Article

The Effect of Giving a Contrast Bath with an Elevation of 30° on Decreasing the Degree of Edema in Patients with Congestive Heart Failure at Ulin General Hospital, Banjarmasin

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Abstract

Background: Congestive heart failure is the inability to pump blood throughout the body which causes the walls to be unable to pump adequately. **Purpose:** This study aimed to ascertain the effect of a contrast bath with a 30 º elevation on the reduction of edema in congestive heart failure patients at Ulin General Hospital, Banjarmasin. **Methods:** The design of this study was quasi-experimental with an unequal control group design. The population is patients with congestive heart failure, and the sample used is successive sampling. 34 respondents were divided into two groups, 17 respondents in the intervention group and 17 in the control group. **Results:** The Mann-Whitney result value P = 0.027 (P < 0.05) represented a significant reduction in Bath contrast edema with 30º feet elevation in the intervention group and control group patients with congestive heart failure. **Conclusion:** Based on the results of this study, it is expected to be able to apply contrast showers with an elevation of 30 º in nursing services to reduce the degree of edema in congestive heart failure patients.

Keywords: Contrast bath. Edema, Elevation of feet 30 °, Congestive heart failure

1. BACKGROUND

Congestive Heart Failure is the inability of the heart to pump blood throughout the body so that the heart only pumps blood for a short time and the weakened heart muscle walls are unable to pump adequately. If heart failure occurs, this will result in a buildup of fluid in several organs of the body, such as: hands, feet, lungs or other organs, causing swelling which can inhibit the activities of heart failure patients (1) .

Edema is a condition in which the veins are blocked by an increase in intra-vascular hydrostatic pressure (the pressure that pushes blood to flow in the vessels by the pumping action of the heart). Thus causing an enlargement of plasma fluid into the interstitial space (2) . In this situation a client who has edema in the extremities will have an impact on the patient's independence or daily activities so that the patient's ability to carry out activities is stopped. This can lead to complications (3) .

According to WHO 2020 data, 17.3 million people died from cardiovascular disorders. In 2017 and more than 23 million people will die each year from cardiovascular disorders (WHO, 2020). More than 80% of deaths from cardiovascular disorders occur in low- and middle-income countries (4) . And in an American study, the risk of developing heart failure

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was 20% for ages ≥40 years, with an incidence of >650,000 newly diagnosed cases of heart failure over the last few decades. The incidence of heart failure increases with age. The death rate for heart failure is about 50% within 5 years (5) .

Based on Riskesdas data for 2020, the prevalence of heart failure in Indonesia is 0.3%. Disease prevalence data was determined based on 2 interview results with respondents aged ≥ 15 years in the form of a combination of disease cases that had been diagnosed by a doctor or cases that had symptoms of heart failure (Riskesdas, 2013).

The management of edema consists of elevation of 30° using gravity to increase venous and lymphatic outflow from the legs. Peripheral venous and arterial pressure is affected by gravity. Blood vessels that are higher than the heart of gravity will increase and decrease peripheral pressure thereby reducing edema (6) . Another therapy that can be done is contrast bath. Contrast bath is a treatment by soaking the feet up to the calf alternately using warm water and followed by cold water. Where the temperature of warm water is between 36.6-43.3°C and cold water temperature is between 10-20°C. Soaking the edematous leg with this therapy will reduce intravenous hydrostatic pressure which causes enlargement of plasma fluid into the interstitial space and fluid that is in the interstitium will return to the veins. So that edema can be reduced (2) .

2. METHOD

2.1 Types of research

The design of this study uses a quasi-experimental research design with a non-equivalent control group design. The population studied were all patients with congestive heart failure who experienced edema at Ulin General Hospital, Banjarmasin

2.2 Location and Time of Research

This research is located at Ulin Hospital, Banjarmasin. The research was carried out in the July-December 2021 period.

2.3 Population and Sample

The population studied were all patients with congestive heart failure who experienced edema at Ulin General Hospital, Banjarmasin.

The sampling technique used consecutive sampling. The sample needs to meet the criteria in order to determine the criteria. The sample criteria were divided into two, namely the inclusion criteria: Hospitalization, willing to be included in this study, patients diagnosed with CHF and experiencing extremity edema, and no contraindications. And the exclusion criteria: patients who terminate or refuse to be responders and patients who have complications other than CHF.

The sample of this study was 34 people, divided into 2 groups, namely 17 people in the treatment group and 17 people in the control group. Each group was observed before and after the intervention 3 times a day.

