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Effectiveness of Cardiac Rehabilitation Instructional Program on Knowledge and Health-related Quality of Life for Patients Undergone Coronary Artery Bypass Graft Surgery

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ABSTRACT

Objective(s): Determination of effectiveness of cardiac rehabilitation instructional program on knowledge and health-related quality of life for patients undergone Coronary Artery Bypass Graft Surgery and to find out the relationship between knowledge and health-related quality of life of patients and their socio-demographic and clinical characteristics.

Methodology: A pre-experimental design (one group, pretest- posttest) was carried out from 8th August, 2022 to 10th January, 2023. A non-probability purposive sample of (50) patients undergone coronary artery bypass graft surgery at Iraqi center for heart diseases. The questionnaire and the program contents' validity was determined by a panel of (18) experts to evaluate their clarity, relevance, and appropriateness for the accomplishment of the study.

The reliability of questionnaire was assessed using Cronbach alpha reliability to estimate its internal consistency. Correlation coefficient of (0.867) was determined which is acceptable. Patients were asked to fill the three questionnaires before applying the instructional program (pre-test), then the program has been presented and discussed through (4) sessions. After one month, patients were asked to refill the forms (post-test) to determine the effectiveness of the CR program. Descriptive and inferential data were analyzed by using: frequency, percentage, mean of score, standard deviation and paired t test.

Results: The patient's knowledge about cardiac rehabilitation and health-related quality of life before applying the program were poor in most items, while their knowledge increased after applying the program.

Conclusions: The study confirmed the effectiveness of cardiac rehabilitation instructional program on patients' knowledge and health-related quality of life and there was significant positive relationship between HRQoL and patient's sociodemographic and clinical characteristics.

Recommendations: The study recommends the application of current CRP within Iraqi cardiac hospitals and centers and the need for further studies on more representative sample.

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فاعلية برنامج تأهيل قلبي إرشادي على معارف وجودة الحياة المتعلقة بالصحة للمرضى الخاضعين لعملية زرع مجازة الشريان التاجي

المستخلص

الأهداف: تحديد فاعلية برنامج التأهيل القلبي الإرشادي على معارف وجودة الحياة المتعلقة بالصحة للمرضى الخاضعين لعملية زرع مجازة الشريان التاجي ومعرفة العلاقة بين معارف وجودة الحياة المتعلقة بالصحة للمرضى وخصائصهم الاجتماعية والديموغرافية والسريرية.

منهجية البحث: نُفذ تصميم قبل التجريبي (مجموعة واحدة، اختبار قبلي وبعدي) في الفترة من 8 آب 2022 إلى 10 كانون الثاني 2023. تم اختيار عينة غير احتمالية (غرضية) تتكون من (50) مريضا خضعوا لعملية زرع مجازة الشريان التاجي في المركز العراقي لأمراض القلب. تم تحديد صلاحية الاستبانة ومحتويات البرنامج من قبل مجموعة من (18) خبير لتقييم مدى وضوحها وملائمتها وعلاقتها لإتمام الدراسة. تم تقييم موثوقية الاستبانة باستخدام معامل كرونباخ الفا لتقدير تناسقها الداخلي. تم تحديد معامل الارتباط (0.867) وهو مقبول. طُلب من المرضى ملئ الاستمارات الثلاثة قبل تطبيق البرنامج التعليمي (الاختبار القبلي)، ثم تم تطبيق البرنامج ومناقشته من خلال (4) جلسات. بعد شهر واحد، طُلب من المرضى إعادة ملئ الاستمارات (الاختبار البعدي) لتحديد مدى فاعلية برنامج التاهيل القلبي. تم تحليل البيانات الوصفية والاستنتاجية باستخدام: التكرار، النسبة المئوية ، متوسط الدرجة، الانحراف المعياري واختبار t المزدوج.

النتائج: كانت معارف المرضى بإلتأهيل القلبي وجودة الحياة المتعلقة بالصحة قبل تطبيق البرنامج ضعيفة في معظم البنود، بينما زادت معرفتهم بعد تطبيق البرنامج.

