Remittances Review
May, 2023
Volume: 8, No: 4, pp. 1869-1885
ISSN: 2059-6588 (Print) | ISSN 2059-6596 (Online)
remittancesreview.com

Received: 11 November 2022 Accepted: 28 March, 2023
DOI: https://doi.org/10.33182/rr.v8i4.131

Effect of Multicomponent exercise program on Echo Parameter for Patients with cardiac dysfunction

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Abstract

Background: *Cardiac dysfunction is the term for the heart's diminished capacity to pump blood efficiently, which can cause a number of symptoms like fatigue and dyspnoea. The quality of life and functional ability of people with heart dysfunction can be greatly impacted by these symptoms. Exercise has been acknowledged as a crucial part of managing and rehabbing people with cardiovascular diseases. Exercise has shown potential outcomes in reducing dyspnoea and fatigue in this population. The ECHO parameters help in diagnosing and monitoring cardiac dysfunction and guiding rehabilitation strategies.* ***Study Objective:*** *To determine the effect of a multicomponent exercise program on a patient's echocardiographic parameter (ejection fraction, stroke volume, preload, afterload, cardiac output), in pre-test and multi-period post-test.* ***Methods and Results:*** *randomized controlled trial design to examine the effectiveness of the Multicomponent exercise program in improving the ECHO parameters in cardiac dysfunction patients. Non-probability (purposively) sample of 80 participants was randomly divided into two groups of 40; The study group have been exposed to a multicomponent exercise program by the researcher and the control group follow the traditional program provided by the Heart Center. Then ECHO parameters of both groups were measured on different intervals during the program period. The results show statistically significant differences between two groups. enhancement of the ECHO parameters among the study group.* ***Result:*** *A non-significant different between control and study group in pre-test and post 1 concerning (afterload, CO), while a significant different in post2, post3 only. On the other hand, a non-significant different between control and study group regarding (EF) in pre-test, while a significant different in post (1,2,3) at p value (0.05). Additionally, preload concerning a non-significant during period of measurement. While (SV) has a significant different between pre-test and post-test (2,3) only. That mean the Appling of multicomponent exercise program effect positively on patients echo cardio parameters in study group.* ***Conclusion:*** *The Multicomponent exercise program has improved the echo cardio graphic parameters in those patients who attended the program. These results have important implications for the management and rehabilitation of heart patients, highlighting the effectiveness of integrated exercise programs to improving the overall quality of life for individuals with cardiac conditions..*

Keywords: *Cardiac dysfunction, multicomponent, rehabilitation.*

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Introduction

Heart failure (HF) is a type of cardiac disease in which the heart's inability to contract properly (systolic dysfunction) or fill properly (diastolic dysfunction) can result in pulmonary or systemic congestion. Acute decompensated heart failure episodes are characterized by increased symptoms of respiratory distress, decreased cardiac output (CO), and poor perfusion. These episodes are also linked to increased hospitalizations, increased healthcare costs, and decreased quality of life. Some cases of heart failure are reversible depending on the cause [1].

The idea of minimizing physical activity to prevent exercise-induced symptoms and hemodynamic overload for the sick ventricle predominated the textbooks when it came to HF patients' activity and exercise [2]. It might be expected that there would be a close relationship between indices of resting ventricular function and exercise capacity, but people with HF experience significant burden that includes low exercise tolerance, which negatively affects their activities.

Most of the symptoms experienced by patients with HF may be the inability to perform exercise without discomfort[3]. Improvements in exercise capacity, peak oxygen uptake (VO2), extraction of oxygen in the periphery, or heart rates at rest and during exercise have been suggested as potential advantages of regular physical activity, though exercise intolerance and the early onset of fatigue are significant symptoms in HF patients. Cardiac rehabilitation (CR), a comprehensive, multidisciplinary, long-term intervention provided to patients with HF, comprises illness information, exercise, dietary counselling, risk factor control, and stress management as components [4].

