Abdominal breathing affects blood pressure in hypertension sufferers

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Abstract

Hypertension is a significant risk factor for heart disease and stroke. This study was conducted to determine the effect of abdominal breathing on blood pressure in a hypertensive patient using the non-pharmacological treatment. This study used a pre-experimental method, which comprises of the one-group pre-test/post-test design. A total of 39 hypertensive respondents taken from a population in Wonokromo, Surabaya were chosen by using simple random sampling technique. Data was analyzed by Wilcoxon Signed-Rank Test, with an assigned significance level of α=0.05. The results of this study showed that before abdominal breathing, the systolic blood pressure was 146.41 mmHg, whereas the diastolic blood pressure was 117.43 mmHg. After performing abdominal relaxation, it was 135.64 mmHg and 87.95 mmHg, respectively. Moreover, the results of the Wilcoxon Signed-Rank Test showed a p-value of 0.000, illustrating that the results of blood pressure measurement were different before and after conducting the abdominal breathing. Therefore, abdominal breathing is suspected of having the ability to decrease the blood pressure.

Introduction

The hypertensive disease is also referred to as "the silent disease" owing to the fact that it comes with no visible signs or symptoms. It slowly develops and is extremely dangerous to health. Inhabitants of the RW III Karangrejo Village, suffering from hypertension, typically cope with this disease through the use of pharmacological treatment, with only a few opting for the non-pharmacological treatment techniques as a supplement to aid recovery.[1]

The Indonesian population suffering from hypertension has been estimated to be about 23.3%. According to the data obtained by the World Health Organization (WHO) in 2012, there is a global scale of 972 million (26.4%) of the population diagnosed with hypertension out of which 26.6% are men and 26.1% women. This figure is likely to increase to 29.2% by the year 2030. Similarly, a 2013 data obtained from Riskesdas, showed that the incidence of hypertension in Indonesia was of 26.5%.[2]

Furthermore, a survey from the National Health Indicators (SIRKENAS) in 2016 indicated that the prevalence had increased to 32.4%. A study carried out by the Surveillance Integrated Disease Clinics, in East Java, showed that the number of hypertensive patients had increased to a total of 530,070 individuals by 2015.[2]

According to the City Health Office Surabaya, over the years this ailment has always typically been one of the top 10 diseases. In 2011, new cases of hypertension had increased by 3.30%, although a slight decrease to 3.06% was seen in 2012. Furthermore, in 2013, a noticeable increase of 13.6% was seen, and the disease was ranked as the second most prevalent diseases in the region. By 2014, this number had decreased to 3%, and its ranking fell to 7th position. Initial data capture results obtained from Wonokromo were obtained on January 15, 2018, has it that out of 160 people living in Rice Village, 43 were affected by hypertension. Factors capable of triggering this ailment include heredity, sex, age (uncontrollable factors), obesity, excess salt consumption, lack of exercise, smoking, stress and high rate of alcohol consumption (controllable factors).[1,3,4]

Besides, the heart palpitations and the levels of angiotensin and aldosterone increase with a corresponding rise in sympathetic nerve activity.[5] Hypertension leads to various organ damage capable of attacking the functions of the brain, kidneys, eyes, and can also culminate in death.[1]

Deep breath is a non-pharmacological treatment which consists of abdominal breathing techniques, such as chest and full shoulder respiratory. The treatment strategy adopted was the relaxation and abdominal breathing method.[1,6]

Abdominal breathing refers to the slow, and rhythmic breathing technique of an individual, while they are comfortable with their eyes, closed.[6] This treatment method stretches the pulmonary, carotid sinus, and arcus aorta regions. This stimulus is received and forwarded by the vagus nerve to the medulla oblongata, producing a response in the baroreceptor reflex.[7] Inhibition of the sympathetic dystrophy nerves to the heart will decrease its pump rate while excitation of the parasympathetic nerve is strong enough to reduce the contractions of the heart, which will cause blood pressure to plummet.[5]

Based on the analysis above, the authors were interested in studying the difference in blood pressure before and after abdominal breathing in people living with hypertension in the RW III Karangrejo Sawah Village of Wonokromo, Surabaya.

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Materials and Methods

The design of this study was pre-experimental and comprised of a one-group pre-test/post-test design. Furthermore, the population in this research consisted of 43 people with a sample size of 39 respondents, obtained through the simple random sampling method. The independent variable was abdominal breathing, while the dependent was blood pressure, which was measured twice (before and after treatment) using a sphygmomanometer (Table 1).

The data was analyzed using the Wilcoxon signed rank test, with a significance level of α=0.05. Assuming the test result statistics showed a ρ of 0.05, H0 would be rejected, and H1 accepted. This would mean that there is a difference in blood pressure before and after abdominal breathing in hypertensive individuals from the RW III Karangrejo Sawah Village of Wonokromo in Surabaya. Ethical clearance of this research was published by the ethics commission of Universitas Nahdlatul Ulama Surabaya with No. 079/EC/KEPK/UNUSA/2018.

