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Effect of back massage on fatigue and quality of life among patients with heart failure

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Abstract

Background: Heart failure is a life-threatening condition with a broad-ranging impact, affecting almost every important aspect of patients' lives. Fatigue has been reported as the most common and distressing symptom associated with heart failure. Also, quality of life in heart failure may be impaired by physical symptoms, psychological problems, adverse treatment effects and social limitations. Massage therapy is widely used to treat patients with different conditions. It has been proven that back massage has a positive effect on improving sleep duration that reduce the physiologic burden on the cardiovascular system, and improving fatigue. Despite the evident that massage therapy has a beneficial effect on fatigue in various populations; however, there is no previous studies examined the effect of massage on fatigue in heart failure patients.

Aim of the study: to examine the effect of back massage on fatigue and quality of life in patients with heart failure.

Setting: The study was carried out at the coronary care unit at Menoufia University Hospital.

Sample: A convenient sample of 84 patients with heart failure was recruited to participate in the study.

Design: A quasi experiment design (study/control) was utilized.

Tools: A Semi Structured Demographic Questionnaire; Piper Fatigue Scale; New York Heart Association Classification of Heart Failure and Minnesota Living with Heart Failure Questionnaire were used to collect data.

Results: There was a highly statistically significant decrease in the total mean score of fatigue and improve quality of life, *P*<.001.

Conclusion: Back massage is a simple, non-invasive technique has a beneficial effect on reducing fatigue and improving quality of life in heart failure patients.

Recommendation: Massage therapy can be used as a routine practice by nurses in the coronary care units to reduce fatigue and improve quality of life in patients with heart failure.

Keywords: Heart failure, fatigue, quality of life, back massage

Introduction

Heart failure is a life-threatening condition in which the heart can no longer pump enough blood to meet the metabolic needs of the body. According to the 2017 American Heart Association of Heart Disease and Stroke Statistics Update, 6.5 million Americans have heart failure, a number which may increase to 8 million by the year 2030 [1]. It is estimated that by 2030, the prevalence of heart failure will increase to 46%, affecting more than 8 million people, and the total medical costs for patients with heart failure are expected to increase from $20.9 billion to $53.1 billion [2].

Heart Failure (HF) is often a highly symptomatic condition, with shortness of breath, fatigue, chest pain, edema, and syncope being the most commonly reported symptoms. These symptoms impair quality of life, drive the need for heart failure- related hospitalizations, inhibit individuals'

ability to function physically and perform activities of daily living.

Fatigue has been reported as the most common and distressing symptom associated with heart failure [3]. Patients with fatigue experience an overwhelming sustained sense of exhaustion and decreased capacity to engage in physical and mental activity that is not relieved by rest. Fatigue is associated with poor functional ability and quality of life, and it could predict a worsening prognosis and increased mortality in patients with heart failure [4].

Individuals with HF experience impairment of physical and functional capacity, which imposes limitations on their life. Quality of life in HF may be impaired by physical symptoms, psychological problems, adverse treatment effects and social limitations. These factors may lead to individuals withdrawing from activities and previous social contacts and losing their social relations and social support

[5]. The negative impact of heart failure on health-related quality of life (HR-QoL) is well recognized. Health-related quality life is influenced by numerous physical, emotional, and social factors and is uniquely perceived by each individual [6].

Massage therapy is an alternative method widely used to treat patients with different conditions. Massage therapy acts by: blocking noxious stimuli, in line with the gate-control theory; increasing blood and lymphatic flow, which may accelerate the elimination of catabolites; and releasing endorphins that promote a feeling of well-being. Massage therapy involves hands-on techniques to increase circulation, relieve tension, improve sleep, and promote relaxation throughout the entire body [7]. The positive effect of back massage has been reported to reduce fatigue which enhance muscle relaxation, reduce stress, improve sleep duration that reduce the physiologic burden on the cardiovascular system, and eventually improve quality of life [8].

Nursing care of patients with heart failure should emphasize on comprehensive assessment and management of physical symptoms such as fatigue and mental status to improve the quality of life of these patients. Massage is one of the complementary and alternative nursing care measures modalities which facilitate the process of nurse-patient communication, gives patients senses of attention, promote patients' safety, and improve their comfort [9 &10].

