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Effectiveness of Daily Living Activities program on physical ability of Patients with coronary artery disease undergoing a stress test

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Abstract
Coronary artery disease (CAD) contributes to poor physical ability, which can degrade the quality of life. Physical inactivity is often common among the general population at present, especially CAD patients. It is necessary to encourage patients to participate in an active lifestyle. A pre-experimental study design was used from the 20th of December 2020 to the 4th of April 2021 to assess the effectiveness of a daily living activities program on the physical ability of patients with coronary artery disease undergoing a stress test. The results showed that the study sample's physical ability improved in the post-test after 6 weeks, according to the duke activity status index, and the stress test. The study concluded that the daily living activity program was effective on the study sample's physical ability after program implementation.The study recommended establishing dedicated cardiac rehabilitation departments in all cardiac centers. Furthermore, as an inherent component of CAD therapy, patients must participate in training and instructions programs.
Keywords : Coronary Artery Disease, Daily Living Activities, Physical Ability, Stress Test.

Introduction

Coronary artery disease is a major cardiovascular disease that affects the entire world's population. In both developed and developing countries, this disease has been identified as the leading cause of death. Cardiovascular disease is caused by a combination of lifestyle, environmental, and genetic factors(1). According to WHO,(2017) unhealthy diet, physical inactivity, tobacco use, and hazardous alcohol use are the most significant lifestyle risk factors for heart disease. Raised blood pressure, elevated blood glucose, elevated blood lipids, and overweight and obesity are all symptoms of behavioral risk factors. The majority of cardiovascular disorders can be avoided if behavioral risk factors are addressed (2).Motivation for lifestyle improvements is thought to be a contributing factor in the effectiveness of cardiac rehabilitation and secondary prevention services because lifestyle habits are significant risk factors for coronary heart disease. People with CHD may be motivated to change their lifestyle by those with whom they have long-term, romantic relationships (3).

Cardiac rehabilitation programs have been proven to increase exercise capacity, improve CHD risk factors, reduce psychosocial stress and, most importantly, to reduce major morbidity and mortality. Considering the importance of physical activity, exercise, in general health, the national guidelines for physical activity and exercise are approximately 150 min/week of moderate exercise (walking) or 75 min/week of moderate to high-intensity exercise (running), and these recommendations are typically for both primary and secondary prevention (4). Patients suffering from coronary artery disease having a high risk for recurrent heart attack and recurrent hospital admission, therefore secondary prevention measures are indicating for those patients to reduce morbidity, decrease heart attack, and improve the quality of life (5).

Sokhteh et al.(2020) reported that the cardiac rehabilitation program improved the ability of patients in the 6MWT and enhanced their functional capacity, which in turn evinces the improvement of the anthropometric index and mitigation of risk factors in CAD patients(6). Avila et al.(2018) stated that a home-based exercise program with telemonitoring guidance following completion of a phase II ambulatory CR program results in further improvement of physical fitness(7).The stress test is the monitoring of a person's cardiovascular reaction to exercise is a noninvasive way of determining the presence and seriousness of coronary heart disease. It may also be used to assess functional ability for work, sports, or rehabilitation programs (8).The use of metabolic equivalent values for calculating physical activity is used to some degree. These MET values are used to account for the intensity of various activities when calculating total energy expenditure over time or to categorize activities based on their intensity level (9).

Methodology

Design and setting of the study

The design which was used in the present study is pre -experimental. The study was conducted in Dhi Qar Governorate, in AL- Nasiriyah Heart Center for the period from 20th of December 2020 to 4th of April 2021.

Ethical Considerations

The patients were fully acquainted with the current study and its aims and then their consent was obtained in order to participate in the study. Also, ethical approval was obtained from the ethical committee of research at the Faculty of Nursing/University of Baghdad regarding the confidentiality and anonymity of the participants.

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Sample of the study

A non-probability (purposive) sampling method was used for selecting the study sample. In this type of sampling method, researchers may choose subjects who are representative of the population.The study sample consists of (40) coronary artery disease patients who have poor physical ability were chosen after taking a stress test.

The study instrument

The study instruments consist of fourth sections. Part one was used to assess socio-demographic data, part two was the patient's clinical history and unhealthy behaviors, part three was used to investigate the patient's functional capacity using the Duke activity status index, and part four was used to investigate the patient's physical and functional capacity during the treadmill test.

Statistical analysis

The data was analyzed by using the program of IBM Statistical Package of Social Sciences (SPSS) Version 26. Both descriptive statistical analysis and inferential statistical analysis approaches were used in order to investigate or predict the relationships between variables. A p-value of < 0.05 was considered statistically significant.