Exercise is a form of physical exercise that helps maintain good health and reduces much of the aberrant pathophysiology that results from heart failure. It consists of organized, deliberate, and repetitive motions performed with the express purpose of preserving or enhancing physical fitness [5]. Because their skeletal muscles and cardiovascular systems are so weakened, patients with HF have extreme exercise intolerance [6]. According to Cattadori, numerous studies and public health guidelines have demonstrated the value of exercise in reducing the symptoms of a number of cardio-metabolic disorders [7].

Loss of muscular function and functional capacity appears to be significantly influenced by physical inactivity. Physical inactivity is linked to a nearly two-fold increase in the risk of cardiac and all-cause deaths in patients with chronic HF. The Heart Failure Association Guidelines recommend moderate continuous rehabilitation training because it is effective, safe, and well-tolerated by HF patients.

As a result, the nurse needs to prepare themselves adequately to manage patients with HF. The majority of heart failure treatment programs aim to provide patients with the best possible medical care by evaluating their needs and putting self-care, follow-up, and psychosocial health care into practice.

Nursing education on self-care management can aid in the reinforcement of behaviour along with successful outcomes, including the management of subjective symptoms, weight surveillance, a low-salt diet, improved activity, medication consumption, and a management strategy in the event of agitated symptoms. In the hospital and outpatient settings, nurses' skills and knowledge are crucial for enhancing patient outcomes and preserving patient conditions[8].

Methods and Materials

Design of the Study: a Randomised Control Trail (RCT) is used to investigate the effectiveness of a Multicomponent exercise program in improving the ECHO parameters in cardiac dysfunction patients. **Ethical consideration:** Ethical issues were taken into account prior to performing the study by adhering to the guidelines established by the National Study Ethics Committee and obtaining the necessary government authorization.

Patients were reluctant to sign any paperwork at first, but as the researcher explained the study's goals, explained patients' rights to participate freely, and explained patients' ability to withdraw from the study at any time, written informed permission was acquired. **The Setting of the Study:** Al Najaf Centre for Cardiac surgery and cardiac catheterization was the designated site for data collection. This centre has (cardiac rehabilitation unit, consulting unit with ECHO cardio graphic examination).

Study Sample and sampling technique: A (80) patients referred for to the Al Najaf Center for Cardiac Surgery and Cardiac Catheterization (consultation and rehabilitation), During the period of the study Patients were selected through non-probability (purposively) and were randomly divided into two groups of (40) patients each group. The criteria for the selection of the study were: (patients who with diagnostic heart failure for at least six months ago, Patients who agreed to participate in the study, Patients able to communicate, Adults (18-69) years and conscious patients, Patients with ejection fraction (EF) < 50, and Patient compliance to medication and diet).

Study instruments and tools: Part I: The Socio-Demographic characteristics: This part was involved the collection of demographic data obtained from the patients by interview questionnaire sheet and consist of (5) such as (gender, age, level of education, occupation, monthly income). **Part II:** The Clinical characteristics for the patients and this part was concerned with the collection of clinical characteristics, data obtained from the patients with cardiac dysfunction by the interview questionnaire such as (Body mass index (BMI), Disease duration since diagnosis, smoking status, chronic diseases). **Part III:** Echo cardio graphic parameters checklist and constructed to evaluate patients' Hemodynamic It consists of 5 Such as items (Ejection fraction stroke volume, Preload, after load, cardiac output), The test applied by the doctor in pre start program and through program and when last program and the researcher records the data. The steps of program application are shown in figure (1).

