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Chapter

The Effect of Chromotherapy on Decreased Blood Pressure during Sleep in Hypertension Patients in Kupang, Indonesia

Serly Sani Mahoklory and Ferdinandus Suban Hoda

Abstract

Various efforts to prevent the increasing prevalence of deaths due to hypertension continue to be developed, including alternative medicine systems (CAMS). One of the alternative treatment methods recommended by the world, easy, cheap, and efficient is chromotherapy or light therapy. The purpose of this study was to look at the influence of chromotherapy in lowering blood pressure during sleep in hypertension sufferers. The research method used is quasi experiment with the design of one group pre- and posttest with a control group design. Sampling techniques are carried out using purposive sampling with the number of 120 respondents. The results of this study have proven that chromotherapy has a tremendous effect in lowering blood pressure by 10–30 mmHg during sleep 15–35 minutes by utilizing the blue and green spectrum that affects the work of the sympathetic and parasympathetic nerves so as to provide elements of relaxation and lower blood pressure. The pretest result of the treatment group obtained a mean from 172/96 to 158/93 mmHg, which showed a decrease while in the control group, there was no significant change with mean values of 166/96 and 166/97 mmHg.

Keywords: chromotherapy, electromagnetic radiation, hypertension, blood pressure, Indonesia

1. Introduction

The prevalence of hypertension is increasing every year and is a leading cause of 13% global mortality. This condition is projected to increase by up to 30% of global mortality in 2025 [1]. Most of the hypertension-related-death in the world occurs in low- and-middle-income countries (31,5%) compared to high-income countries (28.5%) [2]. Indonesia is one of the middle-income countries whose prevalence of hypertension has increased from 25.8% in 2013 to 34.1% in 2018 [3]. The national prevalence for coronary heart disease is 1.5%, and the highest prevalence is in the East Nusa Tenggara (NTT) province at 4.4%.

Pharmacological treatment is the main choice for lowering blood pressure. However, along with the development of technology, non-pharmacological treatment has become one of the recommended alternative treatments for hypertension treatment based on evidence-based practice. The use of complementary therapies and alternative medicine (CAM) continues to grow and the majority of people with hypertension. This is because the side effects produced are lower than that of pharmacological treatment. The relatively cheaper cost and the same effectiveness are indicators of the use of complementary and alternative therapies in the treatment of hypertension. One of the therapies that can be used to lower blood pressure in people with hypertension is chromotherapy [4–6].

Chromotherapy or color therapy is a complementary alternative treatment recommended globally, utilizing electromagnetic radiation and several color frequencies to affect human neurohormonal pathways. With this mechanism, chromotherapy can cure various diseases [7–9]. The color effects work by intervening in the action of the sympathetic and parasympathetic nerves. Color therapy provides a relaxation element, reducing an individual's anxiety level [10]. The use of green and blue lights in chromotherapy help reduce stress levels and lower blood pressure in patients with hypertension *via* epinephrine hormone stimulation. This study aimed to determine the effectiveness of chromotherapy in blood pressure in hypertension patients in Oesapa Primary Health Care Center (Puskesmas). It can be hypothesized that chromotherapy can significantly reduce lower blood pressure in patients with hypertension.

2. Methods

This is a quasi-experimental study with one group pre and posttest with one control group design. The treatment group was given chromotherapy treatment, while the control group was not. The blood pressure was measured at baseline (pretest) and after the treatment was performed (posttest) for both groups [11, 12]. A total of 120 hypertension patients participated in this study. The participants were divided equally into two groups; 60 participants in the treatment group and another 60 participants in the control group. Data were analyzed using Mann–Whitney U test to determine any difference between the pre and posttest scores for each group. The level of significance was determined at p -value <0.05 . Statistical analysis was performed using IBM SPSS™ software.

This study incorporates a combination of green and blue LED lights. The intervention was conducted in a closed room using a 50 cm light transmission device, and then hung or placed 210 cm above the participant's body and left for 15–35 minutes. Participants were requested to relax and close their eyes during the intervention. After the intervention, the respondent's blood pressure was measured again.

3. Results

3.1 General data

See **Table 1**

Characteristic	Category	Groups				p-value
		Intervention		Control		
		n	%	N	%	
Gender	Male	28	46,7	30	50	0,592
	Female	32	53,3	30	50	
Total		60	100	60	100	
Age	40–45	18	30	17	28,3	0,201
	46–50	29	48,3	29	48,3	
	51–55	13	21,7	14	23,3	
Total		60	100	60	100	
Level of Education	Elementary School	3	5	3	5	
	Junior High School	4	6,7	8	13,3	
	Senior High School	25	41,7	22	36,7	
	Bachelor	26	43,3	26	43,3	
	Master - Graduate	2	3,3	1	1,7	
Total		60	100	60	100	

Source: Primary Data 2020

Table 1.
Characteristics of participants based on gender, age, and education level of the working area of Oesapa primary health care Center Kupang.

