

Effect of Hydro-Aromatherapy on Oxygen Saturation in Heart Failure Patients

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Abstract: Background: Heart failure is a pathophysiological condition where the function of the heart as a pump is no longer able to meet the needs of blood throughout the body for tissue metabolism. Cardiac output is an important factor in assessing the adequacy of oxygen supply to tissues in addition to hemoglobin and oxygenation levels. Maintaining oxygenation is an effort to ensure an adequate supply of oxygen to tissues or cells. Lack of oxygen supply in the body can cause tissue damage due to tissue hypoxia.

Object: to determine the effect of hydro-aromatherapy on oxygen saturation (SpO₂) in patients with heart failure.

Methods: This study was a quasi-experiment pretest-posttest with two groups. Thirty-two respondents were selected by consecutive sampling with inclusion and exclusion criteria. The intervention was given a warm feet soak with aromatherapy, while the control only had a warm feet soak. Pulse oximetry was used to measure SpO₂. Data were analyzed using a dependent t-test and independent t-test.

Results: The results showed that there was a significant difference in effect on increasing SpO₂ ($p < 0.005$) in the intervention group soaking feet with warm water mixed with aromatherapy oil ($p = 0,000$).

Conclusion: the study indicated that soaking feet with warm water mixed with aromatherapy oils in heart failure patients can increase the value of SpO₂.

Keywords: Hydro-aromatherapy, Oxygen saturation, Heart failure

1. INTRODUCTION

Heart failure (HF) is a pathophysiological condition where the heart's function as a pump is no longer able to meet the needs of blood throughout the body for tissue metabolism [1]. Heart disease ranks the third-highest number of patients in hospitals in Indonesia. While the number of new patients with inpatient heart failure in one of the North Sumatra has increased in recent years, with 238 patients in 2014, 248 patients in 2015, and 295 patients in 2016 [2].

HF results in a decrease in cardiac output which can be a serious problem in cardiovascular function related to the entire body system [3]. Cardiac output is an important factor in assessing the adequacy of oxygen supply to tissues in addition to hemoglobin and oxygenation levels. Maintaining oxygenation is an effort to ensure an adequate supply of oxygen to tissues or cells. Lack of oxygen supply in the body can cause tissue damage on the body caused by tissue hypoxia. Knowing whether our body has enough oxygen to supply is important to know.

Peripheral SpO₂ is an estimate of the SpO₂ level that is usually measured by a pulse oximeter. This tool is a direct method that can be performed on the side of the bed, is simple and non-invasive to measure the SpO₂ of peripheral arteries. In other words, SpO₂ is the presentation of hemoglobin that binds to oxygen in the arteries, normal SpO₂ is between 95-100% [4].

In this case, there are two kinds of management of cardiovascular diseases, namely pharmacological and non-pharmacological. Pharmacological management is with drugs and medical therapy, and non-pharmacological management without medical drugs such as hydrotherapy and aromatherapy. Hydrotherapy is a therapy using water as a medium. One type of hydrotherapy is to soak feet with warm water. Warm water scientifically has physiological effects on the body, namely in blood vessels where the warm water temperature makes the circulation of blood vessels smooth because of the vasodilation of blood vessels [5].

Wulandari said that hydrotherapy by soaking feet with warm water is beneficial to reduce blood pressure, heart rate, increase circulation, reduce edema, increase muscle relaxation, and increase comfort [6]. Koike et al. found that there was a significant decrease in blood pressure, heart rate as physiological indicators after warm water foot bath therapy [7]. Nauman et al. obtained the result that foot bath therapy with warm water affects the heart rate [8]. Based on the description above, the researchers are interested in determining the effect of hydro-aroma therapy on SpO₂ in heart failure patients.

2. METHODS

This study was a quasi-experiment pretest-posttest with two groups. Thirty-two respondents were selected by consecutive sampling with inclusion and exclusion criteria. Inclusion criteria, namely: 1) respondents with the medical diagnosis of heart failure in the inpatient room at Medan City Hospital with NYHA II and III classification; 2) willing to participate in research, 3) in a conscious condition and able to communicate well; 4) able to sit; 5) there is not a history of peripheral vascular disease or neuropathy disorders due to diabetes; 6) there are no wounds and inflammation in the leg area; 7) not sensitive to warm water; 8) no disturbance in the smell, and 9) no history of allergies to aromatherapy. Exclusion criteria, namely: 1) unilateral reasons for stopping participation in the study; and 2) respondents who died or did not continue treatment until completion of therapy. For the hydro-aromatherapy group (intervention), the intervention was to soak feet with warm water mixed with rose aromatherapy essential oil in a bucket with a water temperature of 35-45⁰C for 10 minutes, while the hydrotherapy group (control) was given the intervention to soak feet in warm water only without mixing with rose aromatherapy essential oil in a bucket with water temperature 35-45⁰C for 10 minutes. The SpO₂ observation sheet was a pre-intervention note sheet and post-intervention SpO₂ values per minute from the measurement results of the pulse oximeter (Operating Manual of Fingertip Pulse Oximeter Version 02) to respondents both in the intervention group and the control group. Data were analyzed using a dependent t-test and independent t-test.