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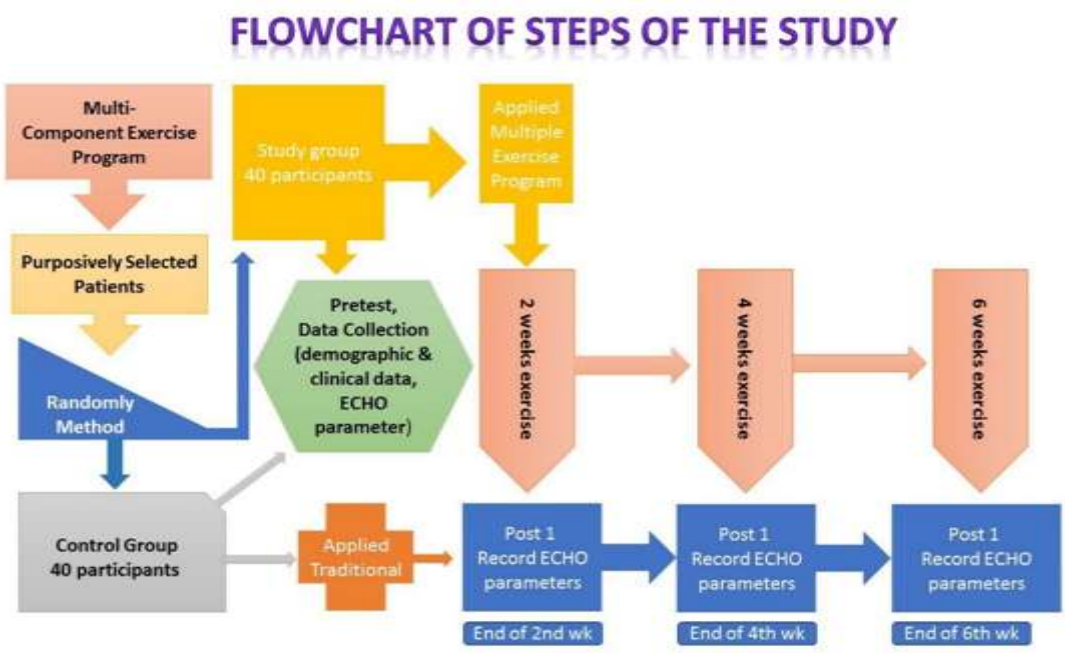

Figure (1) show the steps of MCEP

Statistical Analysis: After the data are prepared for statistical analysis, the descriptive and inferential statistics employ for data analysis using the Statistical Package of the Social Sciences (SPSS), version 26

Study results

Table (1): Distribution of Socio-Demographic Characteristics for both Study and Control Groups

Demographic Variables	Categories	Statistics	Grouping		Total
			Control	Study	
Age	<= 25	F.	1	0	1
		%	2.5%	0.0%	1.3%
	26 – 34	F.	0	1	1
		%	0.0%	2.5%	1.3%
	35 – 43	F.	4	2	6
		%	10.0%	5.0%	7.5%
	44 – 52	F.	13	11	24
		%	32.5%	27.5%	30.0%
	53 – 61	F.	11	14	25
		%	27.5%	35.0%	31.3%
	62+	F.	11	12	23
		%	27.5%	30.0%	28.8%
Mean			53.98	56.25	100%

S.D.			10.16	9.93	
Gender	Male	F.	33	30	63
		%	82.5%	75.0%	78.8%
	Female	F.	7	10	17
		%	17.5%	25.0%	21.3%
Level of Education	Doesn't read &write	F.	0	2	2
		%	0.0%	5.0%	2.5%
	Read and write	F.	5	8	13
		%	12.5%	20.0%	16.3%
	Primary school	F.	10	7	17
		%	25.0%	17.5%	21.3%
	Intermediate school	F.	6	9	15
		%	15.0%	22.5%	18.8%
	Secondary school	F.	10	5	15
		%	25.0%	12.5%	18.8%
	Institute, college or Postgraduate	F.	9	9	18
		%	22.5%	22.5%	22.5%
Monthly Income	<= 300000	F.	9	17	26
		%	22.5%	42.5%	32.5%
	300001 - 600000	F.	23	11	34
		%	57.5%	27.5%	42.5%
	600001 - 900000	F.	8	10	18
		%	20.0%	25.0%	22.5%
	900001+	F.	0	2	2
		%	0.0%	5.0%	2.5%
Mean			500000.0	473125	100%
S.D.			183973.2	251112.1	
Occupation Status	Governmental employee	F.	13	11	24
		%	32.5%	27.5%	30.0%
	Self-employee	F.	13	11	24
		%	32.5%	27.5%	30.0%
	Retired	F.	3	3	6
		%	7.5%	7.5%	7.5%
	Housewife	F.	8	11	19
		%	20.0%	27.5%	23.8%
	Jobless	F.	3	4	7
		%	7.5%	10.0%	8.8%
Total		%	100.0%	100.0%	100.0%

%= percentage, freq. = frequency, S.D. = Standard Deviation

This table (1) shows that the distribution of patients in both groups according to demographic data**.** Regarding patients' age; the mean of patients' age in control group is (53.98%) and study group patients is (56.25%). Concerning the patient's gender, male presents (82.5%) and (75%)

respectively in control and study group, the male to female ratio in the control group was about 4.7:1 while in the study group was 3:1, most of the patients in both groups are males**.** In the other hand; (25%) of patients equally between primary and secondary school in control group, while in study group (22.5%) of patients with intermediate and (institute, college or postgraduate).