الاستنتاجات: أكدت الدراسة فاعلية البرنامج الارشادي للتأهيل القلبي على معارف المرضى وجودة الحياة المتعلقة بالصحة وكانت هناك علاقة ايجابية كبيرة بين جودة الحياة المتعلقة والخصائص الاجتماعية والديموغرافية والسريرية للمريض.

التوصيات: أوصت الدراسة بتطبيق برنامج التأهيل القلبي الحالي داخل مستشفيات ومراكز القلب العراقية والحاجة الى المزيد من الدراسات على عينة أكثر تمثيلاً.

الكلمات المفتاحية: فاعلية، تأهيل القلب ، عملية زرع مجازة الشريان التاجي، جودة الحياة المتعلقة بالصحة.

Introduction

Coronary artery disease (CAD) continues to be the futuristic single reason for death globe wide until the year 2030 [1]. Cardiovascular disease is the leading cause of death in about 63% of chronic disease deaths worldwide [2] [3].

Coronary artery bypass graft surgery (CABGs) is a global scope surgery that deemed as the most common cardiac surgery performed today [4].

Studies showed that post-operative complications increased with physical inactivity and therefore reduces patient's quality of life. Furthermore, continuous and appropriate comprehensive nursing care will continue to be important for enhancing patient's recovery [5].

In addition, the non-modifiable risk factors for CAD include; smoking, hypertension, hypercholesterolemia obesity and diabetes. While modifiable risk factors include lack of exercise, an unhealthy diet and stress [6]. These risk factors considered as consequent contributors in the development of CAD [7]. Thus, risk factor management is a crucial first step in dealing with cardiovascular event [8].

Low mortality rates rise the need for homogenous sample in future studies to overcome the declining efficiency of recent studies for managed CAD cases. [9].

Nurses play a key role in improving patients' life by increasing their awareness about disease risk factors through self‐ care educational programs [3].

Cardiac rehabilitation program (CRP) is a multi-disciplinary approach including supervised exercise training, patient counseling, education and nutritional guidance that may also enhance patient's quality of life (QoL) [10]. In addition, cardiac rehabilitation is an effective strategy in the care of patients who had CAD and in lowering the cardio vascular mortality rate [11].

Constructing a program for cardiac rehabilitation among patients with open heart surgery is very beneficial. Also a follow-up monitoring education is highly advised [12].

The CR programs strive to improve health-related quality of life (HRQL), reduce complications, relief symptoms, as well as prolonging life. Besides prolonging life, the objectives of CR include the improvement of physical functioning and general wellbeing [9].

A recently published meta-analysis results showed that cardiac rehabilitation programs improved health-related quality of life while only two trails exceeded that of the controls [13].

The built-in training exercises conducted within CRP links patient's performance with their HRQoL [14]. For those patients undergone CABGs, it is highly recommended to engage in CRP in order to increase their functional exercise through daily walking and aerobic exercises [15].

Ordinarily, a regular physical activity program should be implemented to improve patient's physical fitness and enhance HRQoL. Targeting a minimum of thirty minutes of moderate physical exercise daily should be the aim of each participant [16].

In Iraq, approximately 2200 patients undergone CABGs in 2021. About 1800 patient survived the complications of surgery. However, there are no reports of cardiac rehabilitation referrals as a result of the absence of specialized cardiac rehabilitation centers [17].

The current study was conducted to reinforce the importance of the CR program in decreasing surgery complications and improving patient's HRQoL, thus it aims to determine the effectiveness of cardiac rehabilitation instructional program on health-related quality oflife.

Methodology

A pre-experimental design (one group, pretest- posttest) carried out in Iraqi Center for Heart Diseases (ICHD) at Medical City Directorate.

The study was conducted from 8th August, 2022 to 10th January, 2023 at ICHD. A non-probability (purposive) sample of (50) patients undergone CABG surgery were enrolled in cardiac rehabilitation program.

Patients were selected according to the following criteria;

(1) Adult patients.

(2) Both male and females, undergone CABGs with no major pulmonary complications.

The patients have signed a consent form to acknowledge their voluntary participation with no coercion and the confidence that their data will be used for research purposes only.

