

Original Research Article

The effect of alternate nostril breathing exercise in vital signs of congestive heart failure patients

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ABSTRACT

Background: Changes in vital signs such as tachycardia, dyspnea, tachipnea, decreased oxygenation, caused by the inability of the heart to pump enough blood to meet the needs of oxygen and nutrients needed by the tissue, so that alternative therapies are needed: alternate nostril breathing exercise (ANBE) as a companion to pharmacological therapy for congestive heart failure (CHF) patients. The purpose of this study was to see the effect of ANBE on the vital sign of CHF patients.

Methods: This quasy experimental study was used one group pretest and Posttes design, conducted at one of the Padang City Hospitals from March to August 2019. Study population includes CHF sufferers, with a sample of 16 people, using accidental sampling technique. Univariate data analysis to get the mean of vital sign and bivariate measurements using parametric test i.e. Paired t-test to see the effect of this therapy.

Results: Mean vital signs pretest and posttest was given in a row The observations are: respiratory rate (RR): 5.4978; 4.6078, pulse: 10.1804; 8,7770, systolic blood pressure (SBP): 12,5963; 11,1481, and diastolic blood pressure (DBP): 10,3009; 8.8606. Paired t-test obtained p-value of RR, pulse, SBP and DBP: 0.000, and existing t count> from t table (t count> 2.13145), so that there is an effect of ANBE on vital signs.

Conclusions: ANBE affects the vital sign of CHF patients and can be continued as an intervention that can be carried out independently by CHF sufferers.

Keywords: Alternate nostril breathing exercise, Congestive heart failure, Vital sign

INTRODUCTION

Congestive heart failure (CHF) is a major cause of morbidity and mortality worldwide.¹ There are 1,094,000 patients in the world hospitalized due to CHF.² 43.8% of deaths in America caused by cardiovascular disease are caused by coronary heart disease and 9% are caused by heart failure.³

In Indonesia, roughly 25% of deaths caused by heart disorders which 0.13% or around 229,696 people were heart failure patients. West Sumatera is at the third place

of this case, 0.13% or around 10,283 people suffering from CHF.⁴ The incidence of CHF is increasing every year. In 2011 there were 90 patients, in 2012 there were 97 patients and in 2013 there were 110 patients. DR. M. Djamil Hospital found that the prevalence of this case in 2 months (August-September) in 2016 was 30 patients.⁵

Common symptoms of CHF are changes of vital signs such as tachycardia, dyspnea, decreased oxygenation, discomfort, anxiety, depression with sleep disturbance, with sign that shortness of breath, coughing, fatigue during mild activities, anxiety due to oxygenation disorders, edema of the lower extremities, anorexia

accompanied by nausea, frequent urination at night, weakness, even decreased consciousness.^{1,6} In addition, according to Bernardi, other damage that usually occurs in heart failure is defect of lung function. Defect of lung function can indirectly contribute to decreasing oxygen saturation and decreasing activity.

CHF therapy commonly do with pharmacological therapy in order to increased oxygenation by giving oxygen and reducing oxygen consumption through reducing activity, reducing the workload of the heart with vasodilators, and improving cardiac muscle contractility.⁷ However, the benefits of these drugs are not completely able to overcome the problem and improve the condition of the heart, and still have side effects of drugs that can enrust the kidney condition. Therefore we need non-pharmacological therapy as treatment companion therapy, one of the treatments is by using the technique of breathing through nose, known as alternate nostril breathing exercise (ANBE).

ANBE can stabilize the patient's vital sign. This therapy is therapeutic for the circulatory and respiratory system, also helps to normalize and balance the pulse. This therapy consists of 8 stages that can be done 5-9 times/day with a length of 10-20 minutes and then do an assessment of vital signs that consists of blood pressure, pulse and respiratory rate (RR).^{8,9,11}

ANBE is significant in reducing blood pressure, pulse, breathing, pain, anxiety, improving sleep quality, increasing comfort and increasing oxygen saturation in patients with heart failure.¹² Alternative breathing nostril encourages deep relaxation because it is believed that this breathing can balance the left and right sides of the brain while calming the nervous system. It considered to reduce heart rate, reduce stress and anxiety, and improve respiration and circulation.¹³

ANBE can also reduce blood pressure. This is related to chemoreflex activity decreased and an baroreceptors sensitivity increased in the vagus nerve, which indicated the change in autonomic balance, which decreases sympathetic activity. The decreased of sympathetic nerves activity causes a decrease in heart volume and arterial and vein vasodilation which causes the decreased of blood pressure. Sensitivity of arterial baroreflex at RR 3-12 times per minute, increased during expiration.¹³

Based on those facts, the researcher is interested in examining the effect of ANBE in the vital signs of CHF Patients.