Regarding the monthly income predominantly of control group patients (57%) was (300001-600000), while in study group frequently (42%) of patients with (<=300000) income. On reviewing the occupational status, (32.5%) the patients in control group are either Governmental employee or Self employee, while (27.5%) of study group are governmental employee, Self-employee and housewives**.**

Table (2): The Distribution of the Clinical Characteristics for both Study and Control Groups

Clinical Variables	**Categories**	**Statistical**	**Grouping**		**Total**
			Control	Study	
Smoking	Yes	F.	17	14	31
		%	42.5%	35.0%	38.8%
	No	F.	13	18	31
		%	32.5%	45.0%	38.8%
	Passive	F.	10	8	18
		%	25.0%	20.0%	22.5%
Disease duration	<= 3	F.	27	28	55
		%	67.5%	70.0%	68.8%
	4 – 6	F.	13	11	24
		%	32.5%	27.5%	30.0%
	7+	F.	0	1	1
		%	0.0%	2.5%	1.3%
Mean			3.18	2.95	100%
S.D.			1.06	1.38	
BMI	Normal	F.	1	3	4
		%	2.5%	7.5%	5.0%
	Over Weight	F.	24	18	42
		%	60.0%	45.0%	52.5%
	Obese	F.	15	19	34
		%	37.5%	47.5%	42.5%
Mean			29.51	33.48	100%
S.D.			3.18	22.13	
Hypertension	Yes	F.	34	36	70
		%	85.0%	90.0%	87.5%
	No	F.	6	4	10
		%	15.0%	10.0%	12.5%
DM	Yes	F.	22	20	42
		%	55.0%	50.0%	52.5%

	No	F.	18	20	38
		%	45.0%	50.0%	47.5%
CVA	Yes	F.	2	5	7
		%	5.0%	12.5%	8.8%
	No	F.	38	35	73
		%	95.0%	87.5%	91.3%
Renal Failure	Yes	F.	0	5	5
		%	0.0%	12.5%	6.3%
	No	F.	40	35	75
		%	100.0%	87.5%	93.8%
Thyroid Disease	Yes	F.	5	7	12
		%	12.5%	17.5%	15.0%
	No	F.	35	33	68
		%	87.5%	82.5%	85.0%
IHD	Yes	F.	25	27	52
		%	62.5%	67.5%	65.0%
	No	F.	15	13	28
		%	37.5%	32.5%	35.0%
Valvular Disease	Yes	F.	19	12	31
		%	47.5%	30.0%	38.8%
	No	F.	21	28	49
		%	52.5%	70.0%	61.3%
Total		%	100.0%	100.0%	100.0%

The (2) table show the clinical characteristics of both study and control groups, regarding smoking (42%) of control group patients and (35%)of study group patients are smokers ,while (32%)of control and (45%)of study were nonsmokers, on other hand the disease duration is slightly higher among the control group with mean of 3.18 years while in the study group only 2.95 years. In addition, BMI shows higher mean in the study group (33.48) compared to (29.51) in the control group.

Also, the table shows the percentage of each comorbid disease as follow (the control group mentioned first): the hypertension dominated in both groups with a percentage of 85% and 90%, diabetes comes in a consistent percentage of 55% and 50%. While the IHD frequently found in percentages of 62.5% and 67.5% the valvular disease shows a consistent percentage (47.5%) among the control group compared to a less frequent percentage (30%) among the study group.

Lastly the other comorbidities (CVA, renal failure and thyroid disease) show sporadic frequency with percentages less than 18%.

