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ORIGINAL ARTICLE

THE EFFECT OF HATHA YOGA THERAPY ON THE BLOOD PRESSURE OF PRIMARY HYPERTENSION PATIENTS OF PRODUCTIVE AGE

Darwin Tamba*, Ridha Dharmajaya, Nur Asnah Sitohang

Department of Medical Surgical Nursing, Faculty of Nursing, Universitas Sumatera Utara, Indonesia

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***Corresponding Author**
Darwin Tamba
darwintamba08@gmail.com

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ABSTRACT

Untreated hypertension can lead to serious complications. One of the nonpharmacological therapies for treating hypertension is hatha yoga. The study aimed to determine the effect of hatha yoga therapy on the blood pressure of those of productive age among primary hypertension patients. The research type was a quasi-experiment with pre-posttest with control group design. The number of study samples was 64 respondents consisting of 32 respondents in the intervention group (who were given 35 minutes of hatha yoga therapy and Amlodipine 5mg/day for 4 weeks) and 32 respondents in the control group who received Amlodipine 5mg/day for 4 weeks. The data analysis used the dependent test (paired t test). The results showed that the mean of systolic and diastolic of blood pressure before the therapy in primary hypertension patients in the intervention group was 161.84 / 93.25 mmHg, while in the control group it was 161.66 / 93.37 mmHg. The mean of the systolic and diastolic blood pressure after therapy in the primary hypertensive patients in the intervention group was 122.87 / 71.69 mmHg, and in the control group it was 127.66 / 73.13 mmHg. The statistical tests using paired t-test showed that the p value was $<\alpha = 0.05$. In conclusion, hatha yoga therapy has the effect of lowering blood pressure for those of productive age among primary hypertension patients.

Keywords: Blood pressure; hatha toga therapy; primary hypertension

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INTRODUCTION

Hypertension is the increase of blood pressure above the normal level with a systolic and diastolic number of more than 140/90 mmHg. Increased and prolonged high blood pressure can damage blood vessels in organs such as the kidneys, heart, brain and eyes, causing complications such as stroke, coronary heart disease, kidney failure, and blindness. Hypertension is also known as the silent killer (Ministry of Health of the Republic of Indonesia, 2016).
Based on the causes of hypertension, it is divided into two, namely primary hypertension (around 90% of total cases of hypertension) and secondary hypertension (around 10% of the total number of hypertension cases). Primary hypertension is a type of hypertension where the cause is unknown or idiopathic (Ministry of Health of the Republic of Indonesia, 2014).

The *World Health Organization (2013)* noted that, in the world, there were 17,000 people per year who died from cardiovascular diseases and 9,400 of them were caused by complications resulting from hypertension. The prevalence of world hypertension reached to 29.2% in men and 24.8% in women (WHO, 2013). In America, there were 74.5 million people who experienced hypertension (American Heart Association, 2013). While in Indonesia, it was estimated that 25.8% of people experienced hypertension (Ministry of Health of the Republic of Indonesia, 2013). Particularly in North Sumatra, Indonesia, it was recorded that 151,939 people suffered from hypertension (Health Office, 2015).

One of the non-pharmacological primary hypertension treatments is hatha yoga, which is a program of unification of the body, mind and spirit. Hatha yoga is a combination of breathing techniques (pranayama), relaxation and stretching or posture exercises (asanas) (Sindhu, 2015). Asana aims to stimulate the release of endorphin hormones, which function as a natural sedative produced by the brain to create a sense of comfort. Increased endorphin hormones

have the effect of reducing high blood pressure. Pranayama in yoga is a systematic and voluntary controlled breathing exercise, which results in an increase in the activity of the parasympathetic nervous system to stimulate the release of dopamine levels, reduce emotional stress and relax blood vessels so that blood pressure can decrease. It is therefore that hatha yoga is recommended as a complementary therapy for hypertensive sufferers (Sindhu, 2015).