METHODS

This is a quasy experimental study, using the one group pre-test and post-test design approach, vital signs (blood pressure, pulse, and RR) of CHF patients were measured before and after being given ANBE. The study was conducted in the intensive care unit of Dr. Rasidin

Hospital in Padang from February 4 to September 10 2019. The population in this study were all CHF sufferers who were treated in the ICU since the last 1 year as many as 67 people.

Sample was taken by a simple experimental calculation formula: 16 respondents, added 10% of the total sample to prevent drop outs so the total sample was 18 respondents. The sampling technique used was accidental sampling. Selected respondents have met the existing sample criteria (1) cooperative patients (2) do not experience a decrease in consciousness (GCS 14-15), oxygen is not attached with non rebreathing mask, and exclusion criteria (1) patients getting worsening conditions, (2) the patient died. Ethical feasibility tests have been met in this study and approved by the research ethics committee of the Faculty of Medicine, Andalas University, Padang, Indonesia (No. 21/ KEP/ FK/ 2019).

The procedures and stages of data collection in this study were pre-test stages: (1) measurement of vital sign pre-test every day before starting the first frequency, (2) measurement of the pre-test by: respondents are asked to relax physically and mentally for 10 minutes in a semi-fowler position/sit in bed, after that measure and record the results of vital signs by: measuring blood pressure using a sphygmomanometer (Diamond) and a stethoscope placed in the systemic artery of the upper right limb by the auscultation method. The measurement of the pulse in the right radial artery by palpation for one minute. RR is obtained by counting the amount of breathing (inspiration and expiration) in one minute. Intervention: ANBE therapy was given for 6 days, 5 times / day with 2 hours interval for 10 minutes in each therapy.

Post-test: (1) vital sign was measured and recorded again after the therapy at eight frequency every day, using the same measurement as the pre-test, (2) patient's response was observed during therapy. All measurement results are recorded in an observation sheet. In addition to variable data, age and gender data were also collected. The data was described through univariate analysis presented in mean, standard deviation (SD), and minimum, maximum interquartile range. Bivariate analysis was by t-test dependent test with paired t-test to see differences in vital sign before and after intervention, with a significance level of 95%, and $p < 0.05$ which statistically found significant differences between before and after ANBE therapy in patients with CHF.

RESULTS

There were 16 respondents who met the criteria for the sample. The other 2 patients experienced a decrease in consciousness and died. Table 1 shows that more than half (50%) of the respondents were >60 years old, and most of them were female (50%). Table 2 shows that the average and standard deviation of vital sign pretest are RR: 5.4978, 0.39882, pulse: 10.1804, 0.42721, systolic blood pressure (SBP): 12.5963, 0.59605, and diastolic

blood pressure (DBP): 10.3009, 0.59244. The average and SD of vital sign post-test are: RR: 4.6078, 0.39025, pulse: 8.7770, 0.23505, SBP: 11.1481, 0.31630, and DBP 8.8606, 0.50572. Table 3 shows that the statistical test

results for overall p-value of RR, pulse, SBP and DBP was 0,000 ($p \leq 0.05$), which means there were differences in RR, pulse, blood pressure between before and after the administration of ANBE.

Table 1: Characteristics of respondent (n=16).

Characteristics	N	(%)
Age (in years)		
51-60	8	50
>60	8	50
Sex		
Male	8	50
Female	8	50

Table 2: Average of respiratory rate, pulse, blood pressure before and after ANBE.

Variables	Mean	SD	Min - Max	N
Respiratory rate				
Pre-test	5.4978	0.39882	20-36	16
Post-test	4.6078	0.39025	16-24	16
Pulse				
Pre-test	10.1804	0.42721	85-120	16
Post-test	8.7720	0.23505	68-80	16
Systolic blood pressure				
Pre-test	12.5963	0.59605	130-185	16
Post-test	11.1481	0.31630	110-135	16
Diastolic blood pressure				
Pre-test	10.3009	0.59244	90-130	16
Post-test	8.8606	0.50572	60-90	16

Table 3: The effect of ANBE on respiratory rate, pulse, blood pressure.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Respiratory rate pretest-posttest	0.88996	0.20296	0.05074	0.78182	0.99811	17.540	15	0.000	
Pulse rate pretest-posttest	1.40843	0.37619	0.09405	1,20797	1,60889	14,976	15	0.000	
Systolic blood pressure pretest-posttest	1.44816	0,37787	0,09447	1,24681	1,64951	15,330	15	0.000	
Diastolic blood pressure pretest-posttest	1.44030	0.66604	0.16651	1.08539	1.79520	8.650	15	0.000	

1= Variabe 1, 2= Mean, 3= Std. deviation (SD), 4= Std. error mean, 5= 95% confidence interval of the difference, 6= Lower, 7= Upper, 8= t, 9= df, 10= Sig. (2-tailed).