Significance of the Study
Heart failure is a life-threatening condition with a broad-ranging impact, affecting almost every important aspect of patients' lives. Fatigue has been reported as the most common and distressing symptom associated with heart failure and has a negative impact on mood, physical function, work performance, social interaction, family care, cognitive performance, and community activities. Currently there is no effective pharmacological treatment for fatigue in heart failure. Quality of life in heart failure may be impaired by physical symptoms, psychological problems, adverse treatment effects and social limitations. These factors may lead to individuals withdrawing from activities and previous social contacts and losing their social relations and social support. Because the chronic nature of heart failure, quality of life is an important factor in patients' overall health and there is a need for better understanding of the impact of the illness on patients one' life [11]. Massage therapy is widely used to treat patients with different conditions. Reports have suggested that massage therapy acts by: blocking noxious stimuli, in line with the gate-control theory; increasing blood and lymphatic flow, which may accelerate the elimination of catabolites; and releasing endorphins that promote a feeling of well-being. It has been proven that back massage has a positive effect on improving sleep duration that reduce the physiologic burden on the cardiovascular system, and improving fatigue. In addition, back massage is a simple, non-invasive and natural technique that considered a safe and inexpensive treatment for most people. Despite the proven evident that massage therapy has a beneficial effect on fatigue in various populations; however, there is no previous studies examined the effect of back massage on fatigue in heart failure patients.

Aim of the Study
The aim of the current study was to examine the effect of back massage on fatigue and quality of life in patients with heart failure.

Research Hypotheses
1. Patients who are receiving back massage are more likely to have decreased fatigue level than patients who are not receiving back massage.
2. Patients who are receiving back massage are more likely to experience improved quality of life than patients who are not receiving back massage.

Methods
Design: A quasi experimental design (study / control) was utilized to examine the effect of back massage on fatigue and quality of life in patients with heart failure.

Setting: The study was carried out at the Coronary Care Unit (CCU), at Shebin El-Kom, Menoufia University Hospital, and Menoufia Governorate, Egypt.

Sample: A convenient sample of 84 patients was recruited for this study. These patients were approached over 11 month period from the beginning of August 2017 to the end of June 2018. These patients met the following inclusion criteria:
a) Patients with confirmed diagnosis of heart failure by cardiologist and through NYHA classification of heart failure.
b) Adult patients, age19-65 years.
c) Patient who are willing to participate in the study.

Patients were excluded from participating in the study if they have any of the following conditions:
a) Back injuries, spine fractures, rib fractures and back pressure ulcer to avoid further injury.
b) Respiratory failure or cardiac tamponade to avoid stressing a weak heart.
c) Heart failure patients who are bedridden and psychologically unstable and NYHA class IV to avoid stressing a weak heart as patient has symptoms at rest.

Sample Size Calculation: In the present study, sample size was calculated based on power analysis performed in a previous study which indicated that 64 patients would yield sufficient statistical power of 80% to detect the effect of back massage, medium treatment effect size = 0.5, and alpha = 0 .05 [12 & 13]. 20 patients more were added as an attrition rate based on the overall mortality rate of heart failure (16%) [14].

Data Collection Tools
1. **A Semi Structured Questionnaire:** This tool was developed by the investigator to collect data related to the two main aspects; the first was patient's demographic data including patient's age, gender, educational level, occupation and marital status. The second was patient's clinical data covering diagnosis, duration of the disease and medication. Data were extracted from the patient's medical records by the investigator at the initial data collection point after admission to Coronary Care Unit.

2. **New York Heart Association Classification of Heart Failure:** Cardiac Function Status was measured using the New York Heart Association (NYHA) Classification [15].

NYHA Classification measures the patient's perception of symptoms occurring during different levels of activity by assigning subjects to one of four cardiac functional classes (I-IV) based on subjects' responses to questions about the amount of fatigue, dyspnea or pain they experience at different levels of physical activity prior to the cardiac event. This classification reflects physical disabilities related specifically to the cardiac event. The instrument consists of four categories and participants were asked to classify themselves in one of the four categories to reflect their cardiac functional status prior to the cardiac event. The categories reflect the ability to perform daily physical activities and the accompanying symptoms.

Class I: No limitation of physical activity. Ordinary activity does not cause undue fatigue, palpitation, or dyspnea.