Direct interview was used in data collection from the study sample through the use of a questionnaire composed of three parts:

Part I: Patients' socio-demographic and clinical characteristics which included 11 items; age, gender, marital status, educational level, occupation, smoking, body mass index, disease diagnosis, blocked coronary arteries, ejection fraction and NYHA classification).

Part II: Evaluation of Patient's knowledge about cardiac rehabilitation which includes 20 multi-choice questions with 1 correct choice and 3 incorrect ones. These questions adopted from relevant CRP literatures.

Part III: Evaluation of patients' Health-related quality of life (HRQoL) which include 5 domains adopted from Euro-QoL (EQ-5D). This tool scored using three levels Likert scale; (3) for no problems, (2) for some problems and (1) for major problems.

The questionnaire and the program contents' validity was determined by a panel of (18) experts from University of Baghdad/ College of Nursing, Iraqi Center for Heart Diseases and Ibn Al-Bittar Specialized Center for Cardiac Surgeries. These experts were with at least ten years of expertise in the research area, they evaluated their clarity, relevance, and appropriateness for the accomplishment of the study.

The reliability of the questionnaire was assessed using Cronbach alpha reliability to estimate its internal consistency. Correlation coefficient of (0.867) was determined which is acceptable.

All participants were asked to fill the three questionnaires before applying the

instructional program (pre-test), then the program has been presented and discussed through (4) sessions. First session was about CAD; second session was about explaining CABG surgery and patient care (pre, intra, and postoperative); third session was about CR program and the fourth session was about the training exercises. After one month, the participants were asked to refill the forms (post-test) to determine the effectiveness of the CR program.

The statistical software (SPSS) ver. 23 was used for data analysis of the study, using; frequency, percentage, mean of score, standard deviation, and paired t test. A p value ≤ 0.05 was counted as statistically significant

Results

Table (1): Distribution of the Patients According to Their Sociodemographic and Clinical Characteristics

Variables	Characteristics	F	%
Age (years)	38- 47 years	4	8
	48- 57 years	19	38
	58- 67 years	16	32
	≥ 68 years	11	22
	Total	50	100
	M.S ± SD (4.68 ± 0.913)		
Gender	Male	33	66
	Female	17	34
	Total	50	100
	M.S ± SD (1.34 ± 0.479)		
Marital status	Married	35	70
	Divorced	2	4
	Widowed	13	26
	Total	50	100
	M.S ± SD (2.56 ± 0.884)		
Educational Level	Middle school	12	24
	Secondary school	20	40
	Institute\ college	18	36
	Total	50	100
	M.S ± SD (5.12 ± 0.773)		
Occupation	Employee	19	38
	Free job	13	26
	Retired	8	16
	Housewife	10	20
	Total	50	100
	M.S ± SD (3.18 ± 1.155)		
Smoking	Non Smoker	19	38
	Smoker	5	10
	Ex- Smoker	26	52
	Total	50	100
	M.S ± SD (2.14 ± 0.948)		
Body Mass Index (BMI)	Normal (18.5- 24.9 kg\m^2)	20	40
	Overweight (25- 29.9 kg\m^2)	27	54

	Obese Class l (30- 34.9 kg\m^2)	3	6
	Total	50	100
	M.S ± SD (2.66 ± 0.593)		
Diagnosis	1- 5 years	30	60
	6- 10 years	18	36
	11- 15 years	2	4
	Total	50	100
	M.S ± SD (2.44 ± 0.577)		
No. of Blocked Coronary Arteries	2 arteries	14	28
	3 arteries	34	68
	> 3 arteries	2	4
	Total	50	100
	M.S ± SD (2.76 ± 0.517)		
Ejection Fraction (EF)	Reduced EF (≤ 40%)	18	36
	Borderline EF (41- 49%)	30	60
	Normal EF (50- 70%)	2	4
	Total	50	100
	M.S ± SD (1.68 ± 0.551)		
NYHA Classification	Class II	29	58
	Class III	21	42
	Total	50	100
	M.S ± SD (2.42 ± 0.499)		