DISCUSSION

Based on the characteristics of the respondents, more than half of the respondents were >60 years old, and most of them were female.

CHF disease increased at 40 years old years and over.² Schultz et al also found that the highest average age of

respondents was 57.9 years old and 32% were 65 years old, and women were more than men (56%).¹⁴ Dokainish et al found the age of respondents was 59 years old (SD 15), men had more CHF (61%) than women (39%).¹⁵ Harigustian et al stated that the highest age of sufferers was 61-65 years (59.38%), the most of them was female (53.12%).¹⁶ Harikatang et al stated that 50% respondents of CHF were the 60-70 years old age.¹⁷

Age is a major risk factor for heart disease and other chronic diseases including heart failure.¹⁸ Increased age is related to progressive dysfunction of organs and has an effect on the ability to maintain homeostasis.¹⁹ This is related to the aging process that causes an increase in atherosclerosis in blood vessels.

Heart failure is a progressive condition in which neurohormonal activation has a central role.²⁰ Women are more risky in hypertension which is closely related to the incidence of heart failure.²¹ This is related to greater hormonal factors in the female body than in men. Hormonal factors can cause an increase in body fat or obesity. Obesity in women can also be due to lack of activity, easier stress on women and more time spent relaxing at home.²²

The results of vital sign measurement before ANBE therapy were the mean RR pre-test 5.4978, standard deviation 0.39882, the highest was 36 and the lowest was 20. Average pulse 10.1804, standard deviation 0.42721, the highest was 120 and the lowest was 85. The average SBP is 12.5963, the standard deviation is 0.59605, the highest was 185 and the lowest was 130, and the average of DBP 10.3009, the standard deviation is 0.59244, the highest was 130 and the lowest was 90.

The results of this vital sign measurement can be interpreted that clinically STEMI patients have increased RR, pulse, and SBP and DBP, with the number of increases being 5, 10, 12, 10 times sequentially from the normal vital sign.

Heart failure is a clinical syndrome caused by structural and functional abnormalities of heart that affect the ability of left ventricle to adequately fill and pump blood,²³ so cardiac output will decrease and it can lead to fatigue and dizziness, as well as the appearance of congestion symptoms such as shortness of breath during activity.²⁴

The increase in hemodynamics in CHF patients is a consequence of abnormalities in the structure, function, rhythm, and conduction system of heart, causing ventricular dysfunction. Impaired ventricular function is mainly caused by myocardial infarction in coronary heart disease, hypertension or both. CHF not only indicates the inability of the heart to maintain adequate oxygen transfer, but also a systemic response to compensate for this inadequacy.²⁵

CHF patients complain of dyspnea, fatigue and symptoms of volume overload, including pulmonary or peripheral edema. Dyspnea will get worse while physical activity increases or a flat body position.²⁶ In addition, CHF also causes changes in neurohormonal regulation so that it will affect the hemodynamic status which can be seen from the instability of the patient's vital signs,²⁷ as the result it will emerge typical signs of heart failure such as tachycardia, tachypnea, rhythmic breath sounds,

effusion pleura, increased jugular vein, peripheral edema and hepatomegaly (Indonesian Cardiovascular Specialist Association, 2015). Symptoms worsen even increase the risk of cardiovascular morbidity and mortality if the treatment does not appropriate.²⁰

To overcome the symptoms, a lot of emphasis has been placed on primary and secondary prevention of cardiovascular disease, with the aim of treatment being to improve clinical status, functional capacity, and quality of life, prevent hospital admission, and ultimately reduce hospital mortality.^{20,28} One of alternative lifestyle-based interventions that is safe and effective is Yoga.²⁹

Breathing exercises (Pranayama) is a component of yoga that has many benefits against cardiovascular disease.³⁰ ANBE is one method of breathing exercises (pranayama) which has many benefits against cardiovascular disease.²⁸

After ANBE is given for 6 days, 5 times in 1 day during 10 minutes, the results post-test are: Average RR 4.6078, standard deviation 0.39025, highest 24 and lowest 16. Average pulse 8.7770, standard deviation 0.23505, highest 80 and lowest 68. Average SBP 11.1481, standard deviation 0.31630, highest 135 and lowest 110, and average DBP 8.8606, standard deviation 0.50572, highest 90 and lowest 60.

This intervention explained that the respondent's vital sign decreased by: RR 4, pulse 8, SBP 11, and DBP 8 times the vital sign condition that had previously risen to normal. From value of t arithmetic (95% confidence interval) with the value of t table and based on the degree of freedom (df)= 15 inferred t arithmetic > from t table (t arithmetic >2.13145) which means there is a significant influence giving ANBE to the vital sign of the respondent. Correspondingly, the Paired t-test showed that the overall p-value of RR, pulse, SBP and DBP was 0,000 ($p \leq 0.05$), which means there were differences in RR, pulse, blood pressure between before and after the administration of ANBE. Thus further strengthening the hypothesis in this study and at the same time proving the existing theory that ANBE is significant in reducing vital signs.