Class II: Slight, mild limitation of physical activity. Comfortable at rest but ordinary activity causes fatigue, palpitation, or dyspnea.

Class III: Marked limitation of physical activity. Comfortable at rest but less than ordinary activity causes fatigue, palpitation, or dyspnea.

Class IV: Unable to carry out any physical activity without discomfort and symptoms occur at rest.
Inter-rater reliability has been demonstrated to be 0.56 as measured by the percent of times that two observers agreed on the assessment of an individual patient [16]. Validity has been measured by comparing NYHA estimates with exercise treadmill performance. Of 150 estimates, 51% of the NYHA results agreed with treadmill performance [16]. Despite these low reliability and validity assessment, the New York Heart Association classification system is widely used and a clinically accepted instrument to categorize the degree of cardiovascular disability.

3. **Piper Fatigue Scale (PFS):** Was developed by Piper (1998) [17] to assess fatigue level, it contains 22 items categorized into 4 reliable and correlated dimensions: behavioral severity (6 items); relating to the severity and degree of disruption in activity of daily living; affective meaning (5 items) relating to the emotional meaning attributed to fatigue; sensory (5 items), relating to the physical symptoms; and cognitive and mood (6 items), relating to mental and mood states.

The score of the scale ranged from zero to ten, total and subscale mean scores are derived from summing individual items and dividing by the number of items in the subscale/ total scale to maintain the 0-10 scaling. With severity codes: (0) none, (1-3) mild, (4-6) moderate and (7-10) sever. The higher scores correspond to higher fatigue level.
The reliability of piper fatigue scale was reported in a study of one-hundred and ten consecutive cancer patients. Internal consistency was evaluated using Crombach's alpha for the entire PFS (22 items) was 0.95. The construct validity was verified by correlating PFS score and the other similarly constructed, administered tools, it was found that there was a significant correlation (*P*<.001) with Profile of Mood States (POMS) [18]. In the current study, the test-retest reliability of PFS (22 items) was 0.92 at seven patients.

4. **Minnesota Living with Heart Failure Questionnaire (MLHFQ):** was developed specifically for use in heart failure patients. The MLHFQ assesses the patients' perception of the effects of heart failure on the physical, socioeconomic and psychological aspects of their life. Patients respond to 21 items using a six-point Likert scale (0-5). The responses range from 0 (none or not applicable), to 1(very little) to 5 (very much). The simple sum of the responses that ranges from 0 to 105 is a measurement of heart failure severity as indicated by its adverse effect on the respondent's life during the past month. It provides a total score (range 0-105, from best to worst HR QoL), as well as scores for two dimensions. It is possible to obtain subscale scores for physical (8 items, range 0-40) and emotional domains (5 items, range 0-25). The remaining eight items (total of 21) are only considered for the calculation of the total score [21]. The questionnaire has been found to be valid in comparison with other health outcome scales [20 & 21]. It has been shown to discriminate between patients with HF and those with symptomatic left ventricular dysfunction. The MLHFQ can be used to measure whether a treatment for heart failure improves subjects' quality of life by reducing the adverse effects of heart failure. Test–retest technique found that initial low scores tended to increase and initial high scores tended to decrease [21].

The comprehensive content of the MLHFQ is representative of the many ways heart failure can adversely affect patients' lives. The 21 questions assess the impact of the signature physical symptoms and signs of heart failure: shortness of breath, fatigue and peripheral edema as well as commonly occurring feelings of depression. Other questions ask about the effects of heart failure on common physical/social functions including walking, climbing stairs, household work, need to rest, sleep, working to earn a living, going places away from home, doing things with family or friends, recreational activities, sexual activities and diet. Ability to concentrate and memory, and feelings of loss of self-control and being a burden to others are also included. Questions about side effects of treatments, hospital stays and costs of care are included to help measure the overall adverse impact of heart failure on patients' lives [22].
The test retest reliability of the questionnaire was performed using Alpha Crombach revealed that all items are significantly differed and has a correlation coefficient (r=0.87) which indicate a good reliability of the questionnaire [23, 24].

