Effect of Digital Cardiac Rehabilitation Program on Self Efficacy of Patients with Coronary Artery Diseases

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Abstract

Background: Coronary artery disease is the umbrella term for a spectrum of diseases caused by myocardial ischemia decreasing blood supply to the heart muscle. Self-efficacy is a vital modifiable personal resource affecting rehabilitation adherence, and disease outcomes such as health-related quality of life among people with cardiovascular disease. **Aim**: To evaluate the effect of digital cardiac rehabilitation program on self efficacy of patients with coronary artery diseases. **Subjects and method: Design:** A quasi-experimental research design was used. **Setting:** The study was conducted at the cardiology unit and outpatients' clinics at El Nasr Insurance Hospital in Hehwan city. **Subjects:** A Purposive sample of (100) adult patients diagnosed with coronary artery disease, was selected and equally divided into study & control groups, (50) patients for each one. **Tools for data collection:** It included 1) a structured interviewing questionnaire, 2) cardiac self-efficacy scale, and 3) cardiac exercise self-efficacy scale. **Results:** Majority of the patients in the study group had satisfactory knowledge level , had high cardiac self efficacy, and practice exercise self efficacy post rehabilitation program implementation. **Conclusion:** There was a statistically significant difference between the study and control groups concerning knowledge, cardiac self-efficacy, and cardiac exercise self-efficacy post, and follow-up rehabilitation program implementation. The results of the current study supported the hypothesis that digital cardiac rehabilitation programs affect positively patients' knowledge and cardiac self-efficacy. **Recommendations:** Future researches are required to develop and refine interventions to improve **patient's** compliance to treatment and prevent further deterioration of cardiac self-efficacy.

Keywords: Cardiac self-efficacy, Coronary artery disease, Digital cardiac rehabilitation.

Introduction

Coronary artery disease (CAD) is the umbrella term for a spectrum of diseases caused by myocardial ischemia decreasing blood supply to the heart muscle **(Leach, 2020)**. It's a pathological condition characterized by the accumulation of atherosclerotic plaque in the coronary arteries. This condition can become unstable at any time, usually due to the acute atherothrombotic event caused by plaque rupture or erosion **(Knuuti, et al, 2020)**. The most common risk factors for the development of coronary artery diseases include diabetes mellitus, hypertension, hyperlipidemia, smoking, and emotional stress **(Barham, Ibraheem, & Zyoud, 2019).**

European Society of Cardiology (ESC) guidelines for the management of coronary syndromes were designed to achieve optimal disease stabilization or regression and included pharmacological management, developing healthy lifestyle behaviors, and percutaneous coronary interventions. A multidisciplinary team approach that provides personalized and flexible support to patients can lead to the achievement of optimum management outcomes **(Knuuti, et al., 2020)**.

The American Heart Association and American College of Cardiology had recommended cardiac rehabilitation (CR) for secondary prevention of acute coronary syndromes after myocardial infarction as cardiac rehabilitation is an evidence-based vital component in the management of patients with cardiovascular diseases. Cardiac rehabilitation has revealed a significant decrease in blood pressure, lipid level, psychosocial stress, and mortality and morbidity rates **(Zeng, Stason, & Fournier, 2013)**. Besides, it also significantly improves exercise tolerance and enhances the quality of life in patients with coronary heart disease who participated in the CR program **(Kumar, & Pina, 2019)**.

Cardiac rehabilitation has great significance in improving the clinical outcomes of coronary artery disease patients. However, patients' contribution to hospital-based cardiac rehabilitation programs is related to many factors as low-income level, traffic and transport difficulties, busy work schedules, as well as lack of awareness about the perceived benefits of rehabilitation programs. These challenges have led to the development of alternative cardiac rehabilitation programs including digital cardiac rehabilitation (HBCR) to enhance the participation rate of patients in clinical practice **(Khorshid, et al., 2019, and Song, et al., 2019)**.

Cardiac self-efficacy is defined as a cardiac-specific measure of a patient's confidence in his or her capability to accomplish activities that can be limited due to the symptoms and challenges imposed by their cardiovascular disease **(O'Neil, et al., 2013)** and their ability to successfully adhere to specific health behaviors such as compliance to exercise training regimes **(Bay, et al., 2018)**. Self-efficacy is considered a vital modifiable personal resource affecting rehabilitation adherence, the management of many chronic diseases, and disease outcomes such as health-related quality of life (HRQOL) among people with cardiovascular disease (CVD) **(Banik, et al., 2018)**.

Significance of the study

Cardiovascular disease (CVD) is the world's leading cause of death, accounting for approximately 31% of all global deaths (World Health Organization **(WHO), 2018)**. In 2017, about 17.8 million deaths were attributed to CVD worldwide, which amounted to an increase of 21.1% from 2007 and the crude prevalence of CVD was 485.6 million cases, with an increase of 28.5% compared with 2007 **(Virani, et al., 2020)**. The patient's risk of great mortality rates caused by acute coronary syndrome (ACS) is markedly increased after a primary cardiac ischemic event, and it is estimated that >7 80 000 persons will experience ACS each year in the United States **(Liu, et al., 2017)**.

Egypt has one of the highest mortality rates secondary to cardiovascular diseases (CVD) in the region and is rapidly rising **(Reda, et al., 2019)**, this may be due to the high prevalence rate of cardiovascular diseases risk factors as hypertension, dyslipidemia, and obesity are common among Egyptians **(Ibrahim, et al., 2013).** World Health Organization Statistics estimates that cardiovascular diseases are the leading cause of death in Egypt, accounting for 40% of total deaths **(WHO, 2018)**.

Technological development allows the spread of electronic products such as smartphones. To improve the efficiency of rehabilitation programs, clinical workers have proposed and carried out digital cardiac rehabilitation program with the support of this technology. The advantages of flexibility in location, time, and cost, improvement in cardiopulmonary exercise capacity permit this scheme to help in solving the limitations of conventional cardiac rehabilitation programs **(Song, et al., 2019)**

In recent years, new models of digital health (DH) enabling continuity of care are increasingly explored as new solutions to the long-term patient maintenance. Also, growing effort has been spent in the development of technology-enabled treatments, able to be carried out outside clinic setting, with promising results **(Rogerson, Burr & Tyson, 2019)** Especially, telerehabilitation aids in decreasing socioeconomic costs related to these pathologies and their weight on the healthcare system. Also, technology-enabled rehabilitation at home allows people with chronic diseases to combine pathology management with their everyday social life **(Chen, 2010& Di Tella, et al. 2019).**

Aim of the study

This study aimed to evaluate the effect of the digital cardiac rehabilitation program on the self-efficacy of patients with coronary artery diseases through:

1. Assessing cardiac patients needs for self-efficacy.
2. Developing and implementing a digital cardiac rehabilitation program according to patients' needs.
3. Evaluating the effect of the digital cardiac rehabilitation program on adult patients outcomes regarding their self efficacy

Research hypothesis:

Application of the digital cardiac rehabilitation program will have an improvement effect on knowledge and cardiac self-efficacy scores of patients with coronary artery diseases.