Results and Discussion

Based on the results, it was observed that nearly all the respondents (*9.7%) had blood pressure classified at the first hypertension stage, which does not generally produce observable symptoms. However, this class of hypertension tends to gradually begin to manifest when high blood pressure is coupled with tremendous bodyweight or when the victim undergoes a crisis. The Joint National Committee (JNC) VII defined this hypertensive stage as when the blood pressure is between 140-159 mmHg and the diastolic is 90-99 mmHg.8 Another research proved that systolic blood pressure decreased by 5.9 +/- 0.8 mmHg (P<0.001) while diastolic blood pressure reduced by 1.4 +/- 0.8 mmHg (P<0.005) after employing diaphragmatic breathing (Table 2).[9,10]

The age of the respondents was between 46-55 years (51.3%). As a result of changes in the anatomy and physiology of the body, the blood pressure was higher. This is especially seen with the cardiovascular system, which is caused by the aging process, where the ability of the heart in pumping blood is less efficient. Anggraini *et al.* (2009) stated that most hypertension sufferers were 45 years and those above this age limit, are at 17.726 time's greater risk.[9]

Women above the age of 45 are already in their menopause and experience a massive decline in estrogen, which triggers an increased activity of the renin-angiotensin and sympathetic nervous systems. This increased activity causes a change in vasokontriksi and dilation of the blood vessels, thereby increasing the blood pressure. According to the theory of Sherwood (2011), menopause leads to the instability of controlled blood flow. This decreases HDL and LDL, which negatively affects the body since high HDL levels is a protective factor in preventing the onset of atherosclerosis. In pre-menopausal women, estrogen is gradually lost, thereby increasing the chance of damages to the blood vessels. Generally women between the ages of 45-55, naturally have a decline in estrogen levels.[10]

A large majority (56.4%) of the respondents have a family history of hypertension. Therefore, assuming one member of the family or the parents suffers from high blood pressure, the child would be at risk of hypertension. This is related to the theory of Dalimartha (2008), which stated that around 70-80% of hypertensive patients have a family history associated with the disease. When both parents have its history, the risk of developing it will be much greater.[1]

Around 82.1% of the respondents consumed salty foods which are capable of affecting blood pressure. This is by the theory of Dalimartha (2008), which stated that high salt intake changes blood pressure, especially when more than 14 grams is consumed daily.[1]

Almost half (48.7%) of the respondents were smokers. The content of nicotine and other toxic substances are as dangerous as the chemical compounds found in these also provide an excellent opportunity to study someone suffering from hypertension. This is in accordance with the theory of Hart (2009), which stated that cigarettes contain nicotine and CO gases which damages the endothelial cells, resulting in decreased levels of oxygen in the red blood cells, thereby, leading to ischemia and spasms. The nicotine content in cigarettes also increases norepinephrine and Catecholamines, which causes the heart to function harder, leading to high blood pressure.[12] Nicotine increases blood clotting and leads to erosion, which is capable of increasing blood pressure.[1]

Abdominal breathing was conducted for eight consecutive days at 9 a.m for 15 minutes. This helped to decrease muscle tension in the body, as well as stimulate both the parasympathetic and sympathetic nerves to decrease blood pressure. Furthermore, an examination was performed with an interval of 15 minutes after each abdominal breathing session. Alimansur *et al.* (2013) stated that relaxation breathing is one technique that can be conducted to reduce the tension experienced by individuals since it aids to relax human muscles.[13] The parasympathetic influence on circulation is essential since it coordinates the frequency of the heart, using the vagus nerve, thereby leading to the release of acetylcholine hormone, which increases membrane permeability for potassium ions, and hyperpolarization in fibers. The hyperpolarization will result in a loss of membrane potential, effectively lowering the connecting fibers located between the muscles of the atrium and the A-V node, thereby slowing the heart impulses traveling to the ventricles. Relaxation also reduces stress and cortisol level, which influences blood pressure.[14]

Based on the results, it has been observed that blood pressure before abdominal breathing at average systole and diastole 146.41 mmHg and 117.43 mmHg had an SD of 6.277 and 5.162 respectively. Furthermore, after a deep breath, an average systole and diastole of 135.64 mmHg and 87.94 mmHg was obtained, with an SD of 8.520 and 6.950 respectively. Based on the Wilcoxon Signed Rank Test, some values obtained were 0.000 ρv, and α = 0.000, which means that there was no difference in blood pressure before and after the abdominal breathing was conducted in hyperten-

Table 1. Characteristics of respondents.

Characteristics	Frequency	Percentage
Age (years old)		
35 – 45	13	33.3
46 – 55	21	53.9
56 – 65	5	12.8
Total	39	100
Sex		
Laki – laki	19	48.7
Perempuan	20	51.3
Total	39	100
Heredity		
Yes	22	56.4
No	17	43.6
Total	39	100
Diet low in salt		
Yes	32	82.1
No	7	17.9
Total	39	100
Smoker		
Yes	19	48.7
No	20	51.3
Total	39	100

Table 2. Blood pressure hypertension sufferers (n=39).

Blood pressure	Pre-test		Post test	
	Mean	SD	Mean	SD
Systole	146.41	6.3	135.64	8.5
Diastole	117.43	5.2	87.94	6.9

sive individuals.

Abdominal breathing is beneficial in people suffering from hypertension, this is because the relaxation technique is employed, for 15 minutes, pulmonary stretch occurs and the muscles relax. This helps the body, and blood vessels, to maintain their elasticity.[7,15]

Stimulation of stretch, in the carotid sinus and arcus aorta, is received and forwarded by the vagus nerve to the medulla oblongata (cardiovascular regulatory centers), leading to an increase in the baroreceptor reflex.[16] Afferent impulses from the baroreceptor will stimulate the parasympathetic nerves and inhibit the sympathetic dystrophy center, thereby making it a systemic vasodilator, which decreases pulsation and contracts the heart. Parasympathetic nerve excitation to other parts of the myocardium will result in a contractile decrease, and the stroke volume produced will have an effect of negative inotropic. These circumstances resulted in a decrease in the stroke volume. On the skeletal muscle, fibers of some acetylcholine cause dilation of blood vessels.[7,16,17]

Conclusions

The results of the Wilcoxon Signed-Rank Test showed a ρ value of 0.000, it can be concluded that abdominal breathing reduced blood pressure in hypertensive patients.

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