.12 ± 13.24; in the control group, 61.85 ± 11.11, it can be concluded that the BW distribution for each group averages between 61 to 66 kg. The mean ± SD value for TB in the cucumber group was 158.28 ± 5.41; in the control group, it was 158.71 ± 5.37; it can be concluded that the TB distribution for each group averages around 158 cm. Duration of hypertension < 10 years in the cucumber group, there were 21 participants (42 %), and in the control group, there were 22 participants (44 %). For the duration of hypertension >=10 years, there were four participants (8 %) in the cucumber group and three participants (6 %) in the control group. Thus, the duration of hypertension < 10 years is the most common or dominant in the sample of this study.

In the distribution of people who have consumed hypertension medication, the cucumber group had 12 participants (24 %), compared to four participants (8 %) in the control group. In the group that never consumed hypertension medication, there were 13 participants (26 %), while the control group had 21 participants (42 %). The majority or dominant group in each group is those who never consumed hypertension medication in this research sample. Regarding the distribution of herbal consumption, the group that consumed cucumber had two participants (4 %), and the control group had two participants (4 %). In the group that never consumed herbs, there were 23 participants (46 %), and the control group had 23 participants (46 %). The majority or dominant group in each group is those who never consumed herbs in this research sample.

Table 2. Description of blood pressure of hypertensive patients in the treatment group and control group

Variable	Descriptive	Cucumber			Control		
		Pretest	Posttest	Δ	Pretest	Posttest	Δ
SBP							
(mmHg)	Minimum	110	110	-30	80	100	-30
	Maximum	160	140	0	160	155	50
	Mean	139.20	124.88	-14.32	126.47	126.40	-0.07
		14.48	8.61	10.58	17.93	10.80	16.98
DBP							
(mmHg)	Minimum	70	65	-20	50	70	-20
	Maximum	100	91	11	100	90	30
	Mean	83.00	77.84	-5.16	80.27	79.13	-1.13
		5.95	6.22	6.63	8.50	5.29	9.36

As shown in Table 2, for the pre-and post-systolic blood pressure variables, the mean ± SD score for the cucumber group was 139.20 ± 14.48 (mmHg) and 124.88 ± 8.61(mmHg), with a range of 110-160 and 110-140, respectively. The cucumber control group's scores were 126.47 ± 17.93 (mmHg) and 126.40 ± 10.80 (mmHg), ranging between 80-160 (mmHg) and 100-155 (mmHg). Based on the change or delta value for the cucumber group, the mean ± SD score was -14.32 ± 10.58; for the control group, it was -0.07 ± 16.98. The intervention group, both cucumber

groups, tended to experience a higher decrease in systolic blood pressure than the control group.

The mean ± SD in descriptive diastolic blood pressure for the cucumber group was 83.00 ± 5.95 (mmHg) and 77.84 ± 6.22 (mmHg), with a score range of 70-100 (mmHg) and 65-91 (mmHg), respectively. The cucumber control group's scores were 80.27 ± 8.50 and 79.13 ± 5.29, ranging from 50-100 and 70-90. Based on the change or delta value for the cucumber group, the mean ± SD score was -5.16 ± 6.63; for the control group, it was -1.13 ± 9.36. The cucumber intervention group tended to experience a higher decrease in diastolic blood pressure than the control group (Table 2).

The cholesterol (mg/dL) variable at pre and post shows that the mean ± SD score for the cucumber group was 219.88 ± 22.52 and 207.44 ± 38.35, with a score range of 177-267 and 122-292. The control group's scores were 215.47 ± 32.27 and 204.40 ± 35.25, with a range of 138-294 and 138-312. Based on the change or delta value for the cucumber group, the mean ± SD score was -12.44 ± 34.99, and for the control group, it was -11.07 ± 34.81. The data on changes in delta cholesterol in the intervention group indicate that the cucumber group tended to experience a higher decrease than the control group (Table 3).

Table. 3. Description of cholesterol levels of hypertensive patients in the treatment group and control group

Variable	Descriptive	Cucumber			Control		
		Pretest	Posttest	Δ	Pretest	Posttest	Δ
Cholesterol (mg/dL)	Minimum	177	122	-70	138	138	-91
	Maximum	267	292	46	294	312	123
	Mean	219.88 ± 22.52	207.44 ± 38.35	-12.44 ± 34.99	215.47 ± 32.27	207.44 ± 38.35	-11.07 ± 34.81

The comparison between the cucumber intervention and the control for the systole and diastole variables during the pre-stage obtained p-values of 0.0001 and 0.0001, respectively, indicating a significant difference between the cucumber intervention groups and the control during the pre-data. Based on the mean values, it can be observed that the systole and diastole values of the cucumber intervention group during the pre-stage were higher than those of the control. Similarly, the systole and diastole values of the cucumber intervention group at the post-stage were higher than those of the control.