Subjects and Methods

Research design:

A quasi-experimental research design was used to achieve the aim of this study. Quasi-experimental research is a prospective or retrospective study in which patients self-select or are selected into one of some different treatment groups to compare the real effectiveness and safety of non-randomized treatments **(Maciejewski, 2020).**

Technical design:

The technical design includes research setting, subjects, and tools for data collection.

Setting:

The study was conducted at the cardiology unit and outpatients' clinics at El Nasr Insurance Hospital in Hehwan city. Cardiaology unit is consisted of 6 rooms each room included 4 beds in third floor of the hospital. Outpatient unit ' clinics consist of one room in first floor of the hospital. It include only one bed,table, chairs, ECG, echogram and emergency durgs. The study was conducted due to increase flow rate of cardiac patients for the hospital from Helwan and beside countries about 1000 patients during last year before data collection.

Subjects:

A Purposive sample of (100) adult patients diagnosed with CAD, was selected and equally divided into study & control groups, (50) patients for each one. The sample size is determined by statistical analysis (power analysis) where it represents the total number of patients who are diagnosed with CAD in the cardiology unit and outpatients' clinics at El Nasr Insurance Hospital at 2018-2019.

Inclusion criteria included:

- Adult and from both gender from 18-60.
- Agree to participate in the study.
- Patients not exposed before to any learning experiences regarding coronary artery disease
- All level of education but able to use the telephone and its applications.

Exclusion criteria included:

- Patients are suffering from other chronic illness as (liver diseases, hyperthyroidism), mental, and injury.

Tools of data collection:

Three tools were used to data collection of the study as the follow:

Tool I: A structured interview questionnaire was developed by the researchers after reviewing the related literature and research studies **(Perk et al., 2012 & Bay, et al., 2018 & Köhle, et al., 2018 & Song, et al., 2019 and Yu, et al., 2019,)**. It included four parts:

Part (1): It included demographic data of patient as (age, gender, marital status, level of education, job, residence, and housing conditions).

Part (2): It included past medical history. It was composed of (8) items in the form of closed-ended questions and open-ended questions.

Part (3): It was used to assess compliance with medication, dietary patterns, smoking, and exercise practices, and job condition and was composed of (9) questions in the form of closed-ended and open-ended questions.

Part 4: Patients' knowledge quationaire sheet: It was adapted from **(Murfin, 2010)**. It was used to assess the knowledge level of patients with CAD. It contains (23) closed-ended (definition of the disease, risk factors, signs and symptoms, diagnostic tests, treatment, diet, exercise, smoking, and sexual relation). The score 1 for the correct answer, and 0 for incorrect answer. The total knowledge score was (23).

Scoring system of of patients' knowledge quationaire sheet:

The level of the patient's knowledge was considered unsatisfactory when less than 60%, while ≥ 60%, the patient level of knowledge was considered as satisfactory level.

Tool II: Cardiac self-efficacy scale

This scale was adopted from **(Sullivan, et al., 1998).** The cardiac self-efficacy scale consisted of 13 items. Translation and re-translation from English to Arabic was done to assure accuracy for content validity.

The cardiac self-efficacy scale measures two factors, maintain function (MF) consisted of 6 items and control symptoms (CS) consisted of 7 items. The first factor represented the patients' confidence that they could maintain functioning by maintaining physical activity, social activities, usual activities at home, and usual activities at work, sexual relationship with the spouse, and maintaining regular aerobic exercise. The second factor represented the confidence of the patients that they could control their symptoms like chest pain and breathlessness. This scale had high internal consistency and good convergent and discriminant validity **(Robertson & Keller 2009).**

Scoring system of cardiac self-efficacy scale:

The researchers asked the patients to write their responses regarding 13statements on a 5-points scale (0 = not at all confident, 1 = somewhat confident; 2 = moderately confident, 3 = very confident, and 4 = completely confident). The items were first scored on a 5-point Likert scale ranging from 0 to 5, followed by summation. Higher scores indicated a greater level of cardiac self-efficacy in maintaining function.

Tool III: Cardiac exercise self-efficacy scale (ESES):

This scale was adopted from **(Hickey, Owen & froman, 1992)**. It contains 16 items. The scale is a self-report scale that was developed specifically to measure exercise self-efficacy in cardiac patients. It assesses patients' level of confidence in performing physical exercise-related items as warming before exercise, exercising without chest pain, measuring their heart rate before and after exercise, enduring strenuous, moderate, and light exercise, cooling after exercise, and exercising at least 20 minutes 3 times weekly. Translation and re-translation from English to Arabic was done for this tool to assure accuracy for content validity.

Scoring system of Cardiac Exercise Self-Efficacy Scale (ESES):

Patients were instructed to indicate their response on the 5-point rating scale (1 = no confident, 2 = very little confident; 3 = some confident, 4 = confident, and 5 = very confident) with "1" represented the lowest and "5" the highest efficacy rating. It was classified as:

- High cardiac exercise self-efficacy if the score ≥ 70 % of the maximum score.
- Low cardiac exercise self-efficacy if the score < 70% of the maximum score.

Proposed digital rehabilitation program:

- A digital cardiac rehabilitation program was developed for patients with coronary artery disease (CAD) to enrich them with information related to CAD, and measures to overcome complications, and measures to improve patient's self-efficacy.
- The program included theoretical knowledge about normal cardiac function, disease process (causes, risk factors, signs and symptoms, and diagnostic studies of CAD). CAD treatment, defining cardiac catheterization, benefits of cardiac catheterization and CAD complications, the non-pharmacological therapy of CAD including dietary regimen, weight control, lipid management, and smoking cessation.
- As well the program included the practical part about practicing physical exercises for CAD patients, precautions during practicing physical exercises and stages of practicing physical exercises. It was measured by cardiac exercise self-efficacy scale.

Operational design:

The operational design includes the preparatory phase, pilot study, and fieldwork.

Preparatory phase:

It included reviewing current and past available literature and theoretical knowledge of various aspects of the study using the booklet, articles, internet, periodicals, and magazines to develop the data collection tools.