Results and Discussions

Discussion of the socio-demographic characteristics of the study sample table (1)

A total of (40) coronary artery disease patient was involved in present study in order to evaluate their physical ability after their participation in the daily living activities instruction program. As shown in table (1) that 50.0% of the participants in the study sample at age group 56-66 years old , and 57.5% of the participants in the study sample are females,82.5% of study sample are married and 85.0% was from urban resident. 35.0% of the study sample have had Graduate of middle school education.52.5% of study sample are housewives and 52.0% are not Sufficient income, also 55.0% of them have 7-9 persons in their family. Jassem & Mansour (2012) assess the functional capacity of patients with coronary artery disease at middle age , their study characteristics was (58.0%) of study sample were males at age 50-55 years old, (58.7%) continuous married, (29.3%) were Institute certificate, (52.0%) were barely sufficient income[(10)]. A randomized controlled trial which was done by Buschetal.(2012) to compare the efficacy of intensive functional exercise training with that of usual CR in very old adults soon after coronary bypass surgery, the study relevant that (69%) of participants was female and the mean age of the group was 78.5 ± 3.2[(11)]. John and Haseena, (2015) conducted a descriptive study to assess compliance with therapeutic measures among CHD patients, reported that about (25 %) of CHD patients have had sixty years old or more, and (37%), (36.5%) of them within the age group of (50-59), (40-49) years respectively[(12)].

Discussion the unhealthy behaviors, medical history, and family history of the study sample table (2)

The unhealthy behaviors of the study sample was 100.0% of them are not drink alcohol , 80.0% of the participants are not smokers , and 97.5 are not smoke hookah. Al-Abbudi et al. (2018) stated in their study that (66.6%) of their sample as unhealthy behaviors were not smoker , and 96.8 % were not drinker alcohol[(13)].Our study shows that the percentage of healthy behaviors is high among the patients participating in the study sample, especially in the behaviors of drinking alcohol, due to the religious nature and social norms in that city.

High percent of the study sample have hadDiabetes, (57.5%) of them have hadHypertension. A case–control study conducted by Amara et al. (2015) to evaluate the risk factors of CHD among 200 adult patients in Mysan /Iraq, reported that (57%) of patients was suffering from hypertension, and 66% was having DM[(14)]. while , in a descriptive study that conducted by Stewart et al. (2017) to analyzed the association between self-reported exercise and mortality in patients with stable CHD. They found that (38.7%) of patients was Diabetes mellitus and (71.5%) of them have had hypertension[(15)]. From the above, it is clear to what extent the patient's clinical history is related to coronary artery disease, especially in patients with high blood pressure and diabetes.

High percent of patients` family 85.0% reported of heart diseases, diabetes and 87.5% of hypertension .A study that conducted by Tahiretal. (2013) to find correlation of lipid profile and diet with premature coronary heart disease in Kirkuk city-Iraq. Where they found that (47.5%) of CHD patients with positive family history[(16)]. Eby (2016) conducted a study to examine the effectiveness of education program about the prevention of CHD, the study revealed that (53.33%) of patients had a family's history of CHD[(17)]. It's clear from this that people with one or more close relatives who have Heart disease, or hypertension, and diabetes are at risk of these disease.

Discussion Patient`s functional capacity (Metabolic Equivalents) according to duke activity status index scale at pre and post-test for study sample table (3)

The patients who took part in this study were in an instruction program to improve their physical ability and awareness of the importance of daily activities, so their progress was visible in the post-instruction program, where the results showed that the percent of post-test activities was higher than the percent of pre-test activities (48.95%, 35.21%, respectively), and showed an improvement in physical ability as the mean ± SD of METs in the pre-test was (4.2±0.6) and (5.3±1.7) in the post-test. Prasada et al. (2020) conducted a study to implementation and impact of home-based cardiac rehabilitation in a veterans affair medical center .The study revealed that DASI METs (Mean ± SD : 5.3 ± 1.7 before program vs. 6.0 ± 1.9 after program , $p = 0.0005$)[(18)].The improvement in functional ability was demonstrated by an increase in the values of METs and the DASI score in patients' answers on the Duke Activity Status Index questionnaire at post-test.