METHOD

Study design

The research design used a quasi-experimental, pre-posttest with control group design (Polit & Beck, 2012).

Instrument

The instrument used in this study was a tensimeter to measure the respondent's blood pressure before and after being given treatment in both the control group and the intervention group.

Intervention

The intervention group received the hatha yoga therapy including *pranayama* and *asana* for 30 minutes per session and this was followed by relaxation for 5 minutes – 35 minutes for the total duration of the intervention. The intervention group received the hatha yoga that was carried out for a month, twice a week, and they were also prescribed pharmacological treatment from doctors i.e. amlodipine 1x5mg/day for 4 weeks. Meanwhile, the control group only received the same pharmacological treatment. The examination and measurement of blood pressure (systolic and diastolic) was measured twice: the first time was before treatment and the last was after receiving hatha yoga and amlodipine therapy for the intervention group and after only receiving amlodipine for the control group.

Data Analysis

The data was analyzed using univariate and bivariate analysis. Univariate was used to see the percentage of age, gender, education, smoking history, and the duration of taking drugs. Bivariate analysis using the paired t-test was used to examine the differences in blood pressure before and after the intervention in primary hypertension patients at Mitra Medika Hospital, Medan.

Sample/ Participants

The respondents were collected using a consecutive sampling method, which is the method of selecting samples by selecting all individuals who meet the selection criteria (inclusion criteria), until the desired sample size is met (Polit Beck, 2012). The total samples in this study were 64 respondents that was determined based on the power analysis table with the equal power set (1-β) = 0.80 and the estimated effect size of 0.7 with a significant level (alpha [α]) = 0.05; therefore the number of samples were 32 respondents for the intervention group and 32 respondents for the control group.

The inclusion criteria included (a) patients who were medically diagnosed with hypertension and received medication or consumed 5mg/day of amlodipine therapy; (b) patients aged 25-55 years; (c) patients with a history of blood pressure ≥140 / 90 mmHg; and (d) patients who were willing to be a respondent. Meanwhile, the exclusion criteria consisted of (a) patients suffering from heart disease; (b) the presence of sensory neuropathy; (c) patients with a right / left lower limb strength <5; (d) patients who were uncooperative; and (e) patients who were unwilling to be a respondent. The number of outpatients who were primary hypertension sufferers at Mitra Medika Hospital Medan was recorded and then collected.

Ethical consideration

The respondents were asked to fill in an informed consent form stating their willingness to be involved in this research. Previously, the researcher had approval of the health research ethics commission from the Faculty of Nursing, Universitas Sumatera Utara, Indonesia with number 1682/III/SP/2019.

RESULT

This research was conducted in Mitra Medika Hospital, Medan from April to May 2019. The total sample was 64 respondents according to the inclusion and exclusion criteria.

Respondent Characteristics

Variables involved in univariate analysis included age, gender, education, smoking history, and the duration of drug consumption as can be seen in Table 1.

Table 1. Respondent characteristics (n = 64)

Variable	Intervention Group		Control Group	
	Frequency (f)	Percentage (%)	Frequency (f)	Percentage (%)
Age				
25-35 years old	7	21.9	3	9.4
36-45 years old	15	46.9	18	56.2
46-55 years old	10	31.2	11	34.4
Gender				
Male	15	46.9	14	43.75
Female	17	53.1	18	56.25
Education				
Junior high school	9	28.1	11	34.4
Senior high school	23	71.9	21	65.6
Smoking history				
Yes, smoked	13	40.6	13	40.6
Not smoked	19	59.4	19	59.4
Duration of taking drugs				

Variable	Intervention Group		Control Group	
	Frequency (f)	Percentage (%)	Frequency (f)	Percentage (%)
<7 days	17	53.1	16	50.0
7-21 days	10	31.3	11	34.4
> 21-30 days	5	15.6	5	15.6