Validity and reliability of the tool:

The content validity of the tool was tested by a board of five experts in medical surgical nursing field. Their opinions were elicited regarding the tool format layout, consistency, and scoring system. The Reliability of the first tool was assessed through Cronbach's alpha test α= 95% (patients' level of knowledge was 0.965), cardiac self-efficacy scale was 0.878, and cardiac exercise self-efficacy was 0.925.

Pilot Study:

A pilot study was conducted on 10% of the patients (10 patients) to test clarity and testing of the feasibility and applicability of the research process, no modifications were carried out. patients involved in the pilot were excluded from the study.

Field work:

- Data collection was started and completed within 6 months in the period from beginning of July 2019 until the end of December 2019.
- The purpose of the study was explained by the researchers to patients who agreed to participate in the study before any data collection; the study patients were divided into study and control group. The study tools were filled in and completed by the researchers in 3 stages (pre & post and follow-up the implementation of a rehabilitation program).
- Researches available at the outpatients' clinics at El Nasr insurance two days per week, from 9 am to 12 Pm.

The collection of data was done through three phases:

The first phase (Assessment phase):

In this phase, the researchers collected data from both groups (study & control). It was begun by the patient structured interview questionnaire which includes (demographic characteristics, past medical history, patients'compliance with (medication, dietary patterns, smoking, exercise practices, and job condition), and knowledge level of patients with CAD (definition of the disease, risk factors, signs and symptoms, diagnostic tests, treatment, diet, exercise, smoking, and sexual relation). The time needed for completing this questionnaire was about (20-30 minutes) for each patient. After that, the cardiac self-efficacy scale and cardiac exercise self-efficacy scale took about (10-15minutes).

Second phase (Planning phase):

- During this phase, the researchers explained to patients the benefits of the digital cardiac rehabilitation program as the availability of the program contents with the patients, continual communication with the researchers through a Whats up application and providing feedback about the program effectiveness as well as providing their suggestions for the improvement of the program.
- Digital cardiac rehabilitation program were designed based on analysis of the actual educational patients' knowledge level in the pretest. The content of the instructional booklet was written in simple Arabic language and consistent with the related literature based on their level of understanding.
- The researchers obtained patients' telephone number from each patient and assessed the availability of internet access to communicate with the researchers via WhatsApp group.
- A WhatsApp group was developed by the researchers to communicate with patients daily and to present the content of the program (Booklet, videos, illustrative pictures)

Third phase (Implementation phase):

- The study group were received digital cardiac rehabilitation program and routine care and the control group who received the routine care only.
- No educated patients in study group were received videos, illustrative pictures and voice recording through WhatApp group application and answered all quations by phone contact.
- After the development of the WhatApp group, the researchers sent text and voice messages to explain the aims of the program

and to display the plan of uploading the program contents.

- After completion of program development, the contents of the designed program were divided into six parts to upload each part weekly to the WhatsApp group for one month and a half.
- The researchers determined one day (Thursday) weekly to upload the educational contents of each part of the program and implement a WhatsApp meeting chat session, as well patients were informed to join this meeting on time to allow for open discussion between all the group members.
- The patients were encouraged to communicate with each other by sending daily short health messages to exchange their experiences with coronary artery disease, its symptoms and complications, and how each patient could manage these experiences.
- As well, the researchers sent daily messages including essential guidelines and practices for coronary artery disease management to assist patients to adopt a healthy lifestyle.
- The researchers continuously answered any patients' questions. Daily messages allowed for constant interaction between patients and the researchers as well as between patients and the educational program materials.
- Patients were informed to be in contact with the researchers by telephone and that they will be followed by the researchers after three months for study and acontrol groups.

Fourth phase (Evaluation phase):

- Evaluation for both groups was conducted through interviewing patients at the outpatients' clinic post immediate & after three months (follow up) by using the same tools to evaluate the effect of the implemented digital cardiac rehabilitation program on patients' knowledge and cardiac self-efficacy. It was tested by comparing the results of the data collected post immediate & after three months from the study and control groups.

Administrative design:

To carry out the study, the necessary approvals were obtained from the hospital director and nursing director of El Nasr insurance hospital. Official letters were issued to them from the Faculty of Nursing explaining the aim of the study to obtain permission for the collection of data.

Ethical considerations:

A verbal consent was obtained from each participant. The aim of the study was explained to patients. The researcher informed the participants that, the study was voluntary, they were allowed to refuse to participate and they had the right to withdraw from the study at any time, without giving any reason. Moreover, they were assured that their information would be confidential and used for research purposes only.

Statistical design:

Data collection obtained was organized, categorized, tabulated, and analyzed. Data were presented in tables, and figures using SPSS for Windows, version 18. Data were presented using descriptive statistics in the form of frequencies and percentages for quantitative variables and mean and SDs for qualitative variables. Differences between the two means tests (t-test) were used. Chi-square (x2) test of significance was used. Cochrane Q, test was used, statistical significance was considered at P-value <0.05.

Results

Table (1): Percentage distribution of demographic characteristics among the study & control group (N=100)

	Study (n=50)		Control (n=50)		Chi- square T test	p- value
	No	%	No	%		
Age (in years)	0	0	1	2		
20-	3	6	4	8		
30-	27	54	19	38		
40-	9	18	10	20		
50-60+	11	22	16	32		
(Mean ± SD)	44.21 ± 8.01		45.71 ± 10.42		0.272	0.781
Gender	30	60	31	62		
Male / Female	20	40	19	38	0.020	1.000
Marital status	0	0.0	1	2		
Single	36	72	38	76		
Married	3	6	1	2		
Divorced / Widowed	11	22	10	20	1.754	0.626
Educational level	13	26	12	24		
Not read or write	10	20	10	20		
Read and Write	24	48	25	50		
High school / University	3	6	3	6	1.207	0.750
Job	31	62	30	60		
Clerk	11	22	8	16		
Private	5	10	7	14		
Pension / Not work	3	6	5	10	1.549	0.668
Residence						
Rural	8	16	13	26	4.245	0.038
Urban	42	84	37	74		

Table (I): illustrates that more than half of the study group (54%) and more than one-third of the control group (38%) were in the same age group from 40 years to less than 50 years old with a mean age (44.21 ± 8.01) (45.71 ± 10.42) respectively. Less than two-thirds of the study and control groups (60% & 62%) respectively were males. While more than two-thirds of the study and control group patients (72% and 76%) respectively were married. As regards the level of education, about half of the study and control group (48% & 50%) respectively had high school degrees.

Regarding the patient's job, less than two-thirds of the study (62%) and control (60%) were clerks. As regards residence, the majority of the study (84%) and control group (74%) were living in urban areas. There were no statistically significant differences among study and control groups patients regarding all aspects of demographic characteristics.