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Discussion Patient`s functional capacity (Metabolic Equivalents) during stress test at pre and post-test for study sample table (4)

The patients' performance during stress test after implementation the instruction program in the post test was better than pre-test. Where the results showed an improvement in the physical ability of the participating patients, as the 97.5% of them was at poor level in the pre-test then the percent was change it to 60.0% at post-test, the fair level of Patient`s functional capacity was 2.5% at pre-test ,and change it to 22.5% at post -test, the average level of Patient`s functional capacity was 0.0% at pre-test, and then change it to 17.5% at post-test. The results also showed the percent of patients that completed stage 3 at post-test was 37.5%.A study conducted study to determine the effects of cardiac rehabilitation program on exercise capacity and rate pressure product in Iranian female patients undergoing coronary artery bypass grafting, their finding was increases of estimated exercise capacity in comparison to before training (10.72 ± 1.30 vs. 7.72 ± 1.6 MET's, respectively) as well as the women increased their exercise duration time (464.6 ± 107.3 vs. 311.2 ± 101.7 seconds, respectively) by 49.2% [(19)]. Also, Solaketal.(2015) reported an improvement in quality of life, functional capacity, and depression level after cardiac rehabilitation. In their study the mean of MET value significantly changed after CR program in both patients with CAD and CABG[(20)].From the foregoing, it becomes clear that the exercise training and adhering to the instruction program improve the exercise capacity on the treadmill test.

Discussion the Duke Activity Status Index scale, Metabolic Equivalent of DASI scale, Metabolic Equivalents of stress test table (5)

The daily living activities program results showed high significant statistically differences between pre and post test for Duke Activity Status Index scale, Metabolic Equivalents of duke activity status index, Metabolic Equivalents of stress test, Knowledge about risk factors & daily activities, and Knowledge about healthy diet & stress manage with p value of (0.000). Bhattal and Winchester (2020) conduct a study entitled home-based cardiac rehabilitation (HBCR) In post-transcatheter aortic valve replacement (TAVR) patients. They concluded significant change in the median score for HBCR DASI survey with a p value of 0.050. Additionally, DASI-Mets score with a p value of 0.034[(21)]. Sandor et al.(2014) conducted study to determine the effects of long-term physical training on hemorheological, laboratory parameters, exercise tolerability, psychological factors in cardiac patients participating in an ambulatory rehabilitation program. They concluded that a significant improvement in exercise tolerability parameters treadmill METs and treadmill time with p value (0.001)[(22)]. Wong et al.(2011) concluded a significant statistical increase in the functional capacity in their study was obtained, estimated in METs after 10-12 weeks of training with (p<0,05), evaluated with a treadmill stress test [(23)].

Conclusion

The study concluded that the daily living activity program was effective on the study sample's physical ability after program implementation.

Recommendation

The study recommended establishing dedicated cardiac rehabilitation departments in all cardiac centers. Furthermore, as an inherent component of CAD therapy, patients must participate in training and instructions programs.

Table(1):Distribution of the study sample according to their socio-demographic characteristics (No=40).

Sample Demographic Characteristics					
Gender			**Residency**		
	No.	**%**		**No.**	**%**
Male	17	42.5%	Urban	34	85.0%
Female	23	57.5%	Rural	6	15.0%
Total	**40**	**100.0%**	**Total**	**40**	**100.0%**
Age			**Level of Education**		
	No.	**%**		**No.**	**%**
25-29 years	0	00.0%	Illiterate	0	00.0%
30-44 years	0	00.0%	Primary	0	00.0%
45-55 years	19	47.5%	Secondary	1	2.5%
56-66 years	20	50.0%	Middle school	14	35.0%
≥67	1	2.5%	Institute	12	30.0%
Mean ± SD	3.5500 ± 0.55238		College & more	13	32.5%
Total	**40**	**100.0%**	**Total**	**40**	**100.0%**
Marital Status			**Monthly Income**		
	No.	**%**		**No.**	**%**
Single	0	00.0%	Sufficient	3	7.5%
Married	33	82.5%	Barely Sufficient	16	40.0%
Widower	7	17.5%	In Sufficient	21	52.5%
Total	**40**	**100.0%**	**Total**	**40**	**100.0%**

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Employment			Family Members		
	No.	%		No.	%
Employee	5	12.5%	1-3	1	2.5%
Unemployed	9	22.5%	4-6	14	35.0%
Housewife	21	52.5%	7-9	22	55.0%
Retired	2	5.0%	10-12	3	7.5%
Free businessman	3	7.5%	13 or more	0	00.0%
Total	**40**	**100%**	**Total**	**40**	**100%**

F = Frequency; % = Percentage ≥ = Equal or More than ;S.D: Standard Deviation

Table (2):Distribution of the study sample according to unhealthy Behaviors, medical history, and family history