F= Frequency, %= Percent, M.S.= Mean of score, SD= Standard deviation, Kg\M^2= Kilogram\Square meter, NYHA=New York Heart Association

The results of table (1) showed that the highest percentage of the patients were within the age group (48- 57) years (38%), the majority of patients were male (66%), most of them were married (70%), with an educational level of secondary school graduate (40%). Most of patients were employed (38%). Half of patients were ex-smokers (52%). Most of them were overweight (54%). Regarding patient's clinical characteristics; most of them were diagnosed with CAD before (1- 5) years (60%). Three blocked arteries were blocked in the majority of patients (68%) prior to CABGs with a borderline ejection fraction (41- 49%) in (60%) of patients. In relation to NYHA classification; most of the patients were staged in class II (58%).

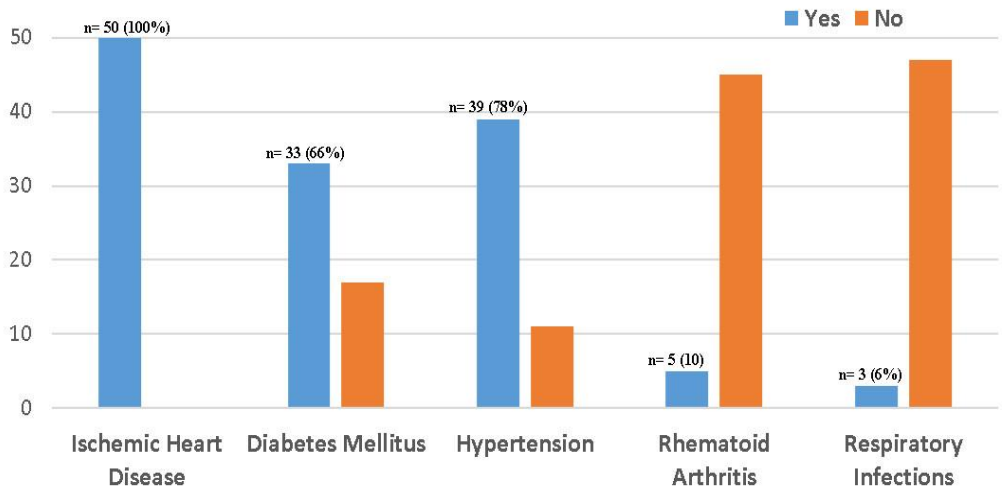

Figure (1): Distribution of Patients According to Chronic Diseases

Table (2): Evaluation of Patients' Knowledge about Cardiac Rehabilitation at the Pre-test and Post-test Periods by Their Means of Scores