3. RESULTS

The distribution and presentation of demographic characteristics of respondents and the factors related to this study can be seen in Table.1. This study found that in the intervention group, research respondents in the pre-treatment stage had SpO₂ with an average of 91.25 (SD=5,871). Whereas in the stage after the treatment of foot soaking with warm water mixed with aromatherapy it was found that the average SpO₂ had increased by an average of 93.13 (SD=5.85). Whereas in the control group, the mean SpO₂ before treatment was 85.44 (SD=4.13), and after the treatment of soaking feet with warm water alone without mixed aromatherapy also increased by an average of 86.94 (SD=6.22) (Table 2).

Based on paired t-test, it was found that in the intervention group there was a significant difference in SpO₂ between before and after the intervention ($t=-1.58$, $p=0.00$). While in the control group, also found a significant difference in SpO₂ between before and after treatment

($t=-1.14$, $p=0.02$). The final results of this study also found that there were significant differences ($p<0.05$) to an increase in SpO₂ values between the intervention group and the control group ($t=2.89$, $p= 0.00$). This shows that soaking the feet with warm water mixed with aromatherapy compared to warm water without aromatherapy has a significant effect ($p <0.05$) increasing SpO₂ in patients with heart failure (Table 3,4,5).

4. DISCUSSION

In the intervention group, based on the age of half the respondents (50%) were late elderly with age 56-65 years and the average age of respondents was 55.06 with a standard deviation of 11.34. The same was true for the control group, which was 62.5% who were late elderly with the average age of respondents being 55.06 ± 8.71 . Two-thirds of respondents (68.8%) from the intervention and control groups (62.5%) were male. More than half of the respondents in the intervention group (75%) and the control group (62.5%) included patients with chronic heart failure with a long history of suffering >60 months (5 years). And most study respondents also had a history of comorbidities such as hypertension in the intervention group (37.5%) and control (50%).

This is in agreement with the results of Kao's [9] study which found that from 91 samples of patients with heart failure the average age was 66.74 ± 12.23 years. The majority of participants were male (57.1%), married (62.6%), not working (73.6%), and not attending school or only elementary school (60.5%). The largest proportion of participants in NYHA Classification II (40.7%), comorbidities was suffered by participants 71.4% hypertension, 50.5% coronary artery disease, and 31.9% diabetes.

This study found that in the intervention group, before treatment had SpO₂ with an average of 91.25 (SD=5878). Whereas at the stage after the treatment of foot soaking with warm water mixed with aromatherapy it was found that SpO₂ had increased by an average of 93.13 (SD=5.85). Whereas in the control group, the average SpO₂ before treatment was 85.44 (SD=4.13), and after the treatment of soaking feet with warm water only without mixed aromatherapy also increased by an average of 86.94 (SD=6.22). This is also in accordance with Wulandari's research [6] which states that hydrotherapy by soaking feet with warm water was beneficial for lowering blood pressure, increasing circulation, reducing edema, increasing muscle relaxation. This was relevant to the results of research Hongratanaworakit [10] who found that aromatherapy affects human autonomic parameters and emotional responses in healthy people after transdermal absorption. Five measures of autonomic

parameters measured were blood pressure, respiratory rate, blood SpO₂, pulse, and body temperature.

Based on paired t-test, it was found that in the intervention group there was a significant difference in SpO₂ between before and after the intervention ($t=-1.58$, $p=0.00$). While in the control group, also found a significant difference in SpO₂ between before and after treatment ($t=-1.14$, $p=0.02$). This shows that soaking feet with warm water can increase peripheral SpO₂ in patients with heart failure whether or not mixed with aromatherapy oil. Same with the results of Harada's research, et.al., [11] states that soaking feet can be combined with herbs, salts, moisturizers or other ingredients added to containers containing warm water and used to soak feet. From the results of the study it was found that soaking foot warm water mixed with salt can increase the temperature of the fingers and locally increase the temperature of the skin, but overall it warms the body, affects blood pressure, and besides it also has an effect on increasing peripheral blood circulation.

Aromatherapy was also beneficial for the patient's vital signs status. This is consistent with the results of research Taheri, et.al. [12] Aromatherapy effect on physiological parameters on inpatient awareness of ICU room hospitals significantly reduced the patient's vital sign in the intervention group compared with the control group with measurements of systolic and diastolic blood pressure, pulse, respiration rate, and arterial blood SpO₂ $p < 0.05$.