Some related research results which state that ANBE influences are: ANBE affects blood pressure, pulse frequency, breathing, pain, anxiety and increases comfort and oxygen saturation in patients with heart failure.²⁸ ANBE has a significant effect on the stability of vital signs of patients with heart disease.¹³ Telles et al, stated the results of previous studies found that 18 minutes of breathing alternative nostrils reduce SBP and DBP in people with essential hypertension controlled by drugs.³¹

Doing yoga several times per week, with each session lasting about 20 minutes, is effective in treating hypertension, reducing angina episodes per week, increasing exercise capacity, and reducing weight and waist circumference, reducing serum cholesterol and LDL

cholesterol levels, reducing the frequency of revascularization. Yoga can facilitate regression and prevent the development of atherosclerosis, with mechanisms similar to statins. Yoga benefits the effects of diabetes by increasing insulin sensitivity and decreasing plasma insulin levels.³²

ANBE which is part of Yoga has many benefits to the physiological, behavioral, and psychological components. Research on the use of ANBE in patients with heart failure shows the benefits of this exercise as supplementary therapy followed by medical therapy. This breathing exercise is proven to be able to stabilize the symptoms of heart failure, increase activity tolerance, cardiovascular system endurance, heart function, autonomic function, quality of life and myocardial distress.³⁰

ANBE are performed by inhalation of one of the nostrils and exhalation is carried out through different nostrils, repeated for six to fifteen minutes.³³ ANBE is done by inhalation with one of the nostrils closed using the thumb and then exhaled through a different nostril by closing the nostril using the little finger.³⁴

In administering therapy, patients are recommended in a semi-fowler/sitting position. This is because the dyspnea will deteriorate in a supine lying position, and can awaken the patient's sleep at night accompanied by sweating and anxiety.³⁵ Andersen et al also stated that dyspnea will get worse with increased physical activity or a flat body position.²⁶ Dyspnea will be reduced if the patient is sitting upright or standing.³⁵

Combining pharmacological therapy, lifestyle modification and the application of breathing exercises (pranayama) can improve lipid profile, overcome hypertension, cardiac dysrhythmias and other cardiovascular diseases such as coronary disease artery.³⁰

ANBE is also closely related to cerebral dominance.¹³ When a nostril is dominant, it causes the counter lateral hemisphere to become activated.¹³ Breathing through the right nostril which passes through the right spinal cord and is associated with the left cerebral hemisphere causes an increase in stimulation of the sympathetic nervous system.¹³ Meanwhile, breathing through the left nostril through the left spinal and is directly related to the right cerebral hemisphere which stimulates the workings of the parasympathetic nerve, so that the body will experience relaxation.¹³ Breathing with both nostrils or known as ANBE can balance the activity of the sympathetic and parasympathetic nerves, so that breathing and blood pressure become stable, and the patient does not feel shortness of breath anymore.¹³ This breathing exercise can balance the left and right sides of the brain, as well as calm the nervous system, so that it can reduce heart rate, reduce stress and anxiety and improve respiration and circulation.¹³

ANBE also causes changes in the physio-psychological component by changing autonomic balance into dominant parasympathetic and increasing baroreflex sensitivity so as to reduce blood pressure and heart frequency which can significantly affect patients with heart failure.³⁰ In addition, this exercise causes better intercostal muscle function, thereby increasing muscular endurance, increasing VO₂ max and facilitating the extraction of oxygen by peripheral tissues.³⁰

An increase in left ventilatory filling pressure with exercise is well explained in heart failure with a sustained ejection fraction.³⁶⁻³⁸

ANBE which is also part of exercise presents other unique hemodynamic pressures, including shortening in the diastolic filling period, increased myocardial wall pressure, increased contractility and myocardial oxygen demand, and changes in the resistive and pulsatile arterial load.²⁶

CONCLUSION

ANBE play a role in stabilizing the vital sign of CHF patients. ANBE is closely related to cerebral dominance. When breathing through the right nostril, it will pass through the right spinal cord and is associated with the left cerebral hemisphere, which results in increased stimulation of the sympathetic nervous system. Breathing with the left nostril goes through the left spinal cord and is directly related to the right cerebral hemisphere which stimulates the workings of the parasympathetic nerve, so the body will experience relaxation. Breathing with both nostrils or known as ANBE can balance the activity of the sympathetic and parasympathetic nerves, so that breathing and blood pressure become stable, while balancing the left and right sides of the brain and calming the nervous system, so as to reduce heart rate, reduce stress and anxiety and improve respiration and circulation.

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