Ethical Considerations
All necessary official permissions for conducting the study were obtained from the Faculty of Nursing as well as from the hospital directors. A verbal consent was obtained from the participants who met the study inclusion criteria. During

the initial interview, the purpose and the procedure of the study were explained to the participants and the verbal consent was obtained. The participants were assured that all information will be confidential. Also, they were assured that their participation in the study is voluntary and that they can withdraw from the study at any time and can refuse to complete the study. It was also emphasized that refusal to participate or to withdraw from the study would not affect any aspect of the care provided to them. Confidentiality and anonymity of patients were assured through coding all data and puting all data collection sheets in a secured closed cabint. Questionnaires were fulfilled by the participants themselves or through personal intreviews by the researcher.The nature of the questionnaires did not cause any physical or emotional harm to the participants.

Pilot Study
A pilot study was conducted on 10% of the study sample (nine patients) to test the practicality and applicability of the tools and to estimate the time needed to fill in the tools. Subjects participating in the pilot study were excluded from the final analysis.

Data Collection Procedure
The participants were recruited to participate in the study on the third day of admission to the coronary care unit in order not to disturb the patients' medical treatment plan. The researcher collected data all days of the week from 1p.m. to 4p.m. Each participant (study and control group) was interviewed for three sessions, one session each day for three consecutive days. Each session took about one hour. The investigator gets the patients 'list from the head nurse of the CCU to identify the potential participants. Participants were interviewed individually by the investigator in the coronary care unit. Eighty-four adult patients were randomly assigned into two equal groups (study/control), 42 patients each. Both groups were matched against the study inclusion criteria as much as possible. The researcher handles the control group first to prevent contamination of data. The control group followed the usual hospital care. The study group received back massage intervention for 10 minutes once a day for three consecutive days beside routine hospital care.

Back Massage Intervention
Back massage (from sacral area through to cervical area) was delivered 10 minutes each day for three days consecutively. Back massage intervention included pressing and stroking (effleurage: circular stroking movements with the palm of the hand), rubbing with short strokes, tapping (percussion), and rubbing with long strokes (friction) [8]. Back massage was scheduled one hour before meal or two hours after meal. Before the massage, each participant was asked to sit up and position himself/herself on a bedside table with a pillow to cushion. Curtains were drawn to ensure the participants' privacy and cover any parts of the body not being worked on. A small amount of olive oil was applied before starting the massage with the whole hand

using smooth rhythmic strokes. Using firm movements to stroke upwards, i.e., from the lower back right up to the neck, using gentle pressure circles around and slowly move to the lower back region for three minutes. Using the heel of the hand, there is a smaller area of contact of which the pressure is deeper. Start at the lower back using both hands and work in circles. Using the same circular movement, move outward first and then upward. Return to the center gradually and then progress to the upper back for two minutes. Use reinforced fingers to concentrate on a smaller area of contact. Stand on the right hand side of the area that you are working on. Place one hand on the top of the other hand and push with the flats of the hand away from the center line, and then glide back towards the spine. Begin this procedure at the lower back and work it up to the upper back for two minutes.

Using a reinforced thumb to apply deep continuous pressure up to the full length of the muscles located at either side of the spine. As you move to the neck, lessen the pressure a little. Move slowly and intentionally, feeling for sensitive spots while you glide from the lower to the upper back. Continue these three times on each side, alternating it with a couple of effleurage and then repeat the stroking for one minute. At the end of the massage session, apply effleurage with supported fingers, then effleurage with the heel of the hand, then full handed effleurage. Using these techniques will increase the impact that you have created with the trigger and stroking point release. Leave the patient quiet for a few minutes. The technique of back massage has been explained in details with illustrated pictures in the designed manual and has been distributed at discharge time for family members. A training session for family members was conducted to make sure that they will continue the massage sessions at home. A phone number was given to the family member to answer any questions. The investigator filled a semi-structure questionnaire (tool I) and New York Heart Association Classification of Heart Failure to assess the severity of the disease (tool II) from each participant individually before applying the massage intervention in the first session only for both study and control groups. The investigator waited for 30 minutes after performing the back massage and then assessed Piper Fatigue Scale (tool III) and the Minnesota Living with Heart Failure Questionnaire (tool IV) for both study and control groups at the third day of the back massages intervention.