Table 1 explained that the majority of respondents in the intervention group were aged 36-45 years old, which was as many as 15 people (46.9%), while the majority of respondents in the control group were 36-45 years old (18 people or 56.3%). Most respondents were women, which was as many as 17 people (53.1%) and 18 people (56.3%) in the intervention and control group respectively. Generally, the respondents were high school graduates: 23 people (71.9%) in the intervention group and 21 people (65.6%) in the control group. The majority of the smoking history in the intervention group was 13 people who smoked (40.6%) and 19 people (59.4%) who had not smoked. As many as 17 people (53.1%) had taken medication <7 days in the intervention group whilst in the control group it was 16 people (50.0%).

Systolic and Diastolic Blood Pressure of Primary Hypertensive Patients in the Intervention Group

The systolic blood pressure of primary hypertensive patients in the intervention group can be seen in Table 2.

Table 2. Systolic and diastolic blood pressure of primary hypertensive patients in the intervention group (n = 64)

Week		Variable	Average	Maximum	Minimum
Week 1	Pretreatment 1	Systolic	161.84	179	151
		Diastolic	93.25	100	90
	Post treatment 1	Systolic	158.81	165	150
		Diastolic	92.50	99	89
	Pretreatment 2	Systolic	154.94	160	145
		Diastolic	90.81	97	88
	Post treatment 2	Systolic	152.09	160	140
		Diastolic	86.16	93	80
Week 2	Pretreatment 3	Systolic	147.97	160	139
		Diastolic	83.88	92	76
	Post treatment 3	Systolic	147.19	160	139
		Diastolic	82.59	90	76
	Pretreatment 4	Systolic	143.28	158	133
		Diastolic	80.97	90	72
	Post treatment 4	Systolic	141.53	157	133
		Diastolic	79.84	87	72
Week 3	Pretreatment 5	Systolic	139.03	158	130
		Diastolic	78.53	86	71
	Post treatment 5	Systolic	137.53	158	130
		Diastolic	77.00	85	70
	Pretreatment 6	Systolic	136.03	155	125
		Diastolic	76.66	85	70
	Post treatment 6	Systolic	134.31	150	122
		Diastolic	75.66	82	70
Week 4	Pretreatment 7	Systolic	132.16	149	122
		Diastolic	74.72	80	70
	Post treatment 7	Systolic	131.44	145	122
		Diastolic	73.09	80	70
	Pretreatment 8	Systolic	126.59	140	110
		Diastolic	72.69	78	70
	Post treatment 8	Systolic	122.87	136	110
		Diastolic	71.69	76	69

Table 2 reports that the systolic blood pressure among primary hypertensive patients after hatha yoga decreased from 151 mmHg after the first treatment to 110 mmHg after the eighth treatment. The maximum the systolic blood pressure, after the hatha yoga, decreased by was from 179 mmHg for the first treatment to 136 mmHg after the eighth treatment and the mean blood pressure for each treatment decreased from 161.84 mmHg in the first treatment to 122.87 mmHg after the eighth treatment. The minimum diastolic blood pressure, after the hatha yoga, decreased by was from 90 mmHg in the first treatment to 69 mmHg after the eighth treatment. The maximum the diastolic blood pressure, after the hatha yoga, decreased by was from 100 mmHg for the first treatment to 76 mmHg after the eighth treatment and the mean blood pressure for each treatment decreased from 93.25 mmHg for the first treatment to 71.69 mmHg.

Systolic and Diastolic Blood Pressure of Primary Hypertensive Patients in the Control Group.

The systolic and diastolic blood pressures of primary hypertensive patients in the control group can be seen in Table 3.