Variables	Categories	F.	%
Unhealthy behaviors			
Drink alcohol	Yes	**0**	**0.00**
	No	**40**	**100**
Smoking status	Yes	**8**	**20.0**
	No	**32**	**80.0**
Smoke hookah	Yes	**1**	**2.5**
	No	**39**	**97.5**
Medical history			
Hypertension	Yes	**23**	**57.5**
	No	**17**	**42.5**
Diabetes mellitus	Yes	**30**	**75.0**
	No	**10**	**25.0**
Family history			
Heart disease	Yes	**34**	**85.0**
	No	**6**	**15.0**
Hypertension	Yes	**35**	**87.5**
	No	**5**	**12.5**
Diabetes mellitus	Yes	**34**	**85.0**
	No	**6**	**15.0**

F = Frequency; % = Percentage

Table (3): Patient`s functional capacity according to Duke Activity Status Index at pre- and post-test

No	Item related to duke activity status index	Pre test				Post test			
		Yes		No.		Yes		No.	
		F	%	F	%	F	%	F	%
1	Can you take care of yourself (eating, dressing, bathing)?	40	100.0	0	00.0	40	100.0	0	00.0
2	Can you walk indoors, such as around your house?	40	100.0	0	00.0	40	100.0	0	00.0
3	Can you walk a block or two on level ground?	7	17.5	33	82.5	18	45.0	22	55.0
4	Can you climb a flight of stairs or walk up a hill?	4	10.0	36	90.0	18	45.0	22	55.0
5	Can you run a short distance?	0	00.0	40	100.0	11	27.5	29	72.5
6	Can you do light work around the house, such as dusting or washing dishes?	38	95.5	2	5.0	38	95.0	2	5.0
7	Can you do moderate work around the house, such as vacuuming, sweeping floors?	19	47.5	21	52.5	25	62.5	15	37.5
8	Can you do heavy work around the house, such as scrubbing floors or lifting ..?	1	2.5	39	97.5	11	27.5	29	72.5
9	Can you do yard work, such as raking leaves, weeding or pushing a power mower?	3	7.5	37	92.5	15	37.5	25	62.5
10	Can you have sexual relations?	17	42.5	23	57.5	17	42.5	23	57.5
11	Can you participate in moderate recreational activities, such as golf, football?	0	00.0	40	100.0	1	2.5	39	97.5

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12	Can you participate in strenuous sports, such as swimming, singles tennis, football?	0	00.0	40	100.0	1	2.5	39	97.5
Total			**35.21**		**64.79**		**48.95**		**51.05**
Metabolic Equivalents (METs)		**METs (Mean ± SD) Pre-test**				**METs (Mean ± SD) Post-test**			
		4.2±0.6				**5.3±1.7**			
(METs = 0.43 × DASI score + 9.6 / 3.5)									

F = Frequency; % = Percentage; S.D: Standard Deviation

Table (4)Patient`s functional capacity (Metabolic Equivalents) during stress test (pre and post-test) for study sample.
F = Frequency; % = Percentage

	Categories	Pre-test		Post-test	
		F	**%**	**F**	**%**
Completed test stages	Stage 1 (3 min)	**37**	**92.5**	**23**	**57.5**
	Stage 2 (3 min)	**3**	**7.5**	**2**	**5.0**
	Stage 3 (3 min)	**0**	**00.0**	**15**	**37.5**
	Stage 4 (3 min)	**0**	**00.0**	**0**	**00.0**
	Stage 5 (3 min)	**0**	**00.0**	**0**	**00.0**
Metabolic Equivalents (METs)	Poor	**39**	**97.5**	**24**	**60.0**
	Fair	**1**	**2.5**	**9**	**22.5**
	Average	**0**	**00.0**	**7**	**17.5**
	Good	**0**	**00.0**	**0**	**00.0**
	High	**0**	**00.0**	**0**	**00.0**

Table (5)Statistical differences between pre and post test for Duke Activity Status Index, Metabolic Equivalents of DASI, and Metabolic Equivalents of stress test

Variables	Pre -test		Post-test		t.test	df	Sig.(2-tailed)
	Mean	S.D	Mean	S.D			
Duke Activity Status Index scale	19.775	1.31046	18.1250	2.67167	4.573	39	0.000 (H.S)
Metabolic Equivalents of Duke Activity Status Index scale	4.25	0.68948	5.3183	1.7090	-4.374	39	0.000 (H.S)
Metabolic Equivalents of stress test	1.025	0.15811	1.575	0.78078	-4.642	39	0.000 (H.S)

Significant at P < 0.05, HS: Highly Significant at P < 0.00,df: degree of freedom, S.D: Standard Deviation

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