Variables	Category	Pretest		Posttest	
		F	%	F	%
Blood Pressure	Intervention				
	Normal	0	0	0	0
	Prehypertension	0	0	1	1,7
	Stage 1 Hypertension	13	21,7	38	63,3
	Stage 2 Hypertension	45	75	21	35
	Isolated Systolic Hypertension	2	3,3	0	0
	Total	60	100%	60	100%
	Control				
	Normal	0	0	0	0
	Prehypertension	3	5	0	0
Stage 1 Hypertension	29	48,3	19	32,7	
Stage 2 Hypertension	27	45	39	65	
Isolated Systolic Hypertension	1	1,7	2	3,3	
Total	60	100%	60	100	

Source: Primary Data 2020.

Table 2.
Distribution blood pressure of hypertension of the working area of Oesapa primary health care Center Kupang.

Resp	Blood Pressure Intervention Groups		Blood Pressure Control Groups	
	Pretest	Posttest	Pretest	Posttest
1	160/100	155/100	170/100	170/100
2	150/100	140/90	190/110	190/100
3	140/90	135/90	180/100	160/100
4	140/90	140/90	160/100	160/105
5	150/100	145/100	210/110	210/120
6	180/90	175/90	180/90	180/100
7	170/100	170/90	200/120	200/110
8	180/110	180/100	150/100	150/100
9	210/100	200/100	140/100	140/100
10	170/110	170/115	180/110	180/110
11	180/100	180/90	190/120	190/100
12	180/110	180/90	140/90	140/100
13	150/90	145/90	140/80	140/90
14	150/80	145/80	160/100	165/100
15	180/100	170/100	145/90	145/90
16	160/90	150/90	150/80	160/90
17	170/100	160/95	180/100	180/90
18	150/80	150/80	160/80	190/100
19	180/90	150/90	150/90	150/90
20	160/100	160/100	200/120	200/100
21	190/90	175/90	190/110	180/100
22	180/100	160/90	190/100	190/100
23	170/90	170/90	180/90	180/100
24	180/110	180/100	160/90	150/90
25	180/110	170/110	160/100	170/100
26	160/90	150/90	160/90	170/100
27	170/90	160/90	150/80	150/90
28	160/90	150/90	170/110	170/100
29	180/90	155/90	160/90	160/90
30	180/90	170/90	150/100	160/90
31	190/90	160/80	180/90	170/100
32	180/100	155/90	150/90	140/90
33	170/100	140/90	140/90	150/90
34	170/100	150/90	170/90	180/100
35	160/100	150/90	180/100	180/100
36	170/100	160/90	180/90	170/100
37	180/100	150/100	160/90	170/100

Resp	Blood Pressure Intervention Groups		Blood Pressure Control Groups	
	Pretest	Posttest	Pretest	Posttest
38	160/90	150/100	160/100	160/100
39	170/100	170/100	150/100	150/100
40	180/100	160/90	170/90	160/100
41	180/90	165/90	180/90	180/90
42	170/100	150/100	150/100	150/100
43	180/100	170/100	150/105	150/105
44	170/80	155/90	150/100	150/90
45	160/100	160/100	170/90	170/80
46	180/100	160/90	180/100	180/90
47	190/100	160/80	180/90	170/90
48	190/90	140/90	180/100	180/100
49	180/100	140/100	160/100	150/100
50	170/100	140/100	160/90	170/100
51	160/90	150/80	150/90	160/100
52	170/100	150/100	180/90	170/100
53	170/100	140/100	160/90	150/100
54	180/80	165/90	160/90	150/90
55	180/100	160/90	180/80	180/80
56	190/80	180/100	160/80	150/90
57	200/90	150/90	150/90	160/80
58	170/100	150/90	150/100	150/105
59	170/80	140/80	150/90	160/100
60	160/100	150/90	160/100	160/100
Rata-rata	172/96	168/93	166/96	166/97

Sumber: Data Primer 2020.

Table 3. Distribution of blood pressure pre and post intervention and control groups of working area of Oesapa primary health care Center Kupang.

3.2 Specific data

The pretest was performed at baseline to understand the respondent's initial blood pressure before chromotherapy treatment was given.

Table 2 shows that chromotherapy treatment can reduce blood pressure. After receiving chromotherapy treatment and the blood pressure was reevaluated, the blood pressure had improved to a level I hypertension (63.3%). On the contrary, there was no significant decrease in blood pressure for the control group; level I hypertension (48.3%) at the pretest and increased to level II hypertension (65%) at posttest.