Table 3. Systolic and diastolic blood pressure of primary hypertensive patients in the control group (n = 64)

Week		Variable	Average	Maximum	Minimum
Week 1	Pretreatment 1	Systolic	161.66	170	154
		Diastolic	93.37	100	90
	Post treatment 1	Systolic	158.97	170	140
		Diastolic	93.28	99	89
	Pretreatment 2	Systolic	156.09	165	150
		Diastolic	87.06	100	80
	Post treatment 2	Systolic	154.62	161	140
		Diastolic	86.56	93	70
Week 2	Pretreatment 3	Systolic	152.06	160	140
		Diastolic	83.59	93	76
	Post treatment 3	Systolic	148.31	158	140
		Diastolic	83.28	90	76
	Pretreatment 4	Systolic	147.13	160	137
		Diastolic	80.91	90	72
	Post treatment 4	Systolic	146.53	158	137
		Diastolic	80.78	87	70
Week 3	Pretreatment 5	Systolic	143.81	159	130
		Diastolic	78.97	90	70
	Post treatment 5	Systolic	141.31	157	130
		Diastolic	78.88	90	70
	Pretreatment 6	Systolic	138.53	155	125
		Diastolic	77.78	87	70
	Post treatment 6	Systolic	135.31	150	123
		Diastolic	77.41	86	70
Week 4	Pretreatment 7	Systolic	133.91	164	118
		Diastolic	75.13	80	70
	Post treatment 7	Systolic	132.47	145	120
		Diastolic	74.84	82	70
	Pretreatment 8	Systolic	129.91	149	116
		Diastolic	73.19	80	70
	Post treatment 8	Systolic	127.66	142	112
		Diastolic	73.13	80	70

Table 3 shows the systolic blood pressure in patients with primary hypertension. In the control group, it decreased from 154 mmHg at the first treatment to 112 mmHg after the eighth treatment. The maximum systolic blood pressure, after receiving the treatment, decreased by was from 170 mmHg to 142 mmHg after the treatment and the mean blood pressure for each treatment decreased from 161.66 mmHg to 127.66 mmHg.

The minimum diastolic blood pressure after treatment decreased from 90 mmHg to 70 mmHg; the maximum systolic blood pressure decreased from 100 mmHg to 80 mmHg after treatment and the mean blood pressure after treatment decreased from 93.37 mmHg to 73.13 mmHg.

Bivariate Analysis

Bivariate analysis was used to examine differences in blood pressure before and after intervention among primary hypertensive patients.

The Effect of Hatha Yoga Therapy on Systolic and Diastolic Blood Pressure for Each Treatment in Primary Hypertension Patients

Table 4. The effect of hatha yoga therapy on systolic and diastolic blood pressure for each treatment in primary hypertensive patients in the intervention group

	Variable			
	Systolic		Diastolic	
	Pre-test	***Post-test***	***Pre-test***	***Post-test***
Treatment 1				
Mean ± SD	161.75 ± 4.277	158.89 ± 4.704	93.31 ± 3,270	92.89 ± 3.056
Mean difference ± SB	2.86 ± 0.427		0.42 ± 0.214	
95% CI	1,609 - 4,571		0.069 - 0.775	
p	0.000		0.020	
t	.171	-.132	-.152	-.745