Table (3) Assessment of (Echocardiogram Parameters) in Period of Measurements for both Study and Study and Control Groups

Echocardiogram Parameters	Categories	Statistical	Grouping		Total
			Control	Study	
EF pre-test	<= 40.00	F.	27	25	52
		%	67.5%	62.5%	65.0%
	41.00 - 60.00	F.	13	15	28
		%	32.5%	37.5%	35.0%
Mean			38.63	38.95	100%
S.D.			4.25	4.27	
EF post-test1	<= 40.00	F.	28	18	46
		%	70.0%	45.0%	57.5%
	41.00 - 60.00	F.	12	22	34
		%	30.0%	55.0%	42.5%
Mean			38.40	40.78	100%
S.D.			4.62	4.16	
EF post-test2	<= 40.00	F.	30	14	44
		%	75.0%	35.0%	55.0%
	41.00 - 60.00	F.	10	26	36
		%	25.0%	65.0%	45.0%
Mean			37.03	42.83	100%
S.D.			4.41	4.09	
EF post-test3	<= 40.00	F.	32	8	40
		%	80.0%	20.0%	50.0%
	41.00 - 60.00	F.	8	32	40
		%	20.0%	80.0%	50.0%
Mean			36.43	45.28	100%
S.D.			4.23	4.08	
SV pre-test	<= 69.00	F.	23	29	52
		%	57.5%	72.5%	65.0%
	70.00+	F.	17	11	28
		%	42.5%	27.5%	35.0%
Mean			66.60	62.40	100%
S.D.			9.29	8.28	
SV post-test1	<= 69.00	F.	25	29	54
		%	62.5%	72.5%	67.5%
	70.00+	F.	15	11	26
		%	37.5%	27.5%	32.5%
Mean			64.88	65.18	100%
S.D.			8.65	8.04	
SV post-test2	<= 69.00	F.	25	16	41

		%	62.5%	40.0%	51.3%
	70.00+	F.	15	24	39
		%	37.5%	60.0%	48.8%
Mean			63.60	70.05	100%
S.D.			9.09	8.09	
SV post-test3	<= 69.00	F.	28	12	40
		%	70.0%	30.0%	50.0%
	70.00+	F.	12	28	40
		%	30.0%	70.0%	50.0%
Mean			62.68	73.83	100%
S.D.			9.19	7.57	
Preload pre-test	100.00 - 129.00	F.	40	40	80
		%	100.0%	100.0%	100.0%
Mean			112.13	113.25	100%
S.D.			6.70	6.05	
Preload post-test1	<= 99.00	F.	1	2	3
		%	2.5%	5.0%	3.8%
	100.00 - 129.00	F.	39	38	77
		%	97.5%	95.0%	96.3%
Mean			112.03	111.18	100%
S.D.			6.20	6.16	
Preload post-test2	<= 99.00	F.	0	3	3
		%	0.0%	7.5%	3.8%
	100.00 - 129.00	F.	40	37	77
		%	100.0%	92.5%	96.3%
Mean			111.38	109.45	100%
S.D.			6.34	6.24	
Preload post-test3	<= 99.00	F.	1	3	4
		%	2.5%	7.5%	5.0%
	100.00 - 129.00	F.	39	37	76
		%	97.5%	92.5%	95.0%
Mean			110.58	110.00	100%
S.D.			6.85	6.08	
Afterload pre-test	Normal	F.	34	37	71
		%	85.0%	92.5%	88.8%
	High	F.	6	3	9
		%	15.0%	7.5%	11.3%
Mean			94.78	93.05	100%
S.D.			4.75	4.63	
Afterload post-test1	Normal	F.	37	40	77
		%	92.5%	100.0%	96.3%
	High	F.	3	0	3