Results
Characteristics of the Sample
The mean age of the participants in the study and the control group was 52.38±4.8 and 52.62±4.8 years old respectively. More than half of the participants in both study and control groups were male 52.4% and 54.8% respectively. Concerning the educational level, about 35.7% of both study and control groups can read and write. Half of the participants in the study and the control groups were working 50.0% and 54.8% respectively. The majority of the participants in both study and control groups were married 83.3% and 81.0% respectively. See table 1.

Table 1: The Demographic Characteristics of the Sample (N=84)

Items	Study Group n= (42)		Control Group n= (42)		χ^2	P -value
	No	%	No	%		
Age						
Mean ± SD	52.38±4.8		52.62± 4.8		-.229- ns	.820
Range	40 – 60		40 – 60			
Age Group						
<50 years	14	33.3%	12	29.3%	.814 ns	.436
>50 years	28	66.7%	29	70.7%		
Sex					.048 ns	.827
Male	22	52.4%	23	54.8%		
Female	20	47.6%	19	45.2%		
Marital Status					.091 ns	.955
Married	35	83.3%	34	81.0%		
Widow	6	14.3%	7	16.7%		
Divorced	1	2.4%	1	2.4%		
Educational level					.000 ns	1.000
Illiterate	11	26.2%	11	26.2%		
Read and write	15	35.7%	15	35.7%		
Secondary education	12	28.6%	12	28.6%		
High education	4	9.5%	4	9.5%		
Occupation						
Working	21	50.0%	23	54.8%	.827 ns	.414
Not working	21	50.0%	19	45.2%		

Table (I) illustrated that there was no statistically significant difference between the study and the control group regarding their demographic characteristics.

Table 2: The Effect of Back Massage on Fatigue level among the Studied Groups Pre and Post Intervention

Total Fatigue Score					Mann-Whitney U test P-value	
	Study Group		Control Group		Pre	post
	Pre	Post	Pre	Post		
Total Fatigue Score					-.296-ns	2.500-(S)
Mean ±SD	149.64 ±7.2	133.26 ±8.1	151.43 ±8.2	148.90 ±9.1	.768	.014
t-test p-value	21.039$^{(HS)}$ < .001		4.968$^{(HS)}$ < .001			

NB: ns= not significant (p>0.05) $^{(S)}$= (p<0.05) $^{(HS)}$ =(p<0.001)

Table (2): Showed that there was a significant difference between the study and the control group, 133.26 ±8.1 and 148.90 ±9.1, P= <0.001. Also, the mean score of fatigue declined from 149.64 ±7.2 pre intervention to 133.26 ±8.1 post intervention in the study group
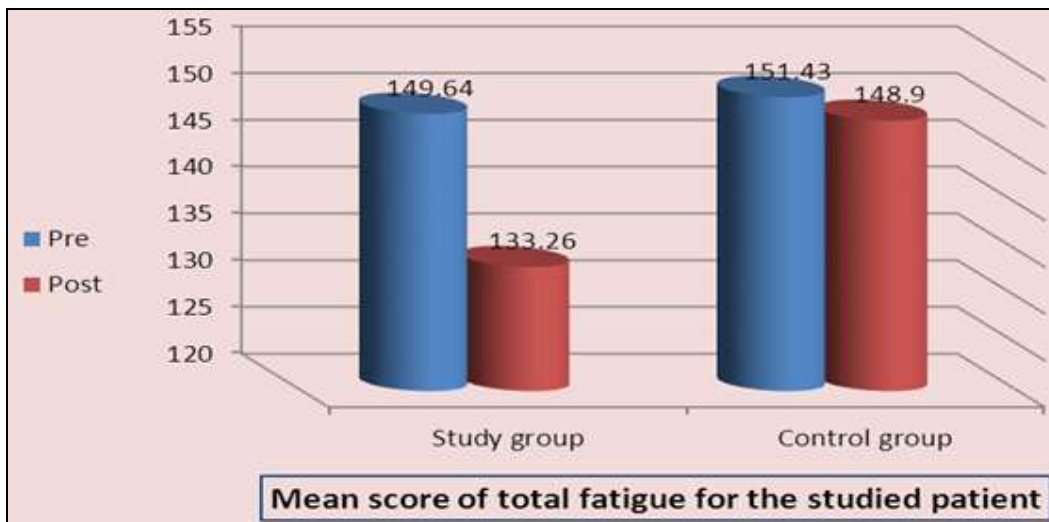

Fig 1: The Effect of Back Massage on Total Fatigue Score among the Studied Groups pre and post Intervention.