Table (2): Percentage distribution among the study and control group as regards their medical history (N=100)

	Study (n=50)		Control (n=50)		Chi- square/ T test	p- value
	No	**%**	**No**	**%**		
Diabetes	25	50	25	50	0.351	0.549
Hypertension	36	72	38	76	0.207	0.681
Angina	30	60	32	64	0.168	0.697
COPD	10	20	13	26	0.409	0.541
Cardiac catheterization	12	24	18	36	1.625	0.202
-Time of the procedure	7.15±12.84 months		7.95±16.58 months			
Open heart surgery	1	2	2	4	0.343	0.558
-Time of procedure	5.00±0 months		36.5±33.50 months			

Table (2) presents that half of the study and control groups (50%) had diabetes mellitus. More than two-thirds of study and control group subjects (72% & 76% respectively) had hypertension.

More than half of the study group and control groups (60% & 64% respectively) had angina. While about one-quarter of the study and control groups patients (20% & 26% respectively) had COPD.

About one-quarter of the study group (24.0%) and more than one-third of the control group (36%) had a previous history of cardiac catheterization. While the minority of the study and control groups patients (2% & 4%) respectively had a history of open-heart surgery. There were no statistically significant differences among study and control group patients as regards all items of past medical history.

Table (3): Comparison between study and control group as regards lifestyle aspects pre-program implementation(N=100)

	Study group (n=50)		**Control group (n=50)**		**Chi-square/ T test**	
	No	**%**	**No**	**%**		
Dietary patterns						
Weight gain	15	30.0	17	34.0	0.181	0.675
Weight loss	11	22.0	7	14.0	1.070	0.310
Smoking						
Yes	19	38.0	17	34.0		
No	14	28.0	21	42.0	1.290	0.530
Ex-smoker	17	34.0	12	24.0		
Duration of smoking						
> 3 years	19	100.0	17	100.0	0	1
Exercise practicing						
Yes	2	4.0	2	4.0		
No	48	96.0	48	96.0	0.012	0.913
Type						
Walking	2	4.0	2	4.0	0.80	0.604
Job condition						
Types of Job						
- Heavy muscular work	12	24	10	20	0.068	0.795
- Sedentary work	30	60	28	56	0.087	0.769
Effect of health condition on working						
Need rest periods while working	36	72	32	64	0.459	0.498
Change job	10	20	9	18	0.82	0.774

Not significant (NS) **p > 0.05**

Table (3): shows that about one-third of study and control subjects (30% and 34%) respectively had weight gain. While more than one-third of study and control group subjects (38% & 34% respectively) were smokers for more than 3 years. The minority of both groups' patients (4%) practice exercise (walking).

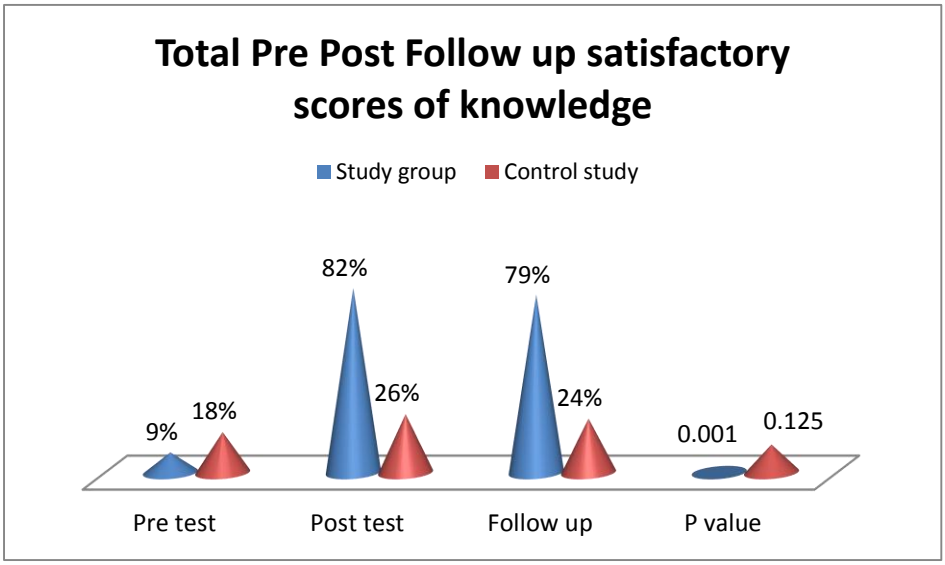
Regarding job condition, the job of more than half of the study and control groups (60% & 56% respectively) was sedentary work and the majority of the both groups (72% & 64% respectively) need rest periods while working. While less than one-fifth of study and control group patients (20% & 18% respectively) changed their job due to health condition. There were no statistically significant differences among study and control group subjects as regards all aspects of lifestyle.

Table (4): Comparison of Mean score of patient's total knowledge among study and control group pre, post and follow up dgital cardiac rehabilitation program implementation (N=100)

Items	Study group (n=50)	Control group (n=50)	T-stet	p- value
	Mean ± SD	Mean ± SD		
Total Knowledge				
- Pre-test	20.99 ± 8.89	22.92 ± 10.62	3.091	0.125
- Post-test	78.02 ± 10.12	24.08 ± 10.26	25.993	<0.001**
- Follow up- test	74.50 ± 10.72	21.68 ± 10.26	22.753	<0.001**

*** Significant p ≤ 0.05 ** Highly Significant p ≤ 0.001 Not significant p > 0.05**

Table (4): shows that there were no statistical significant differences between control and study group subjects pre-program implementation regarding patient`s total knowledge. While highly statistically significant difference was found between both groups post and follow up program implementation in total knowledge with (p≤ 0.001).



* Significant (S) p ≤ 0.05 ** Highly Significant (HS) p ≤ 0.001
Satisfactory level >70%

Figure (1): Comparison between study & control groups' patients regarding the total pre, post and follow up test satisfactory scores of knowledge (N=100)

Figure (1): Reveals that there was a highly statistically significant improvement among study group patients regarding the total pre-post and follow up test satisfactory scores of knowledge (p≤ 0.001**). While there was no statistically significant improvement in the control group regarding the total pre-post and follow up test satisfactory scores of knowledge (p≤ 0. 125).