		%	7.5%	0.0%	3.8%
Mean			92.90	92.80	100%
S.D.			5.27	3.99	
Afterload post-test2	Normal	F.	31	40	71
		%	77.5%	100.0%	88.8%
	High	F.	9	0	9
		%	22.5%	0.0%	11.3%
Mean			94.08	89.98	100%
S.D.			5.81	4.06	
Afterload post-test3	Normal	F.	31	40	71
		%	77.5%	100.0%	88.8%
	High	F.	9	0	9
		%	22.5%	0.0%	11.3%
Mean			95.53	90.63	100%
S.D.			5.90	4.12	
CO pre-test	Low	F.	33	40	73
		%	82.5%	100.0%	91.3%
	Normal	F.	7	0	7
		%	17.5%	0.0%	8.8%
Mean			3.42	3.27	100%
S.D.			0.52	0.34	
CO post-test1	Low	F.	38	38	76
		%	95.0%	95.0%	95.0%
	Normal	F.	2	2	4
		%	5.0%	5.0%	5.0%
Mean			3.30	3.45	100%
S.D.			0.42	0.29	
CO post-test2	Low	F.	36	33	69
		%	90.0%	82.5%	86.3%
	Normal	F.	4	7	11
		%	10.0%	17.5%	13.8%
Mean			3.26	3.65	100%
S.D.			0.47	0.29	
CO post-test3	<= 3.90	F.	39	22	61
		%	97.5%	55.0%	76.3%
	3.91 - 7.90	F.	1	18	19
		%	2.5%	45.0%	23.8%
Mean			3.23	3.85	100%
S.D.			0.49	0.32	

This table (3) shows that the mean of echocardiography parameters in pretest all parameters (EF, SV, Preload, afterload, and CO) with the nearly mean in both study and control groups ,while the

(EF,SV,CO) enhanced in study group and deteriorate in control group during the post (1,2,3), On the other hand the (afterload) improved in post (1,2) only in study group ,while the preload not affected during the period of measurement for both groups.

Table (4) Comparison of Patient (Echocardiogram Parameters) for the Control Group between Pre and Posttest1, Posttest2, and Posttest3

Parameters	Period of Measurement	Mean	S.D.	Mean Rank	Friedman (Chi-square)	df	P-value
E.F.	Pre-test	38.63	4.25	3.14	31.16	3	0.000 S
	Post-test1	38.40	4.62	2.98			
	Post-test2	37.03	4.41	2.08			
	Post-test3	36.43	4.23	1.81			
S.V.	Pre-test	66.60	9.29	3.01	12.56	3	0.006 S
	Post-test1	64.88	8.65	2.65			
	Post-test2	63.60	9.09	2.24			
	Post-test3	62.68	9.19	2.10			
Preload	Pre-test	112.13	6.70	2.53	2.41	3	0.492 NS
	Post-test1	112.03	6.20	2.63			
	Post-test2	111.38	6.34	2.61			
	Post-test3	110.58	6.85	2.24			
Afterload	Pre-test	94.78	4.75	2.61	11.85	3	0.008 S
	Post-test1	92.90	5.27	1.98			
	Post-test2	94.08	5.81	2.48			
	Post-test3	95.53	5.90	2.94			
C.O.	Pre-test	3.42	0.52	2.98	10.55	3	0.014 S
	Post-test1	3.30	0.42	2.63			
	Post-test2	3.26	0.47	2.24			
	Post-test3	3.23	0.49	2.16			

The table (4) illustrate that a significant different between pre-test and post-test (1,2,3) regarding (EF, SV, preload, afterload, and CO) while the non-significant different between pre-test and post (1,2,3) regarding Preload at p value (0.05). That mean patients in control group deteriorate during the period of measurement.

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Table (5) Comparison of Patient (Echocardiogram Parameters) for the Study Group between Pre and Posttest1, Posttest2, and Posttest3

Parameters	Period of Measurement	Mean	S.D.	Mean Rank	Friedman (Chi-square)	df	P-value
E.F.	Pre-test	38.95	4.27	1.01	119.7	3	0.000 S
	Post-test1	40.78	4.16	1.99			
	Post-test2	42.83	4.09	3.00			
	Post-test3	45.28	4.08	4.00			
S.V.	Pre-test	62.40	8.28	1.13	111.2	3	0.000 S
	Post-test1	65.18	8.04	1.93			
	Post-test2	70.05	8.09	2.99			
	Post-test3	73.83	7.57	3.96			
Preload	Pre-test	113.25	6.05	3.85	95.1	3	0.000 S
	Post-test1	111.18	6.16	2.95			
	Post-test2	109.45	6.24	1.26			
	Post-test3	110.00	6.08	1.94			
Afterload	Pre-test	93.05	4.63	3.61	82.1	3	0.000 S
	Post-test1	92.80	3.99	3.14			
	Post-test2	89.98	4.06	1.31			
	Post-test3	90.63	4.12	1.94			
C.O.	Pre-test	3.27	0.34	1.18	107.7	3	0.000 S
	Post-test1	3.45	0.29	1.90			
	Post-test2	3.65	0.29	2.98			
	Post-test3	3.85	0.32	3.95			