The comparison between the cucumber intervention and the control for the systole and diastole variables at delta or change showed p-values of 0.0001 and 0.0001, respectively, indicating a significant difference between the cucumber intervention group and the control at the time of the delta data. Based on the mean values, the systole and diastole delta values in the cucumber intervention group were lower than in the control.

The comparison between the cucumber intervention and the control for the cholesterol variable in the pre, post, and delta data showed p-values of 0.146, 0.285, and 0.768, respectively, indicating no significant difference between the cucumber intervention groups and the control in the pre, post, and delta data.

Based on the test results in Table 4, the comparison between pre- and post-treatment in the cucumber intervention group for the systole variable showed p-values of 0.0001 and 0.001, respectively, indicating a significant difference between pre- and post-treatment. However, for the control group, the p-values were 0.150 and 0.840, respectively, indicating no significant difference between pre- and post-treatment.

Table 4. Comparative test results on systolic and diastolic blood pressure, and cholesterol

Variable	Group	Pretest Mean ± SD	Posttest Mean ± SD	Δ Mean ± SD	p-value
SBP					
(mmHg)	Intervention	139.20 ± 14.48	124.88 ± 8.61	-14.32 ± 10.58	0.0001
	Control	126.47 ± 17.93	126.40 ± 10.80	-0.07 ± 16.98	0.840
	p-value	0.0001	0.0001	0.0001	
DBP	Intervention	83.00 ± 5.95	77.84 ± 6.22	-5.16 ± 6.63	0.006
(mmHg)	Control	80.27 ± 8.50	79.13 ± 5.29	-1.13 ± 9.36	0.304
	p-value	0.0001	0.0001	0.037	
Cholesterol	Intervention	219.88 ± 22.52	207.44 ± 38.35	-12.44 ± 34.99	0.088
(mg/dL)	Control	215.47 ± 32.27	204.40 ± 35.25	-11.07 ± 34.81	0.001
	p-value	0.146	0.285	0.768	

SBP: systolic blood pressure; DBP: diastolic blood pressure.
*It is significantly different if the p-value is <0.05

Similarly, the comparison between the pre- and post-in-the-cucumber intervention groups for the diastole variable showed p-values of 0.006, 0.023, and 0.005, indicating a significant difference. For the control group, the p-value was 0.304, indicating no significant difference between the pre- and post-in-the-cucumber intervention groups.

The comparison between the pre- and post-in-the-cucumber intervention groups for the cholesterol variable showed p-values of 0.088 and 0.616, indicating no significant difference between the two groups. However, for the control intervention group, the p-values were 0.040 and 0.001, indicating a significant difference between the pre- and post-in-the-control group.

DISCUSSION

Most hypertensive patients who have had hypertension for a long time and have taken medication have also consumed herbal medicine, namely around 16 %. In the cucumber herbal group, it was found that there were differences in systolic and diastolic blood pressure during pre-treatment. Our results indicate that the cucumber intervention group's systolic and diastolic blood pressure values during pre-treatment were greater than the control. However, in the cucumber group, the mean systolic and diastolic blood pressure values at post-treatment were lower than in the control group. This study found that hypertensive patients in the cucumber group had a significant reduction in systolic and diastolic blood pressure values during pre- and post-treatment (2).

Research on outpatient hypertensive patients found no difference between the treatment and control groups between initial systolic ($p=0.528$) and initial diastolic ($p = 0.184$) blood pressure. There was a difference between systolic and diastolic blood pressure in the treatment group before and after treatment. Meanwhile, in the control group, there was no significant difference in systolic blood pressure; however, there was a difference in diastolic blood pressure (5). A p-value of 0.304 was obtained in the control group, indicating that there was no difference in diastolic blood pressure between the pre- and post-intervention control groups.

Cucumbers have various nutritional contents, including potassium, calcium, and magnesium. The sodium/potassium ratio is also related to blood pressure. Reducing sodium intake by 100 mmol per day and potassium consumption by up to 70 mmol per day is predicted to decrease systolic blood pressure by 3.4 mmHg (6). Potassium intake affects blood vessels. It reduces peripheral vascular resistance, which can directly dilate arteries, increase water and sodium excretion from the body, suppress renin-angiotensin secretion, and stimulate sodium-potassium pump activity.