Table (5): Comparison of mean scores of cardiac Self Efficacy (SECS and SEMF) among the study and control group during pre, post and follow up program implementation (N=100)

Items	Study group	Control group	F ratio	p value
	Mean ± SD	Mean ± SD		
SECS				
- pre-test	1.54 ± 2.36	1.62 ± 2.03	60.832	< 0.001**
- post-test	9.25 ± 5.30	2.69 ± 2.30		
- Follow up test	7.98 ± 3.96	2.42 ± 1.98		
SEMF				
- pre-test	0.19 ± 0.74	0.29 ± 0.94	38.672	< 0.001**
- post-test	4.46 ± 3.53	0.56 ± 1.26		
- Follow up test	4.17 ± 3.07	0.54 ± 1.23		

**** Highly Significant (HS) $p \leq 0.001$**

Table (5): shows that there were highly statistically significant differences between pre, post and follow up program in the study and control group subjects regarding SECS and SEMF.

Table (6): Comparison between study and control groups patients regarding Cardiac Exercise Self Efficacy (CESE) scores pre, post & follow up dgital cardiac rehabilitation program implementation (N=100)

Items	Group				Chi-square	p-value
	Study		Control			
	No	%	No	%		
CESE (pre-test)	45	90	48	96	1.377	0.25
Low exercise self-efficiency						
High exercise self-efficiency	5	10	2	4		
CESE (post- test)	8	16	48	96	62.04	<0.001
Low exercise self-efficiency						
High exercise self-efficiency	42	84	2	4		
CESE (follow up- test)	8	16	47	94	67.67	<0.001
Low exercise self-efficiency						
High exercise self-efficiency	42	84	3	6		
Cochrane Q	74		0			
p value	<0.001		1			

Table (6): shows that most of the study and control group subjects (90% & 96% respectively) had low exercise self-efficacy preprogram implementation. The majority of the study group (84%) and the minority of the control group (4%, 6%) respectively had high exercise self-efficacy post and follow-up program implementation. There were highly statistically significant differences between both groups post and follow-up program implementation regarding CESE, as well within the study group between pre, post, and follow-up program implementation. While there were no statistically significant differences between the two groups preprogram implementation.

Discussion

Regarding demographic characteristics of patients, the result of the present study revealed that more than half of the study group and more than one-third of the control group patients were below 50 years. This result is consistent with **Cheng, et al., (2019)**, who examined the psychometric properties of the Hong Kong Chinese version of the cardiac exercise self-efficacy instrument and found that one-third of the study sample were between 40 to 49 years old. As well, this result is incongruent with **Yu, et al ., (2019)**, in their recent study entitled ‘‘Effect of health education based on behavioral change theories on self-efficacy and self-management behaviors in patients with chronic heart failure” and reported that the majority of the study sample aged 31-69 years. This can be interpreted as; coronary artery diseases can affect different age groups.

As regards gender, the present study clarified that about two-thirds of study and control group subjects were males. This result

is in accordance with **Bay, et al., (2018)**, who identified factors related to low exercise self-efficacy in adults with congenital heart disease, and potential strategies for being physically active and found that more than half of study and control group subjects were males. As well, this result goes in line with **Peng, et al., (2018)** in their study about ‘‘Home-based telehealth exercise training program in Chinese patients with heart failure: A randomized controlled trial” and they stated that most of the patients were men. However, this result is inconsistent with **Cheng, et al., (2019)**, who mentioned that the majority of the study sample was female.

In the current study, the results showed that more than two-thirds of the studied patients were married. This finding goes in line with **Köhle, et al., (2018)**, who assessed the level of patient empowerment and general self-efficacy in patients six to 12 months after the cardiac event and mentioned that the majority of their study sample were married. This finding also is in agreement with Salari, et al. (2016), who determined the cardiac self-efficacy predictors after coronary artery angioplasty and reported that the majority of their study sample were married.

Concerning educational level, this study result revealed that about half of the study and control groups patients had high school education. This result is inconsistent with **Barham, Ibraheem, & Zyoud, (2019)**, who assessed patterns of cardiac self-efficacy and quality of life among coronary heart disease patients and mentioned that less than half of their study subjects had primary education. As well, this result is incongruent with **Salmoirago-Blotcher, et al., (2017)** who mentioned in their study about ‘‘Tai Chi is a promising exercise option for patients with coronary heart disease declining cardiac rehabilitation” that half of their study subjects had a college education.

Relating to patients' working status, the present study result indicated that, about two-thirds of the study and control group were clerks. This may be interpreted that patients had jobs consistent with their educational level in governmental or private sectors. This result is congruent with **Tawalbeh, (2018)**, who examined the effect of a cardiac educational program on knowledge and self-care behaviors among patients with heart failure and indicated that about two-thirds of the studied patients were working. While, these results are in disagreement with **Baradaranfard, et al., (2018)**, who determined the relationship between quality of life and cardiac self-efficacy in patients with heart failure and denoted that the minority of the sample were employees.

In the current study, the results showed that there were no statistically significant differences between study and control group patients regarding all aspects of demographic characteristics, this result indicates that both study and control groups were compatible. This result is in accordance with **Peng, et al., (2018)**, who mentioned that there were no significant differences between the experimental and control groups concerning patients’ demographic variables. Also, this result is congruent with **Aminpour, Shahamfar, & Shahamfar (2014)**, in their study, ‘‘Effects of lifestyle modification program on reduction of risk factors in patients with coronary heart disease”, they mentioned that there were no significant differences regarding any of the demographic characteristics of the patients between the control and teaching groups. While, this results in disagreement with **Maddison, et al., (2018)** in their study titled ‘‘Effects and costs of real-time cardiac telerehabilitation: randomized controlled trial”, they found that a minority of the studied sample had diabetes mellitus.

Considering medical history, the present study indicated that half of the study and control group subjects had diabetes mellitus. This may be due to that the majority of the ages of the patients were within 30-50 years and this age group is a common high-risk group for diabetes mellitus. This result is in accordance with **Song, et al., (2019)**, who investigated the effects of telemonitored exercise rehabilitation on patients with coronary heart disease in China and mentioned that slightly more than half of study patients had diabetes mellitus.

In the same context of past medical history, the present study indicated that more than two-thirds of the study and control groups patients had hypertension. This may be due to

that hypertension is a major predisposing factor to coronary artery diseases. This result is in accordance with **Khorshid, et al., (2019)** who mentioned in their study about ‘‘Cardiac rehabilitation after myocardial infarction: a comparison between the standard and home-based cardiac rehabilitation programs”, that the majority of their study patients had hypertension. While, this result in disagreement with **Park, et al., (2019)** in their study titled ‘‘comparison of the obesity-related index and exercise capacity between center-based and home-based cardiac rehabilitation programs”, they found that only two-fifths of the studied sample had hypertension.