The table (4-5) illustrate that a significant different between pre-test and post-test (1,2.3) regarding (EF, SV, preload, afterload CO) at p value (0. 05). That mean the patients in study group improving during the period of measurement.

Table (4.6) Comparison of Patient's Echo Parameters of Study and Control Groups between Pre and Posttest1, Posttest2, and Posttest3

Echo Parameters	Period of Measurement	Grouping	Mean Rank	Sum of Ranks	Mann-Whitney Test	P-value

E.F.	Pre-test	Control	39.61	1584.5	764.5	0.731 NS
		Study	41.39	1655.5		
	Post-test1	Control	34.60	1384.0	564.0	0.022 S
		Study	46.40	1856.0		
	Post-test2	Control	27.49	1099.5	279.5	0.000 S
		Study	53.51	2140.5		
	Post-test3	Control	23.54	941.5	121.5	0.000 S
		Study	57.46	2298.5		
S.V	Pre-test	Control	46.15	1846.0	574.0	0.029 S
		Study	34.85	1394.0		
	Post-test1	Control	40.53	1621.0	799.0	0.992 NS
		Study	40.48	1619.0		
	Post-test2	Control	32.74	1309.5	489.5	0.002 S
		Study	48.26	1930.5		
	Post-test3	Control	27.81	1112.5	292.5	0.000 S
		Study	53.19	2127.5		
Preload	Pre-test	Control	38.73	1549.0	729.0	0.493 NS
		Study	42.28	1691.0		
	Post-test1	Control	42.44	1697.5	722.5	0.455 NS
		Study	38.56	1542.5		
	Post-test2	Control	43.95	1758.0	662.0	0.183 NS
		Study	37.05	1482.0		
	Post-test3	Control	41.34	1653.5	766.5	0.746 NS
		Study	39.66	1586.5		
Afterload	Pre-test	Control	44.11	1764.5	655.5	0.162 NS
		Study	36.89	1475.5		
	Post-test1	Control	40.15	1606.0	786.0	0.892 NS
		Study	40.85	1634.0		
	Post-test2	Control	49.13	1965.0	455.0	0.000 S
		Study	31.88	1275.0		
	Post-test3	Control	51.21	2048.5	371.5	0.0000

		Study	29.79	1191.5		S
	Pre-test	Control	44.50	1780.0	640.0	0.122 NS
		Study	36.50	1460.0		
	Post-test1	Control	36.58	1463.0	643.0	0.128 NS
		Study	44.43	1777.0		
	Post-test2	Control	30.84	1233.5	413.5	0.000 S
		Study	50.16	2006.5		
	Post-test3	Control	26.33	1053.0	233.0	0.000 S
C.O.		Study	54.68	2187.0		

The table (4-6) demonstrate that a non-significant different between control and study group in pretest and post 1 concerning (afterload, CO), while a significant different in post2, post3 only. On the other hand, a non-significant different between control and study group regarding (EF) in pretest, while a significant different in post (1,2,3) at p value (0.05). Additionally, preload concerning a non-significant during period of measurement. While (SV) has a significant different between pre-test and post-test (2,3) only. That mean the Appling of multicomponent exercise program effect positively on patients echo cardio parameters in study group.