The results of this study indicate that soaking feet with warm water mixed with aromatherapy oils in heart failure patients can increase the value of SpO₂ better than soaking feet with warm water alone without mixing aromatherapy oils $p < 0.05$ ($t=2.89$, $p=0.00$). This is in accordance with research that found that the influence of aromatherapy was very positive on the mind, the response to relaxation, comfort and calmness. In a safe situation, a calm atmosphere, someone will experience the opposite of the stress response so that feelings of discomfort, tension, blood pressure, oxygen use and so on will decrease [13].

5. CONLUSSION

The results of this study indicated that there was an effect of hydro-aroma therapy on increasing SpO₂ in patients with heart failure.

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Table1. demographic characteristics of respondents and related factors (n=32)

Variable	Intervention (n=16)		Control (n=16)	
	f	%	f	%
Age				
Early Adulthood 26-35 years	0	0	1	6.30
Late Adulthood 36-45 years	4	25	1	6.30
Early Elderly 46-55 years	3	18.80	3	18.80
Late Elderly 56-65 years	8	50	10	62.50
Old man >65 years	1	6.20	1	6.30
Mean ± SD	55.06 ± 11.34		55.06 ± 8.71	
min-max			33-68	
Gender				
Male	11	68.80	10	62.50
Female	5	31.20	6	37.50
Education				
Primary School	4	25	1	6.30
Junior High School	3	18.80	1	6.30
Senior High Scholl	3	18.80	10	62.50
Diploma/ Bachelor	5	31.30	4	25
Magister	1	6.30	0	0
Profession				
Farmer	3	18.80	2	12.50
Driver	1	6.30	1	6.30
Trader	12	6.30	1	6.30
Government Employees	1	12.50	3	18.80
Entrepreneur	3	6.30	4	25
General Employees	5	18.80	0	0
Jobless/ Housewife/ Retired		31.30	5	31.30
Long suffered				
Acute <5 years (60 months)	6	37.50	4	25

Chronic ≥ 5 years (60 months)	10	62.50	12	75
Mean \pm SD	47.94 \pm 65.98		31.44 \pm 26.63	
min-max	1-216		1-96	
Family History				
Yes	9	56.30	14	87.50
No	7	43.80	2	12.50
History of Disease				
Hypertension	6	37.50	8	50
Bronchopneumonia	1	6.30	0	0
Chronic Obstructive Pulmonary Disease	0	0	1	6.30
Hypertension + Diabetes Mellitus (DM)	2	12.50	5	31.30
Hypertension + Kidney Illness	0	0	1	6.30
Hypertension + COPD	0	0	1	6.30
DM + Pneumonia	1	6.30	0	0
Pneumonia	1	6.30	0	0
Hemorrhoid	1	6.30	0	0
No	4	25	0	0
Lifestyle History				
Smoke				
Yes	13	81.30	10	62.50
No	3	18.80	6	37.50
Alcohol				
Yes	2	12.50	4	25
No	14	87.50	12	75
Regular Exercise				
Yes	0	0	0	0
No	16	100	16	100
Eat Regularly				
Yes	12	75	7	43.80
No	4	25	9	56.30
Enough Rest				
Yes	6	37.50	7	43.80
No	10	62.50	9	56.30

BMI				
Underweight	0	0	1	6.25
Normal	14	87.50	15	93.75
Overweight	1	6.25	0	0
Obesity	1	6.25	0	0
Pain Scale				
Moderate	10	62.50	15	93.80
Severe	6	37.50	1	6.20
Mean \pm SD	6.06+1.29		5.19+0.9	
min-max	4-8		4-7	
Pain Location				
Chest	16	100	16	100
Pain Metastases				
Back	7	43.80	9	56.20
Neck	3	18.80	2	12.50
Chest	3	18.80	2	12.50
Stomach	1	6.30	3	18.80
Neck and Hand	1	6.30	0	0
Neck and Back	1	6.30	0	0
Classification of CHF (NYHA)				
Class II	7	43.80	5	31.30
Class III	9	56.30	11	68.80

Table 2. effects of hydro-aromatherapy on SpO2 Before and After hydro-aromatherapy

Variabel	Intervention Group (N=16)		Control Group (N=16)	
	Mean \pm SD	min-max	Mean \pm SD	min-max
Oxygen Saturation Before	91.25 \pm 5.87	77-100	85.44 \pm 4.13	80-90
Oxygen Saturation After	93.13 \pm 5.85	80-99	86.94 \pm 6.22	75-96

Table 3 the differences of effects of hydro-aromatherapy on SpO2

Variabel	Intervention Group		Control Group	
	Mean (SD)	t (sig)	Mean (SD)	t (sig)
SpO2	-1.87 (4.74)	-1.58 (0.00)	-1.50 (5.25)	-1.14 (0.02)

Table 4 comparison of the differences in the Effects of hydro-aromatherapy on SpO2 between
the Intervention and the Control Group

Variabel	t	Sig
SpO ₂	2,89	0,00