Regarding the dietary patterns, the present study revealed that about one-third of the studied patients were obese. This may be due to that weight gain is a predisposing factor for coronary artery diseases. This result is consistent with **Barham, Ibraheem, & Zyoud, (2019)**, who stated that about one-third of the studied patients were obese. While, this result is inconsistent with **Bay, et al., (2018)**, who signified that the study sample had normal body mass index measurement.

In the same context, this result is in agreement with **Knuuti, et al., (2020)**, in a very recent study titled "European Society of Cardiology (ESC) Guidelines for the diagnosis and management of chronic coronary syndromes”, they revealed that lifetime risk of cardiovascular diseases was higher in those who were overweight compared with those with a normal body mass index. As well, in a study by **Khan, et al., (2018)**, titled "Association of body mass index with the lifetime risk of cardiovascular disease and compression of morbidity", they mentioned that overweight was associated with developing cardiovascular diseases at an earlier age and these studies supported the explanation given by the researcher.

Considering smoking habit, the present study finding showed that more than one-third were smokers for more than 3 years. This may indicate that smoking is a predisposing factor for coronary artery diseases. This result is in accordance with **Salmoirago-Blotcher, et al., (2017)** who mentioned in their study that one-fifth of their study sample was smoking. While, this result is incongruent with **Khorshid, Abdeltawab, Menshawy, & Zaki, (2019)**, who found that the majority of their study sample were smokers.

Regarding physical exercise practicing, the present study findings showed that the minority of the study & control groups patients were practicing exercise. This may be due to the lack of knowledge regarding the benefits of practicing exercise regularly. This result is consistent with **Larsson, (2019),** in his study titled “cardiac self-efficacy and fatigue one-year post-myocardial infarction” mentioned that the minority of their studied subjects were performing regular exercise. While this result is inconsistent with **Song, et al., (2019)**, who found that the majority of their studied subjects were performing exercise habits.

As regards working conditions, the present study indicated that the minority of the study sample changed their job after coronary artery diseases attack. This result is inconsistent with **Meng et al., (2015)**, in a research study titled "Evaluation of a standardized patient education program for inpatient cardiac rehabilitation: impact on illness knowledge and self-management behaviors up to 1 year", who found that majority of the study sample had been declared that they changed their job after the attack of coronary artery diseases.

As well, the results of the current study revealed that there was a highly statistically significant improvement in study group patients as compared to the result of control group post-program implementation regarding total knowledge satisfactory scores; this might be due to the effectiveness of program implementation and the motivation of cardiac patients to be familiar with their disease. This result goes in line with **Tawalbeh (2018)**, who indicated that patients’ knowledge improved significantly at 1 and 3 months after the program application.

Regarding **cardiac self-efficacy**, the present study indicated that there were no statistically significant differences between control and study group subjects regarding Self Efficacy Continuous Symptoms (SECS) and Self Efficacy Maintaining Function (SEMF) total mean scores preprogram implementation.

This result is consistent with **Tavakolizadeh, Tabari, & Akbari (2015)**, who studied "Academic self-efficacy: predictive role of attachment styles and metacognitive skills in Iran" and mentioned that there were no statistically significant relations between control and study group subjects regarding SECS and SEMF preprogram implementation.

While, this finding in disagreement with **Borzou, et al., (2018),** who stated in their study about ‘‘effects of the first phase of cardiac rehabilitation training on self-efficacy among patients undergoing coronary artery bypass graft surgery” that the mean score of the self-efficacy was statistically significantly different between the 2 groups before intervention.

On the other hand, the present study declared that there were highly statistically significant differences between study and control group subjects regarding SECS and SEMF post and follow up program implementation. This result is consistent with **Nur’aeni, Mirwanti, & Anastasia, (2019),** in their study entitled ‘‘effect of a workbook in health education on self-efficacy and quality of life of patients with coronary heart disease”, they declared that a significant difference occurred in patients’ self-efficacy at two months after measurement. As well, this study result is in agreement with **Boroumand,** & **Moeini, (2016),** in their study about ‘‘The effect of a text message and telephone follow-up program on cardiac self-efficacy of patients with coronary artery disease: A randomized controlled trial”, they stated that there were significant differences in terms of self-efficacy 6 weeks and 6 months after the intervention.

The present study indicated that there were highly statistically significant improvements in the study group patients as compared to the result of control group post and follow up program implementation regarding SECS and SEMF total mean scores. This may be attributed to the effect of program implementation in improving cardiac self-efficacy of coronary artery disease patients. This result is in agreement with **Yu, et al., (2019)**, who stated that the self-efficacy level of patients in the observation group who received health education was significantly higher than that in the control group. As well, this study result goes in line with **Boroumand,** & **Moeini, (2016),** who mentioned that the mean cardiac self-efficacy scores of the intervention group were significantly higher than the control group 3 and 4 months after the interventions.

Concerning **cardiac exercise self-efficacy (CESE),** the present study indicated that the majority of the study group and minority of the control group had high exercise self-efficacy post-program implementation. This may due to the cardiac patient was motivated in the digital rehabilitation program which results in improving CESE. This result is inconsistent with **Paryad, et al., (2013),** who studied self-efficacy in patients with coronary artery disease and its predictors and mentioned that only one-fourth of the study sample had desirable exercise self-efficacy.

The present study indicated that there were highly statistically significant differences between control and study group post and follow up program implementation regarding CESE. This result is congruent with **Borzou, et al., (2018),** who stated that the exercise self-efficacy scores were significantly different between intervention and control groups at the time of discharge and 1 month after program implementation. While, this result disagrees with **Claes et al, (2020),** in their very recent study titled “feasibility, acceptability, and clinical effectiveness of a technology-enabled cardiac rehabilitation platform physical activity toward health): randomized controlled trial’’, they signified that there was a documented decrease in exercise self-efficacy after the intervention.

Conclusion

In light of the current study results, it was concluded that the majority of study group subjects had a satisfactory level of knowledge, high cardiac self-efficacy, and high cardiac exercise self-efficacy post and follow-up rehabilitation program implementation. There was a statistically significant difference between the study and control groups concerning knowledge, cardiac self-efficacy, and cardiac exercise self-efficacy post, and follow-up rehabilitation program implementation.

Recommendations

Based on the findings of the current study, the following recommendations are proposed:

- Future researches are required to develop and refine interventions to improve patient's compliance to treatment and prevent further deterioration.
- Designing clinical educational programs and nursing interventions on the detection of predictors of cardiac self-efficacy could be effective in the promotion of cardiac patients' self-efficacy.
- Improving patient's self-efficacy should be the main objective for nurses during their care of a patient with coronary artery diseases.