Discussion

During the period of measurement, a detailed ECHO examination done for every single patient either from the control or the study groups by a professional expert cardiologist to measure the study parameters accurately to capture even a small change in the parameters number to address any significant finding, surprisingly all the ECHO parameters (EF, SV, Preload, Afterload, CO) in the study group show a significant improvement along the period of the program, compared to the control group patients whom their parameters getting a significant deteriorate apart from the preload. Edwards, conduct a meta-analysis implicate that Exercise training can play a significant role in the management of heart failure, it can produce significant improvements in exercise capacity and quality of life in heart failure patients with both preserved and reduced ejection fraction and when comparing the parameter among the control and the study groups, we can notice the significant deterioration and the significant improvement respectively among the two groups, this finding strongly consistent with the meta-analysis [9].

Overall, exercise training can lead to significant improvements by enhancing cerebral, muscular hemodynamics in heart failure patients, exercise capacity and quality of life in heart failure patients with both preserved and reduced EF, making it a safe and effective intervention for this population [10]. in conclusion all studies indicate a positive effect of the ET on EF. According to the research results, exercise training in patients with stable chronic heart failure is associated with small but significant improvements in stroke volume, However, it is important to note that exercise will

improve ejection fraction as the both parameters are related to each other. The American Heart Association has advised that regular exercise training is safe and does not increase cardiac events in stable (HFrEF) patients by improving stroke volume and cardiac output. exercise training can enhance exercise tolerance, reduce symptoms, and improve the overall cardiovascular health of individuals with heart failure [11]. The convergence of this study results with these previous studies strengthens the validity and generalizability of this study findings. The relationship between preload and exercise training in heart failure patients is not clear from the search results, Some studies have shown exercise induce acute increases in LV preload in patients with heart failure, particularly those with coronary artery disease, additionally the relationship between preload and exercise training in heart failure patients is not straightforward.

While exercise training may improve stroke volume and reduce cardiomegaly, it may also lead to acute increases in LV preload in some patients. Preload and afterload reduction provide symptomatic relief and may improve cardiac function in heart failure patients. Further researches is needed to clarify the effects of exercise training on preload and other hemodynamic parameters in heart failure patients, in conclusion, it is better to decrease cardiac preload in certain conditions such as heart failure, mitral stenosis, and mitral regurgitation, as increasing preload can lead to increased hydrostatic pressure in the pulmonary capillaries and further debilitate the already diseased heart [12].

In Morris and Chen study, they states that the relationship between afterload and exercise program in patients with heart failure is complex and multifactorial, Afterload reduction is important in understanding the pathophysiology and treatment of several diseases, including aortic stenosis, systemic hypertension, and congestive heart failure, Afterload reduction is an important goal of therapy for chronic heart failure, and exercise training may help achieve this goal. However, the effects of exercise on central hemodynamic function are not well established, and some patients may experience an increase in peripheral resistance during exercise[13].

Right ventricular afterload is also an important consideration in patients with pulmonary arterial hypertension. The after-load reduction was achieved with Significant P value in this study and this add to the body of literature on ET effect on the cardiac physiology in heart failure. Numerous studies demonstrate the effect of exercise training on cardiac physiology, in particular the CO like a study done by LaMonte and another study done by Haq, ET can reduce peripheral resistance, improve LV function, improve circulation, oxygen utilization and afterload in patients with CHF this can lead to improved CO and reduce fatigue during exercise. These findings in the previous studies were highlighted by the robustness of the current study results findings were the CO significantly improved in the study group [14, 15].

Conclusions

The results of the study provided strong support for the acceptance of the researcher's hypothesis and the rejection of the null hypothesis; The Multicomponent exercise program has improved the

echo cardio graphic parameters in those patients who attended the program. These results have important implications for the management and rehabilitation of heart patients, highlighting the effectiveness of integrated exercise programs to improving the overall quality of life for individuals with cardiac conditions.

Recommendation

Longitudinal Studies: Support long-term studies that follow heart patients over an extended period to understand the long-term benefits of rehabilitation interventions, these studies can assess the impact of rehabilitation on various outcomes, such as mortality rates, quality of life, functional capacity, and healthcare costs. Additionally, rehabilitation in Special Populations: Encourage research that explores the unique rehabilitation needs of specific populations, such as elderly individuals, women, individuals with comorbidities, or those from different cultural backgrounds. Understanding the specific challenges and tailoring interventions accordingly can lead to more effective rehabilitation strategies.

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