Fig (1): Illustrated that there was a statistically significant difference between the total fatigue score post intervention comparing to pre intervention among the studied groups.

Table 3: Effect of Back Massage on Fatigue Level Post Intervention

Items		Study Group n=(42)				Control Group n=(42)				χ^2	P -value
		Pre		Post		Pre		Post			
		No	%	No	%	No	%	No	%		
Fatigue Level											
Low level	(1-73)	0	0%	0	0%	0	0%	0	0%		
Moderate level	(74-146)	15	35.7%	29	69.0%	14	33.3%	15	35.7%	$\chi^2 1=.053$	P1=0.818
High level	(147-220)	27	64.3%	13	31.0%	28	66.7%	27	64.3%	$\chi^2 2= 9.355$	P2=0.002
χ^2		9.355(S)				.818ns					
P-Value		.002				.053					

NB: ns= not significant $(p>0.05)$ (S)= $(p<0.05)$ (HS) =$(p<0.001)$

χ^2 1&p1: Comparison of pre intervention between study and control groups

χ^2 2&p2: Comparison of post intervention between study and control groups

Table 3: Showed that more than half of the study and the control groups had a high level of fatigue pre intervention (64.3% and 66.7%) respectively. Whereas, post intervention the percentage of participants with high fatigue level decreased from 64.3% to 31% in the study group.

Table 4: The Effect of Back Massage on Quality of Life Post Intervention

Items	Mean Scores of Quality of Life N=(84)				Mann-Whitney U test p-value	
	Study Group		Control Group		Pre	post
	Pre	Post	Pre	Post		
Total Scores of Quality of Life					.317 ns	-14.586- (HS)
Mean ± SD	92.88±6.3	64.52± 7.5	92.45 ± 6.0	86.02± 5.9	.752	< .001
Wilcoxon test P-value	-5.653 (HS) < .001		-5.683 (HS) < .001			

Table 4: Illustrated that the mean score of quality of life decreased in the study group from 92.88±6.3 to 64.52± 7.5 post intervention. Also there was a statistically significant difference between the study and the control groups, 64.52 ± 7.5; 86.02 ± 5.9, $P<0.001$.
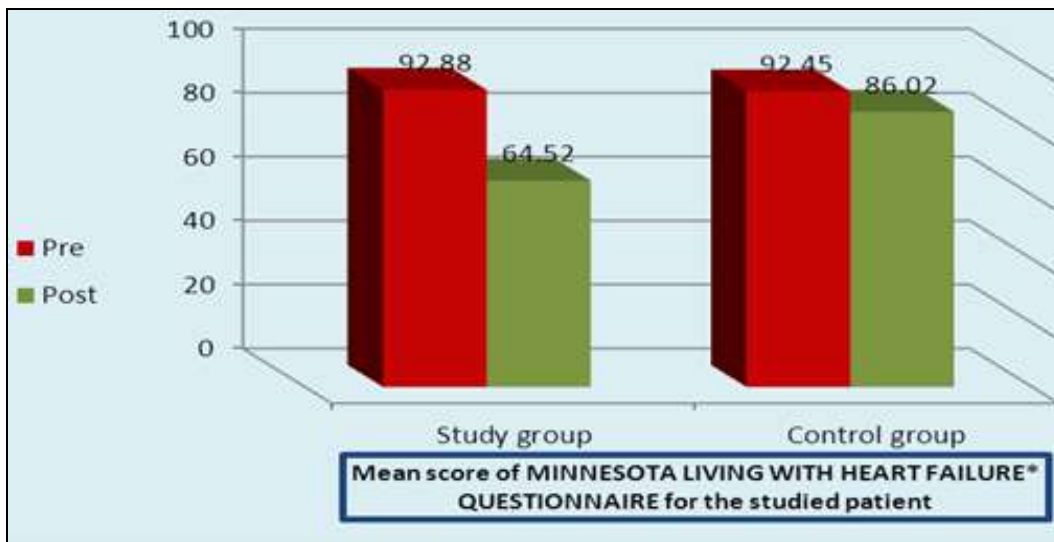

Fig 2: Effect of Back Massage on Quality of Life Post Intervention

Fig 2: Showed that there was a high statistically significant difference in the mean score of quality of life between the study and the control group post intervention.