References

Aminpour, S., Shahamfar, M., & Shahamfar, J.(2014): Effects of Lifestyle Modification Program in Reduction of Risk Factors in Patients with Coronary Heart Disease European Journal of Experimental Biology, 4(1):353-357

Banik, A., Schwarzer, R., Knoll, N., Czekierda, K., & Luszczynska, A. (2018): Self-Efficacy and Quality of Life Among People with Cardiovascular Diseases: A Meta-Analysis. *Rehabilitation Psychology; 63* (2): 295 – 312.

Baradaranfard, F., Babaei, S., Boroumand, S., Mosleh, S., Jafari, F., & Binaee, N. (2018): The Relationship between Quality of Life and Cardiovascular Self-Efficacy in Patients with Heart Failure: A Descriptive Correlation Study. Journal of Chronic Disease Care; 7(4): 1-6.

Barham, A., Ibraheem, R., & Zyoud, S. (2019): Cardiac Self-Efficacy and Qualityof Life in Patients with Coronary Heart Disease: A Cross-Sectional Studyfrom Palestine. BMC Cardiovascular Disorders: 19 (290): 1-12.

Bay, A., Sandberg, C., Thilén, U., Wadell, K., & Johansson, B. (2018): Exercise Self-Efficacy in Adults with Congenital Heart Disease**.** *International Journal of Cardiology: Heart and vasculature*; 18: 7-11**.**

Boroumand, S., & Moeini, M. (2016): The Effect of A Text Message and Telephone Follow-Up Program on Cardiac Self-Efficacy of Patients with Coronary Artery Disease: A Randomized Controlled Trial. Iran Journal of Nurs Midwifery Res; 21(2): 171–176.

Borzou, S., Amiri, S., Salavati, M., Soltanian & A., Safarpoor, G. (2018): Effects of The First Phase of Cardiac Rehabilitation Training on Self-Efficacy Among Patients Undergoing Coronary Artery Bypass Graft Surgery. The Journal of Tehran University Heart Center; 13 (3):126-131.

Cheng, H., Chair. S., Wang, Q., Cao, X., Cheng, L., & Lee, I. (2019): Measuring Exercise Self-Efficacy In Hong Kong Chinese Adults with Cardiovascular Risk: Validation of a Chinese version of the Cardiac Exercise Self-efficacy Instrument. *Res Nurs Health*; 42: 148–154.

Chen J. (2010): Parkinson's Disease: Health-Related Quality of Life, Economic Cost, and Implications of Early Treatment. *Am J Manag Care.* 16:S87–93.PubMed Abstract | Google Scholar

Claes, J., Cornelissen, V., McDermott, C., Moyna, N., Pattyn, N., Cornelis, N., Gallagher, A., McCormack, C., Newton, H., Gillain, A., Budts, W., Goetschalckx, K., Woods, C., Moran, K., & Buys, R. (2020): Feasibility, Acceptability, and Clinical Effectiveness of a Technology-Enabled Cardiac Rehabilitation Platform (Physical Activity Toward Health-I): Randomized Controlled Trial. Journal of Medical Internet Research; 22 (2): 1-19.

Di Tella S., Pagliari C., Blasi V, Mendozzi L., Rovaris M., & Baglio F. (2019): Integrated Telerehabilitation Approach in Multiple Sclerosis: A Systematic Review and Meta-Analysis. *J Telemed Telecare*. doi: 10.1177/1357633X19850381. [Epub ahead of print].PubMed Abstract | CrossRef Full Text | Google Scholar

Hickey, M., Owen, S., & Froman, R., (1992): Instrument Development Cardiac Diet &

Exercise Self-Efficacy Nursing Research (41): 347-51.

Ibrahim, M., Ibrahim, A., Shaheen, K., & Nour, M. (2013): Lipid Profile in Egyptian Patients with Coronary Artery Disease. The Egyptian Heart Journal 65: 79-85. At: www.elsevier.com/locate/ehj . Last access:(9/7/2020 7: 35 PM)

Khan, S., Ning, H., Wilkins, J., Allen, N., Carnethon, M., Berry, J., Sweis, R., & Lloyd-Jones, D. (2018): Association of Body Mass Index with The Lifetime Risk of Cardiovascular Disease and Compression of Morbidity. JAMA Cardiol; 3: 280-287.

Khorshid, H., Abdeltawab, A., Menshawy, M., & Zaki, T. (2019): Cardiac Rehabilitation After Myocardial Infarction: A Comparison between The Standard and Home-Based Cardiac Rehabilitation Programs. Journal of Cardiology & Current Research; 12 (1): 12-19.

Knuuti, J., Wijns, W., Saraste, A., Capodanno, D., Barbato, E., Funck-Brentano, C., Prescott, E., Storey, R., Deaton, C., Cuisset, T., Agewall, S., Dickstein, K., Edvardsen, T., Escaned, J., Gersh, B., Svitil, P., Gilard, M., Hasdai, D., Hatala, R., Mahfoud, F., Masip, J., Muneretto, C., Valgimigli, M., Achenbach, S., & Bax, J. (2020): European Society of Cardiology (ESC) Guidelines for The Diagnosis and Management of Chronic Coronary Syndromes. European Heart Journal: 41, 407_477.

Köhle, A., Tingström, P., Jaarsma, T., &Nilsson, S. (2018): Patient Empowerment and General Self-Efficacy in Patients With Coronary Heart Disease: A Cross-Sectional Study. BMC Family Practice; 19:76

Kumar, K., & Pina, I. (2019): Cardiac Rehabilitation in Older Adults: New Options. Clinical Cardiology; 43:163–170.

Larsson, U. (2019): Cardiac Self-Efficacy and Fatigue One Year Post-Myocardial Infarction. Open Journal of Nursing; 9: 396-407.

Leach, T., (2020): Myocardial Infarction and Acute Coronary Syndromes (ACS). At:almostadoctor.co.uk/encyclopedia/myocardial-infarction-and-acute coronary-syndromes.

Liu, X., Shi, Y., Willis, K., Wu, C., & Johnson, M. (2017): Health Education for Patients with Acute Coronary Syndrome And Type 2 Diabetes Mellitus: An Umbrella Review Of Systematic Reviews And Meta-Analyses. BMJ Open: 7: 1-30.

Maciejewski, M. (2020): Quasi-Experimental design. Biostatistics & Epidemiology; 4 (1): 38-47.

Maddison, R., Charles, J., Stewart, R., Benatar, J., Whittaker, R., Rolleston, A., Jiang, Y., Gao, L., Moodie, M., Warren, I., Meads, A., & Gant, N. (2018): Effects and Costs of Real-Time Cardiac Telerehabilitation: Randomized Controlled Non-Inferiority Trial. Heart Journal; 105: 122–129.