Data collection

The intervention carried out in this study was a contrast bath. Contrast

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bath is a treatment by soaking the feet up to the calf alternately using warm water and followed by cold water. Where the temperature of warm water is between 36.6-43.3°C and cold water temperature is between 10-20°C. And the 30° elevation intervention uses gravity to increase venous and lymphatic outflow from the legs. Peripheral venous and arterial pressure is affected by gravity. Edema measurement using the observation sheet Degree of edema.

Processing and data analysis

The data obtained were then analyzed using the Mann Whitney U Test statistical test, the Wilcoxon Signed Rank Test, with a significance degree of $p<0.05$.

The researcher has passed the research ethics test from the Ethics Committee of the Ulin General Hospital Banjarmasin with the *Ethical Clearance* (EC) number 421/VIII-RegRiset/RSUDU/21.

3. RESULTS

3.1 Sample Characteristics

Table 1. Characteristics of Sample Age

Variable	Group	N	Min	Max	Means	SD
Age	treatment	17	36	75	47,29	9.51
Sample	control	17	33	70	49,58	10.50

Based on the table above, it shows that the frequency distribution of sample characteristics is based on the age of the respondents in the inpatient room of the Ulin Banjarmasin Hospital in 2021, it was found that the minimum age was 36 years and the maximun age was 75 years in the treatment age group, while for the minimum control group it was 33 years and the maximum age is 70 years.

Table 2. Characteristics of Gender, History of Consuming Alcohol, Smoking, and Working

	Treatment Group			Control Group	
Characteristics of Respondents		Amount (n)	Percentage(%)	Amount	percentage(%)
Gender	Man	8	23.5	11	32,4
	Woman	9	26.5	6	17,6
Consuming History Alcohol	Yes	7	20,6	3	8,8
	Not	10	29,4	14	41,2
Smoking History	Yes	6	17,6	7	20,6
	Not	11	32,4	10	29,4
Working	Yes	13	38,2	14	41,2
	Not	4	11,8	3	8,8

The frequency distribution of respondents' characteristics based on gender was mostly male, namely 19 people between the treatment group and the control group

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Table 3. The Value of The Degree Of Edema In CHF Patients Before and After Administration of a Contrast Bath with a 30◦ Foot Elevation in The Treatment Group and Control Group

Control Group						
	Edema Variable	n	Means	Min	Max	SD
Before	Degree 1	6	.000	2	2	-
	Degree 2	11	.505	3	4	.683
	degree 3	0	-	-	-	.
After	degree 1	6	1.83	1	2	.480
	Degree 2	10	3.5	3	4	527

Treatment Group						
	Edema Variable	n	mean	min	max	SD
Before	Degree 1	0	-	-	-	-
	Degree 2	16	3.25	2	4	.663
	Degree 3	1	6.00	6	6	-
After	Degree 1	12	1.75	1	2	1.75
	Degree 2	4	3.00	3	3	3.00

The mean degree of edema in the respondents before being in the control group was at degree 2 with an average of 505mm. While the mean degree of edema of the respondents after being in the control group was at degree 2 with an average of 3.50 mm.

Table 4. Differences in Degrees of Edema in CHF Patients Before and After Giving Contrast Baths with 30◦ Leg Elevation in the treatment group and the control group

Treatment Group							
	Edema Variable	N	Means	Min	Max	sd	Pv
Before	Degree 1	6	.000	2	2	-	.317
	Degree 2	11	.505	3	4	.683	
	Degree 3	0	-	-	-	.	
After	Degree 1	6	1.83	1	2	.480	
	Degree 2	10	3.50	3	4	.527	
	Degree 3	1	5.00	5	5	-	
Control Group							
	Edema Variable	N	Means	Min	Max	SD	PV
Before	Degree 1	0	-	-	-	-	
	Degree 2	16	3.25	2	4	.663	
	Degree 3	1	6.00	6	6	-	083
After	Degree 1	12	1.75	1	2	1.75	

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Degree 2	4	3.00	3	3	3.00
degree 3	1	6.00	6	6	6.00

(SD= Standard Deviation; PV= PValue)

The researcher uses the normality test first because the data is parametric, namely using intervals so that the results show that the data is not normally distributed, so they use the bivariate Wilcoxon Sign Rank analysis to test paired data (pre-posttest) the degree of edema in the control group and the treatment group if the data is distributed abnormal in table 4.4 shows the degree of edema before and after Pvalue = 0.317 > α = 0.05 and in the treatment group Pvalue = 0.083 <α = 0.05.

Table 5. Analysis of the Effect of Contrast Bath with Feet Elevation 30◦ In the Treatment Group and Control Group of CHF Patients

Group	Edema Variable	N	Mean s	SD	Mi n	Ma x	PV
Treatment	Posttest leg edema	17	2,24	0.97	1	5	0.027
Control	Posttest leg edema	17	3.00	1,061	1	5	

Statistical test results used Mann-Whitney U bivariate analysis to test unpaired data on the degree of edema in the treatment and control groups.