Discussion

Fatigue is a frustrating and disabling long-term sequela of heart failure, impacting both the physical functioning and patients' quality of life. Massage therapy is a non-pharmacological nursing intervention widely used to treat patients with different conditions.

Effect of Back Massage on Fatigue

Integration of massage therapy in acute care settings has been shown to effectively enhance patients' ability to cope with both physical and emotional aspects of pain and other physical symptoms [25].

The present study findings revealed that there was highly statistically significant decreases in the total mean score of fatigue in the study group post intervention compared with the control group. The findings are not surprising given that massage therapy has been shown to decrease fatigue in

people with chronic fatigue syndrome [26], multiple sclerosis [27], cancer [28] fibromyalgia syndrome, [29] and other chronic diseases significantly impacting the health and well-being of individuals in a similar way as heart failure. The finding of the current study are similar to what was reported by Najafi, *et al*. (2016) [30] who Compared the effects of back massage and music on fatigue in patients with chronic heart failure and found that back massage was more effective than music in reducing fatigue in these patients.

However, the findings of the current study was different from what was reported by Shahdadi, *et al*. (2016) [31] who found that slow stroke back massage was not effective in reducing fatigue in patients undergoing hemodialysis.

Effect of Back Massage on Quality of Life

Heart failure adversely affects QoL. Quality of life is viewed as a reflection of a person's mental and physical well‑being in their everyday life. Recently, QOL was introduced as an outcome measure and a prognostic variable as many patients prefer improvement in QOL over prolonged survival. Meaningful survival indicates satisfactory QOL [32].

There is evident that patients suffering from heart failure may receive at least short-term relief of their symptoms from massage therapy. Also, massage therapy caused a statistically significant improvement in the quality of life.

The present study findings revealed that there was a highly statistically significant improvement in quality of life in the study group compared with the control group post intervention. The finding of the current study are similar to Felipe, *et al*. (2017) [33] who examined the effect of massage therapy on cortisol circadian rhythm, pain intensity and quality of life of patients with fibromyalgia syndrome and found that there was a significant decreased in pain intensity and improved quality of life. Also, similar findings were reported by Ather, *et al* (2017) [34] who examined the effect of massage therapy on quality of life in Osteoarthritis of the Knee and Mojtaba, *et al* (2015) [35] who examined the effects of massage therapy on the quality of life in patients with acute leukemia undergoing chemotherapy and found that participants reported the relaxation effect and improved quality of life associated with receiving massage therapy.

Limitation of the Study

One of the limitations of the study is that fatigue is a highly subjective and complex entity to study. Thus, it would be beneficial to include objective measures that may correlate with fatigue, such as activity levels measured from wearable devices in the future studies.

The findings of the current study should be interpreted with caution because of the bias associated with using the convenient sample, whereas lack of random sampling may contribute to sample selection bias and limits the generalization of the findings.

Another limitation of the study is that the researcher performed the back massage and collected the data, so there is a risk of the experimenter effect.

Conclusions

Findings of the study indicated that back massage is a safe and potentially beneficial nursing intervention to decrease fatigue and enhance quality of life in these subjects. There is a need for future studies validating and extending these

findings, as well as exploring the mechanisms responsible for the beneficial effect of back massage on fatigue in heart failure patients.

Recommendations

- Nursing currently emphasizes caring and humanity. In that light, the back massage protocol and the results of this study might be used to improve nursing education. It can be promoted in clinical practice, and carried out as part of nursing continuous education so as to enhance nursing care quality and patients' comfort.
- Continuous educational sessions on the proper technique of back massage should be provided for all critical care nurses in the coronary care units.

Recommendations for Future Research

Back massage was applied as a short-term intervention, thus, there is a need for future researches to confine the stability of the immediate improvements in fatigue and quality of life observed in the current study over time. Following participants in a longer term may have resulted in different results. Further research is needed to determine the exact dosage and length of effects of back massage on fatigue. This study design needs to be expanded to a larger more heterogeneous population.

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