Meng, K., Seekatz, B., Haug, G., Mosler, G., Schwaab, B., Worringen, U., & Faller, H.(2015): Evaluation of a standardized patient education program for inpatient cardiac rehabilitation: impact on illness knowledge and self-management behaviors up to 1 year, Health Education Research; 30 (1): 154-157.

Murfin, R., (2010): Coronary heart disease knowledge and health behavior in student nurses; 17,301, PP. 123-132.

Nur'aeni, A, Mirwanti, r., & Anastasia, A. (2019): Effect of A Workbook in Health Education on Self-Efficacy and Quality of Life of Patients with Coronary Heart Disease. Belitung Nursing Journal; 5(6): 218-224.

O'Neil, A., Berk, M., Davis, J., & Stafford, L. (2013): Cardiac-Self Efficacy Predicts Adverse Outcomes in Coronary Artery Disease (CAD) Patients. Health; 5 (7): 6–14.

Park, H., Kim, K., Kim, J., Song, M., Choi, I., & Han, J. (2019): Comparison of Obesity-Related Index and Exercise Capacity between Center-Based and Home-Based Cardiac Rehabilitation Programs. Ann Rehabil Med 2019; 43 (3):297-304

Paryad, E., Hosseinzade, T., Kazemnejad, E., & Asiri, S. (2013): A Study of Self-efficacy in Patients with Coronary Artery Disease and Its Predictors, Qom University of Medical Sciences Journal;7(2): 21.

Peng, X., Su, Y., Hu, Z., Sun, X., Li, X., Dolansky, M., Qu, M., & Hu, X. (2018): Home-Based Telehealth Exercise Training Program in Chinese Patients with Heart Failure: A Randomized Controlled Trial. Medicine Journal; 97(35):1-9

Perk, J., De Backer, G., Gohlke, H., Graham, I., Reiner, Z., Verschuren, M., Albus, C., Benlian, P., Boysen, G., Cifkova, R., Deaton, C., Ebrahim, S., Fisher, M., Germano, G., Hobbs, R., Hoes, A., Karadeniz, S., Mezzani, A., Prescott, E., Ryden, L., Scherer, M., Syvanne, M., Scholte, O., Reimer, W., Vrints, C., Wood, D., Zamorano, J., & Wolpert, C. (2012): European Guidelines on Cardiovascular Disease Prevention in Clinical Practice. European Heart Journal; 33:1635–170.

Reda, A., Ashraf, M., Bendary, A., Elbahry, A., Farag, E., Bendary, M., Tabl, A., Mostafa, T., Wadie, M., & Selim, M. (2019): Premature Coronary Artery Disease among Egyptian Patients with The Acute Coronary Syndrome; Data From The Cross-Sectional Cardio-Risk Project. Egyptian Association of Vascular Biology and Atherosclerosis (EAVA). *European Heart Journal*; 40 (1): 440.

Robertson, D., & Keller, C. (2009): Relationships Among Health Beliefs, Self-Efficacy, and Exercise Adherence in Patients with Coronary Artery Disease. Heart Lung; 21:6-63.

Salari, A., Balasi, L Moaddab, F., Zaersabet, F., Saeed, A., & Nejad, S. (2016): Patients' Cardiac Self-Efficacy after Coronary Artery Angioplasty. Jundishapur J Chronic Dis Care; 5(2): 1-5.

Rogerson L., Burr J., & Tyson S. **(2019) :**The Feasibility and Acceptability of Smart Home Technology Using The Howz System for People with Stroke. Disabil Rehabil Assist Technol. 1–5. doi: 10.1080/17483107.2018.1541103 PubMed Abstract | CrossRef Full Text | Google Scholar

Salmoirago-Blotcher, E., Wayne, P., Dunsiger, S., Krol, J., Breault, C., Bock, B., Wu, W., & Yeh, G. (2017): Tai Chi Is a Promising Exercise Option for Patients with Coronary Heart Disease Declining Cardiac Rehabilitation. Journal of the American Heart Association; 2017;6:1-11

Song, X., Ren, C., Liu, P., Tao, L., Zhao, W., & Gao, W. (2019): Effect of Smartphone-Based Telemonitored Exercise Rehabilitation among Patients with Coronary Heart Disease. Journal of Cardiovascular Translational Research; https://doi.org/10.1007/s12265-019-09938-6. Last access:(8/7/2020 2 PM)

Sullivan, M., Lacroix, A., Joanrusso, & Katon, W. (1998): Self-Efficacy and Self-Reported Functional Status in Coronary Heart Disease: A Six-Month Prospective Study Psychosomatic Medicine (60): pp 473-478.

Tavakolizadeh, J., Tabari, J., & Akbari, A. (2015): Academic Self-Efficacy: Predictive Role of Attachment Styles and Meta-Cognitive Skills, Procedia - Social and Behavioral Sciences; 171: 113 – 120.

Tawalbeh, L. (2018): The Effect of Cardiac Education on Knowledge and Self-Care Behaviors among Patients with Heart Failure. Dimensions of Critical Care Nursing; 37 (2): 78- 86

Virani, S., Alonso, A., Benjamin, E., Bittencourt, M., Callaway, C., Carson, A., Chamberlain, A., Chang, A., Cheng,

S., Delling, F., Djousse, L., Elkind, M., Ferguson, J., Fornage, M., Khan, S., Kissela, B., Knutson, K., Kwan, T., Lackland, D., Lewis, T., & Lichtman, J. (2020): Heart Disease and Stroke Statistics—2020 Update: A Report from The American Heart Association. Circulation; 141 (9): 139–596.

World Health Organization (2018): Noncommunicable Diseases (NCD) Country Profiles. At: https:// www. who. int/nmh/publications/ncd-profiles-2018/en/ Last access:(8/7/2020 2: 30 PM)

World Health Organization. (2018): Cardiovascular disease. Available Online at http://www.who.int/cardiovascular_diseases/en/. Last access:(8/7/2020 2: 35 PM)

YU, H., Zhang, P., Wang, X., Wang, Y., & Zhang, B. (2019): Effect of Health Education Based on Behavioral Change Theories on Self-Efficacy and Self-Management Behaviors in Patients with Chronic Heart Failure. *Iran J Public Health; 48 (3): 421-428*

Zeng, W., Stason, W., & Fournier, S. (2013): Benefits and Costs of Intensive Lifestyle Modification Programs for Symptomatic Coronary Disease in Medicare Beneficiaries. American Heart Journal; 165(5):785-792.