	Variable			
	Systolic		Diastolic	
	Pre-test	***Post-test***	***Pre-test***	***Post-test***
Treatment 2				
Mean ± SD	155.52 ± 4.163	153.36 ± 5.015	88.94 ± 4,000	86.36 ± 4,064
Mean difference ± SB	2.16 ± 0.852		2.58 ± 0.064	
95% CI	1,012 - 3,301		1,503 - 3,653	
p	0.000		0.000	
t	-1.113	-2.071	4.222	-.397
Treatment 3				
Mean ± SD	150.02 ± 7,117	147.75 ± 5.809	83.73 ± 4.141	82.94 ± 3,800
Mean difference ± SB	2.27 ± 1.308		0.79 ± 0.341	
95% CI	0.994 - 3,537		0.253 - 1.340	
p	0.001		0.005	
t	-2.385	-.772	.270	-.721
Treatment 4				
Mean ± SD	145.20 ± 7,069	144.03 ± 6,794	80.94 ± 3,813	80.31 ± 3,536
Mean difference ± SB	1.17 ± 0.275		0.43 ± 0.277	
95% CI	0.033 - 2.311		0.134 - 1.116	
p	0.044		0.013	
t	-2.243	-3.145	.065	-1.062
Treatment 5				
Mean ± SD	141.42 ± 8,271	139.42 ± 7,184	78.75 ± 4.239	77.94 ± 4.397
Mean difference ± SB	2.00 ± 1,087		0.81 ± 0.158	
95% CI	0.709 - 3,291		0.350 - 1.275	
p	0.003		0.001	
t	-2.398	-2.166	-.410	-1.733
Treatment 6				
Mean ± SD	137.28 ± 7,531	134.81 ± 6,671	77.22 ± 3,811	76.53 ± 4,024
Mean difference ± SB	2.47 ± 0.86		0.69 ± 0.213	
95% CI	1,114 - 3,823		0.025 - 1.350	
p	0.001		0.042	
t	-1.336	-.597	-1.185	-1.769
Treatment 7				
Mean ± SD	133.03 ± 8.365	131.95 ± 6,627	74.92 ± 3,031	73.97 ± 3.065
Mean difference ± SB	1.08 ± 1.738		0.95 ± 0.034	
95% CI	0.003 - 2.153		0.415 - 1.492	
p	0.049		0.001	
t	-.835	-.619	-.533	-2.365
Treatment 8				
Mean ± SD	128.25 ± 7.950	125.27 ± 7,394	72.94 ± 2,630	72.41 ± 2.505
Mean difference ± SB	2.98 ± 0.556		0.53 ± 0.125	
95% CI	2,130 - 3,839		0.207 - 0.855	
p	0.000		0.002	
t	-1.691	-2.714	-.758	-2.378

Based on the Table 4, the results of the t test statistical test on systolic blood pressure obtained the p-value <α = 0.05 for each treatment, meaning that Null Hypothesis (H0) is rejected. There were differences in systolic blood pressure before and after the treatment of hatha yoga therapy. The results of the t test statistical test on diastolic blood pressure obtained the p-value <α = 0.05 of each treatment, meaning that H0 was rejected. It means that there was an effect of hatha yoga therapy on reducing blood pressure in primary hypertensive patients.

The Effect of Hatha Yoga Therapy on Decreasing Systolic and Diastolic Blood Pressure in Primary Hypertensive Patients

The effect of hatha yoga therapy on reducing systolic and diastolic blood pressure in primary hypertensive patients can be seen in Table 5.

Table 5. The effect of hatha yoga therapy on systolic and diastolic blood pressure among primary hypertensive patients in the control group

	Variable			
	Systolic		Diastolic	
	Pre-test	Post-test	Pre-test	Post-test
Mean ± SD	161.75 ± 4.353	125.27 ± 7,394	93.31 ± 3,270	72.41 ± 2.505
Mean difference ± SB	36.48 ± 3.041		20.9 ± 0.765	
95% CI	34,659 - 38,310		19,821 - 21,492	
p	0.000		0.020	

Table 5 shows the results of the t test statistical test obtained the p-value <α = 0.05 that means that H0 is accepted or in other words, there are differences in the systolic and diastolic blood pressure of primary hypertensive patients before and after practicing hatha yoga therapy in the intervention and control groups.

DISCUSSION

Blood Pressure of Hypertensive Patients in the Intervention Group

Statistical tests showed that the systolic and diastolic blood pressure in primary hypertensive respondents was significantly reduced by 38.97 mmHg. It could be because the respondent received therapeutic treatment from a doctor as well as non-pharmacological therapy using hatha yoga regularly over 4 weeks with 8 meetings. According to Palmer & Williams (2009), the treatment for primary hypertension can be done pharmacologically and non-pharmacologically. Non-pharmacological medications can be used as a complement to get a medicinal effect when anti-hypertensive drugs are given.