Cucumbers are diuretic because of their high-water content, which contributes to lower blood pressure. The elements phosphorus, folic acid, and vitamin C in cucumbers are useful for relieving tension or stress (7). This suggests that in hypertensive patients, blood pressure can be lowered with non-pharmacological therapy, such as cucumber juice, which contains substances that contribute to reducing blood pressure. Our data are supported by Aisyah and Probosari, who showed a reduction in diastolic blood pressure of 6.67 mmHg (8). In addition, Elya et al. (9) strengthen this hypothesis, showing that there is an effect of reducing blood pressure in the elderly with non-pharmacological treatment by administering cucumber juice (9). Meanwhile, Hermawan and Novariana (10) found that ethanol extract from cucumber skin could have the potential as an anti-cholesterol. However, our present results do not support these results since the complementary cucumber treatment did not change significantly pre and post-cholesterol values (11).

In the present study, the control group was hypertensive patients who received only pharmacological treatment. Non-pharmacological treatment is an integral part of the management of hypertension. It includes lifestyle changes in the form of special diets and the reduction of salt, alcohol, and saturated fat. Weight reduction, exercise, salt intake restriction, not smoking, avoiding stress, increased physical activity, and time-restricted meals have also been effective (12). Meanwhile, pharmacological management of hypertension consists of several alternatives: diuretics, sympathetic blockers, beta-blockers, vasodilators, angiotensin-converting enzyme inhibitors, calcium antagonists, and angiotensin II receptor blockers (11).

Kandarini stated that some hypertensive sufferers think that hypertension can be cured, leading them to stop taking medication. While there is no cure for high blood pressure, patients must take steps that matter, such as making effective lifestyle changes and taking BP-lowering medications as their physicians prescribe (12-14). Medication does not always function to cure; instead, it has four functions: to prevent disease, control disease, eliminate symptoms/complaints, and cure the disease. Pharmacological therapy can be given alone or in combination with antihypertensives (15). The choice of antihypertensive medication can be based on the presence or absence of special conditions such as comorbidities or complications (16). There are many different types of antihypertensive agents, and they have different mechanisms of action to lower blood pressure. Some remove extra fluid and salt from the body, while others induce vasorelaxation or slow the heartbeat. The drugs widely used as antihypertensives are synthetic drugs whose active substances are derived from chemical compounds, posing a high risk of side effects with long-term use (13). Lifelong hypertension treatment is also relatively expensive due to its many side effects, leading sufferers to disobey therapy often and turn to other alternatives, such as herbal or non-pharmacological drug therapy (14).

Regarding gender, the majority of respondents in this study were predominantly female. This aligns with Aini (15), who showed that most respondents were female, specifically 30 people (75%) out of 40 respondents. These results are also similar to those reported by Yaghoobi et al. (17), showing that of 55 respondents, 31 were female. In younger age groups, men tend to suffer from hypertension more than women because women have estrogen as a protector against the risk of cardiovascular disease. However, as age increases and menopause sets in, the chances of women and men suffering from hypertension become equal. According to Anggraini et al., it was found that more than half of the hypertension sufferers were women, around 56.5%. The most common or dominant result of this study is that the duration of hypertension is less than 10 years (18).

Paramitha et al. showed that 70.9% of hypertensive patients use natural medicines as a complementary therapy (19). Several studies have demonstrated that natural medicine lowers blood pressure (20,21). Medicinal herbs have several active substances with pharmacological and prophylactic properties that can be used to treat hypertension and are used as a complementary therapy (16). Traditional herbs for the management of hypertension include turmeric (rhizome), water gourd (flesh and fruit juice), watercress (all parts), ceplukan (all parts), alang-alang (root), noni/pace (fruit), orange lime (fruit juice), cat's whiskers (leaves) and bay leaves (22).

Complementary and alternative healthcare and medical practices are a group of diverse medical and healthcare systems, practices, and products that are not presently considered part of conventional medicine. Complementary medicine refers to therapies that complement traditional Western (or allopathic) medicine and are used together with conventional medicine, and alternative medicine is used instead of conventional medicine. Alternative medicine refers to therapeutic approaches taken in place of traditional medicine and used to treat or ameliorate disease. Evidence shows that alternative medicine, such as herbs to treat chronic illnesses, is part of everyday life for many people and appears to be increasing (23,24). Based on their experience and communities, people believe alternative medicine is effective with fewer side effects than prescription drugs (25,26). Considering that many hypertensive patients are elderly, therapy using herbal medicine is the most effective because it is easily accessible, cheap, and can even be obtained for free in the surrounding area (24,27,28).

CONCLUSION

The results showed that cucumber intervention for the systole-diastole variable obtained a p-value of 0.0001 and 0.001, where the value was <0.05, which means there was a significant difference between pre and post-in the intervention group. Providing complementary nursing module interventions based on using herbal medicine is effective in preventing hypertension and its complications. This has become one of the newest models in health literature. It can be used as a medical reference in education and implementation of nursing actions.

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