4. DISCUSSION

4.1 Assessing the Degree of Edema of CHF Patients Before and After Administration of Contrast Bath with 30° Foot Elevation in the Treatment Group and Control Group

The results of measuring the degree of edema in the respondents in the treatment group before the Contrast Bath intervention was carried out after which it was continued with a 30° leg elevation in Congestive Heart Failure patients obtained an average degree of edema was at degree 2, namely 16 people with an average of 3.25mm then after being given the contrast bath intervention and followed by elevation of the feet 30º with intervals 3x a day for 3 days obtained the average value was at degree 1, namely 12 people with an average of 1.75mm while in the previous control group respondents were at degree 2 with an average of .505mm. While the mean degree of edema of the respondents after being in the control group was at degree 2 with an average of 3.50mm.

The increase in the results of measuring the degree of edema that occurred in the control group patients in this study could be caused by several external factors that could not be controlled by the researchers, these external factors such as the administration of pharmacology that occurred in each sample which caused a different degree of edema between one respondent and the other. The respondent also has a history of consuming alcohol and smoking which can increase blood acidity so that the blood becomes thick and the heart is forced to pump blood more forcefully, but when the heart cannot pump optimally, the blood that reaches the tissues is

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insufficient and fluid accumulates.

In most patients with congestive heart failure, the high degree of edema is caused by three main mechanisms that cause edema, namely: Increased capillary hydrostatic pressure. Decreased plasma oncotic pressure and increased capillary permeability (6) .

These results are in line with research conducted by (7) at Ambarawa Hospital, Ungaran Hospital, Salatiga City Hospital, Central Java regarding the effect of Contrast Bath therapy on leg edema in congestive heart failure patients, the results obtained were p value = 0.034 < α (0 .05) which means there is a difference in leg edema in the pretest and posttest control group on the degree of leg edema in patients with congestive heart failure.

According to the researchers, a contrast bath with a 30° leg elevation uses a gravity technique which will increase venous and lymphatic flow from the legs and reduce intravenous hydrostatic pressure which causes enlargement of plasma fluid into the interstitial space and circulating fluid returns to the veins so that edema can be reduced (7) .

4.2 Differences in Degrees of Edema Before and After Contrast Bath Intervention Given with 30° Foot Elevation in the Treatment Group

The results of measuring the degree of edema in the respondents in the treatment group before the Contrast bath intervention was carried out after which it was continued with a 30° leg elevation in Congestive Heart Failure patients obtained an average degree of edema was at degree 2, namely 16 people with an average of 3.25mm then after being given intervention contrast bath and continued with elevation of the feet 30º with intervals 3x a day for 3 days the average value was obtained at degree 1, namely 12 people with an average of 1.75mm. Then the Wilcoxon Sign Rank statistical test was carried out with a Pvalue = 0.083 < α = 0.05, so it can be concluded that there is a difference in the mean (mean) degree of edema before and after the act of giving a contrast bath with a 30° leg elevation.

Whereas in the previous control group respondents were at degree 2 with an average of .505mm. While the mean degree of edema of the respondents after being in the control group was at degree 2 with an average of 3.50 mm. after administering a contrast bath followed by elevation of the feet 30° to reduce edema in the control group who were not given intervention so that the degree of edema did not decrease.

The ability of the heart to pump blood throughout the body is influenced by several factors, one of which is the age of the respondent. Along with the development of age, more and more problems and levels of stressors are faced can affect a person's quality of life. Individuals who have entered adulthood or the elderly are often faced with conditions such as physical changes that are getting weaker so that it has an impact on the ability of the heart to do its job (Bowman et al, 2006). Judging from the results of the characteristics of the respondents based on the age of the respondents, it was found that the average age of the respondents was 48.44 and the minimum age was 33 years while the maximum age was 75 years.

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Several researchers have also proven that a person's age greatly influences the quality of heart function, such as a study conducted by (8) at the PKU Muhammadiyah Yogyakarta Hospital on the relationship between age and gender and the quality of life of heart failure sufferers, that all respondents aged > 65 years had a quality of life which is less than (100%) the Kendall Tau test results show a P value of 0.001 <α 0.05.

The mechanism of action of contrast bath therapy with 30° leg elevation in reducing the degree of edema starts with reducing intravenous hydrostatic pressure which causes enlargement of plasma fluid into the interstitial space and fluid that is in the interstitium will return to the veins so that edema can be reduced ((9) . And combination with 30° leg elevation therapy will improve venous return and reduce edema (increased gravity) will help restore systemic circulation through the venous valves (10) .