Table 3 shows the results of the blood pressure of the intervention and control groups before participating in chromotherapy did not experience a

Tekanan Darah	Control	Mean	SD	Min-Max	p-value
Before intervention chromotherapy	intervention (n = 60)	69,81	0,469	3–5	0,001
	Control (n = 60)	51,19	0,596	2–5	
After intervention chromotherapy	intervention (n = 60)	49,99	0,510	2–4	0,000
	Control (n = 60)	71,01	0,524	3–5	

Sumber: Data Primer 2020.

Table 4.
Analisis Beda mean tingkat Stres kelompok perlakuan dan kontrol.

significant difference, namely the mean blood pressure of the treatment group was 172/96 mmHg and the group 166/96 mmHg. Meanwhile, after participating in chromotherapy, there was a decrease in the average blood pressure of the intervention group, namely 168/93 mmHg and the control group did not experience a decrease in blood pressure, namely 166/97 mmHg. So the average decrease in blood pressure after following chromotherapy is 10–14 mmHg.

Table 4 shows the mean blood pressure in the treatment group before the intervention was 69.81, while the blood pressure in the control group was 51.19. The results of further tests using the Mann–Whitney U Test showed no significant difference in blood pressure scores of hypertensive patients between the treatment and control groups before being given chromotherapy. After treatment, blood pressure in the treatment group decreased significantly compared to the control group ($p = 0.000$) and the mean blood pressure score in the treatment group decreased to 49.99, while the control group did not experience a decrease in blood pressure and tended to experience an increase in blood pressure, namely 71.01.

4. Discussion

This quasi-experimental study is one of the initial studies exploring the effects of color therapy on the stress levels of hypertension patients. In chromotherapy, a color is a form of electromagnetic energy and visible light. When it enters the retina's photoreceptors, it will be translated as a color that stimulates the pituitary and pineal glands to produce hormones, such as serotonin and endorphin. These hormones are secreted as a response to light to maintain psychological health, balancing mood, feelings, and behavior [13, 14]. This study uses a green and blue light that specifically has been proven to reduce blood pressure by utilizing reflected green and blue light. Combining these colors with light could selectively repair damaged cells and provide the healing energy needed [15–17].

A report by Gul et al. (2016) reinforced the result of this study, which exhibits both mild and severe stress in both groups during pretest. After the treatment group received chromotherapy treatment, there was a reduction in blood pressure score up to 10–14 mmHg with a p-value of 0.000. This means that there was a change in the initial blood pressure. Results indicated a decline of the mean blood pressure in the treatment group from 172/96 mmHg during pretest, to 158/93 during posttest. It suggests a drop of 10–14 mmHg. In the meantime, the control group did not record

any significant change with a mean blood pressure of 166/96 mmHg during pretest and 166/97 during posttest. Still, a reduction in blood pressure can also be explained by categories of hypertension. Before the treatment, most of the participants in the treatment group were at level II hypertension (75%). Posttest measurement after the chromotherapy treatment displayed an improvement with 63.3% of the participants recording level I hypertension. On the other hand, no significant change was found. Most of the participants in the control group recorded level I hypertension during pretest (48.3%) and level II hypertension in posttest (65%).

The mechanism of chromotherapy in the body utilize electromagnetic radiation and different color frequency by affecting the human neurohormonal system from the sympathetic and parasympathetic nerves, thus giving it a relaxation effect, which can reduce anxiety [10]. Also, chromotherapy can heal various illnesses by utilizing seven color lights, for example, yellow for gastric ulcer, a combination of red and blue for skin infections, etc. [15]. The effect of color and light from chromotherapy can be used as an easy, inexpensive alternative nonpharmacologic treatment with minimum risk of side effects.

This study has several limitations, including a relatively small sample size (120 participants) with a short time span to measure stress level and blood pressure, which was within the three times intervention. However, this study has shown the efficacy of chromotherapy using green and blue lights after accounting for several biases during the study.

5. Nursing implication

Nurses can implement chromotherapy in their environment as an alternative treatment aside from pharmacologic medication, which is a new innovation in complementary therapy. Also, this study adds to the nursing reference regarding the efficacy of color therapy in reducing stress and lowering blood pressure in hypertension patients. It is recommended for forthcoming studies to increase the sample size and lengthen the timespan of the measurement by also including other color lights.

6. Conclusion

Chromotherapy with a combination of green and blue lights is proven to be effective to stimulate the pituitary and pineal glands to produce hormones such as serotonin and endorphin, thus maintaining psychological health, balancing mood, feelings, repairing impaired cells, and providing healing energy that the body needs. Therefore, this study recommends the use of chromotherapy to reduce stress and lower blood pressure for hypertension patients.

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