Blood Pressure of Hypertensive Patients in the Control Group

In this study, primary hypertension patients who received pharmacological treatment experienced a significant reduction in systolic and diastolic blood pressure, but interestingly it sometimes increased or decreased. This may be because the patients regularly follow the medication given by the doctor. This is in accordance with JNC (2013) who stated that the goal of hypertensive treatment is not only to reduce blood pressure but also to reduce and prevent complications due to hypertension so that sufferers can increase their strength.

According to Gunawan (2015), preventive efforts, besides drugs prescribed by doctors, are also beneficial for people with hypertension to prevent the disease from getting any worse. Hypertensive patients need to check their blood pressure regularly in order to know the development and state of their blood pressure so that they can maintain a healthy lifestyle to keep their blood pressure in a normal range.

Differences in Blood Pressure of Hypertensive Patients between the Intervention Group and the Control Group

Table 2 shows that the decrease in systolic blood pressure before and after the implementation of yoga hatha therapy in the intervention group of primary hypertensive patients was 38.97 mmHg (before 161.84 mmHg and after 122.87 mmHg) and a decrease in diastolic blood pressure by 21.56 mmHg (before 93.25 mmHg and after 71.69 mmHg). Meanwhile, Table 3 shows that the decrease in systolic and diastolic blood pressure in the control group was 34.0 mmHg (before 161.66 mmHg and after 127.66 mmHg) and the decrease in diastolic blood pressure was 20.24 mmHg (before 93.37 mmHg and after 73.13 mmHg) so that the mean difference in the decrease of systolic blood pressure was 4.97 mmHg (from 38.97 mmHg to 34.0 mmHg) and the mean difference in diastolic blood pressure reduction was 1.32 mmHg (from 21.56 mmHg to 20.24 mmHg). According to Cohen et al. (2011) in Ridwan (2009), yoga therapy is very helpful for those suffering from hypertension.

The Effect of Hatha Yoga Therapy on the Blood Pressure of Primary Hypertensive Patients

The basic mechanism of increasing systolic and diastolic blood pressure corresponds to a decrease in the elasticity of the blood vessels and the ability to stretch the large arteries. Changes in sympathetic nervous system activity with increased norepinephrine cause a decrease in the sensitivity of the beta-adrenergic receptor system, resulting in decreased muscle relaxation function of blood vessels (Palmer & Williams, 2009).

Vasoconstriction causes decreased blood flow to the kidneys, resulting in the release of renin. Renin stimulates the formation of angiotensin I which is then converted by the ACE (Angiotensin Converting Enzyme) to angiotensin II, a potent vasoconstrictor, which in turn stimulates aldosterone secretion by the adrenal cortex. This hormone causes retention of sodium and water by the renal tubules, causing an increase in intravascular volume. All of these factors tend to trigger hypertension (Palmer & Williams, 2009).

Asana in yoga can stimulate the release of endorphin hormones which function as natural sedatives produced by the brain that creates a sense of comfort. Increasing levels of endorphins in the body can reduce high blood pressure. Pranayama in yoga is a form of voluntary controlled breathing that affects the increase in activity of the parasympathetic nervous system and increases the level of dopamine, which function is to reduce emotional stress as well as relaxing blood vessels. It is therefore that yoga is recommended as a complementary therapy for hypertension sufferers (Sindhu, 2015).

Hatha yoga therapy affects systolic and diastolic blood pressure in patients with primary hypertension. This is in line with Cramer et al. (2014) who reported that the provision of yoga that is done regularly for 8 weeks can significantly influence changes in blood pressure in hypertensive patients.

CONCLUSION AND RECOMMENDATION

There is an effect of hatha yoga and amlodipine therapy in reducing blood pressure. It is recommended that hypertensive patients practice hatha yoga therapy as a non-pharmacological therapy in managing hypertension.

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