Likewise what was done by (7) , Ungaran Hospital, Salatiga City Hospital, Central Java regarding the effect of contrast bath therapy on leg edema in congestive heart failure patients, the results obtained were p value = 0.034 <0.05, which means that there is a significant effect of contrast bath on leg edema in congestive heart failure patients. And in a study conducted by Ricky Efendi Siregar (2016) regarding the provision of 30° leg elevation at HAM Hospital, West Sumatra concerning the effect of elevating the leg position 30° above the bed on reducing leg edema in congestive heart failure patients, the results showed that P = 0.000 < 0.005, which means that there is a difference before and after the intervention with 30° leg elevation above the bed.

Based on the research analysis supported by related research, it can be concluded that administering a contrast bath with a 30° leg elevation can reduce the degree of edema in Congestive Heart Failure patients who experience edema. Soaking the feet in warm water and cold water causes vasodilation in muscles and blood vessels, so that blood pressure decreases and muscle work decreases and the effect of elevation therapy will increase venous return and reduce edema (increased gravity) will help return to systemic circulation .

4.3 Analyzing the Effect of Giving Contrast Baths with 30° Leg Elevation in the Treatment Group and the Control Group in Congestive Heart Failure Patients.

The results of measuring the degree of edema in the treatment group respondents after giving a contrast bath with a 30° leg elevation in the treatment group obtained an average degree of edema value of 2.24 mm which decreased while in the control group which was not given an intervention contrast bath with a 30° leg elevation an average of 3.00 mm has increased. Statistical test results using MannWhitney U bivariate analysis to test unpaired data on the degree of edema in the treatment group and the control group if the data is not normally distributed, in table 5 shows Pvalue = 0.027 < α = 0.05 meaning that there is a significant effect on the contrast bath intervention with an elevation of 30 ° to reduce the degree of edema.

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The results showed that patients with congestive heart failure in the inpatient room of Ulin Banjarmasin General Hospital in the treatment group and the control group partially had degrees of edema in the range of degrees 1 and 2. In measuring the results of the Wilcoxon signed rank test statistical test the degree of edema with intervention was given P value = 0.000 < α = 0.05, this shows that a contrast bath with a 30° leg elevation is effective in reducing the degree of respondent's edema. Whereas in the control group the results were Pvalue = 0.480 < α = 0.05 indicating that the control group that was not given the intervention did not experience a decrease in the degree of edema.

If we compare the results of the treatment group and the control group, there is a more significant difference in reducing the degree of edema in the intervention group because each intervention's P-value is not the same. The difference between these two groups was in the magnitude of the decrease in the degree of edema that occurred, in the treatment group there was a decrease in the degree of edema compared to the control group which did not experience a decrease in the degree of edema. this is because the control group was not given interventions carried out by researchers but only depended on interventions carried out by the hospital.

Judging from the change in the degree of edema, the technique of administering a contrast bath followed by elevating the feet 30° is effective in reducing the degree of edema, compared to the group that did not receive the intervention and only relied on pharmacological therapy as well as many factors that influence changes in the degree of edema, including age, type of gender, and history of smoking and alcohol consumption.

So administration of contrast bath therapy followed by 30° leg elevation is very effective in reducing the degree of edema, the mechanism of action of this therapy is by reducing intravenous hydrostatic pressure which causes enlargement of plasma fluid into the interstitial space and increases venous return and helps return it to the systemic circulation so that edema can reduced (2) .

5. CONCLUSION

There was a change in the degree of edema before and after in Congestive Heart Failure patients in the control group who were not given Contrast bath therapy followed by 30° leg elevation and the treatment group who were given contrast bath therapy followed by 30° leg elevation. There are differences in the degree of edema in Congestive Heart Failure patients in the control group and the treatment group. There was a significant effect of administering a contrast bath intervention followed by an elevation of 30° on leg edema in the treatment group and the control group.

Respondents with heart failure who experience leg edema are expected to be able to use contrast bath therapy with a 30° leg elevation at home or independently to reduce the degree of edema. For nursing services, they can apply this practice not only when patients are treated in hospitals, and teach families to be able to apply it at home, so that the benefits of this therapy will

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be felt more. For inpatient rooms, knowledge of nursing is developed, so that the Head of the Room can instruct the room nurse to continue contrast bath therapy with a 30° leg elevation as a non-pharmacological technique to reduce the degree of edema. Future studies may be able to use different compression techniques or be able to overcome inhibiting factors such as those in this study.

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