No.	Items	Test Responses	Pre-Test				Post-Test			
			F	%	M. S.	Ass.	F	%	M.S.	Ass.
1	Normal adult heart rate	Correct A.	9	18	1.18	P	47	94	1.94	G
		Incorrect A.	41	82			3	6		
2	Function of coronary arteries	Correct A.	7	14	1.14	P	41	82	1.82	G
		Incorrect A.	43	86			9	18		
3	The main cause of CAD	Correct A.	4	8	1.08	P	35	70	1.70	G
		Incorrect A.	46	92			15	30		
4	Modifiable risk factors of CAD	Correct A.	6	12	1.12	P	41	82	1.82	G
		Incorrect A.	44	88			9	18		
5	Pre-operative preparing patient for CABGs	Correct A.	5	10	1.10	P	38	76	1.76	G
		Incorrect A.	45	90			12	24		
6	Best direction for patient assurance before CABGs	Correct A.	19	38	1.38	F	37	74	1.74	G
		Incorrect A.	31	62			13	26		
7	Medications stopped one week before CABGs	Correct A.	14	28	1.28	P	43	86	1.86	G
		Incorrect A.	36	72			7	14		
8	The perfusion machine used during CABGs	Correct A.	3	6	1.06	P	32	64	1.64	F
		Incorrect A.	47	94			18	36		
9	The number of grafts required for CABGs	Correct A.	9	18	1.18	P	32	64	1.64	F
		Incorrect A.	41	82			18	36		
10	Anesthesia used in CABGs	Correct A.	46	92	1.92	G	48	96	1.96	G
		Incorrect A.	4	8			2	4		
11	Goals of patient care in ICU	Correct A.	18	36	1.36	F	47	94	1.94	G
		Incorrect A.	32	64			3	6		
12	Encourage supporting chest during coughing	Correct A.	17	34	1.34	F	48	96	1.96	G
		Incorrect A.	33	66			2	4		
13	Training deep breathing techniques in ICU	Correct A.	13	26	1.26	P	47	94	1.94	G
		Incorrect A.	37	74			3	6		
14	Discussing discharge plan in phase I of CRP	Correct A.	4	8	1.08	P	33	66	1.66	F
		Incorrect A.	46	92			17	34		
15	Main focus of phase II of CRP	Correct A.	15	30	1.30	P	32	64	1.64	F
		Incorrect A.	35	70			18	36		
16	Importance of eating healthy diet for heart	Correct A.	7	14	1.14	P	41	82	1.82	G
		Incorrect A.	43	86			9	18		
17	Goals of training exercises after CABGs	Correct A.	11	22	1.22	P	42	84	1.84	G
		Incorrect A.	39	78			8	16		
18	Preparations before training exercises	Correct A.	19	38	1.38	F	42	84	1.84	G
		Incorrect A.	31	62			8	16		
19	Cautions during training exercises	Correct A.	16	32	1.32	P	37	74	1.74	G
		Incorrect A.	34	68			13	26		
20	Wound healing precautions	Correct A.	6	12	1.12	P	40	80	1.80	G
		Incorrect A.	44	88			10	20		

CAD= Coronary artery disease, CABGs= Coronary artery bypass graft surgery, ICU= Intensive care unit, CRP= Cardiac rehabilitation program, F= Frequency, %= Percentage, M.S.= Mean of score Assess. =Level of assessment, 1-1.33- =Poor (P), 1.34-1.66= Fair (f), 1.67-2= Good (G)

Table (2) showed that patient's knowledge about cardiac rehabilitation before applying the program were poor in all items except in items concerning with (anesthesia, goal of ICU care, patient's assurance patient's encouragement and preparations before training exercises) which were fair. The patient's knowledge after applying cardiac rehabilitation program were good in all items except in items concerning with (heart-lung machine, used grafts, discussion of discharge plan and the main focus of phase II) which were fair.

Table (3): Overall Evaluation of Patient's Knowledge about Cardiac Rehabilitation Program at Pre-Test and Post-Test Periods

Variable	Pre-test			Post-test		
	Level	F	%	Level	F	%
Knowledge about Cardiac Rehabilitation Program	Poor	44	88	Poor	0	0
	Fair	6	12	Fair	4	8
	Good	0	0	Good	46	92
	Total	50	100	Total	50	100
	M.S±SD (1.12±0.328)			M.S±SD (2.92±0.274)		

F= Frequency, %= Percent, M.S= Mean of score, SD=standard deviation, Assess. =Level of assessment, 1-1.33- =Poor (P), 1.34-1.66= Fair (f), 1.67-2= Good (G)

Table (3) showed that the overall evaluation of patient's knowledge about cardiac rehabilitation were poor (88%) before applying the program while their knowledge became good (92%) after applying the program.

Table (4): Evaluation of Health-Related Quality of Life for Patients at Pre-Test and Post-test Periods

Variable	Pre-test				Post-test			
	F	%	M.S.	SD	F	%	M.S.	SD
1. Mobility								
- No problem	2	4	2.16	0.468	36	72	1.28	0.454
- Some Problems	38	76	MS		14	28	LS	
- Extreme Problems	10	20			0	0		
2. Self-Care								
- No problem	5	10	2.14	0.572	9	18	1.82	0.388
- Some Problems	33	66	MS		41	82	MS	
- Extreme Problems	12	24			0	0		
3. Usual Activities								
- No problem	14	28	2.22	0.545	3	6	2.02	0.319
- Some Problems	33	66	MS		45	90	MS	
- Extreme Problems	3	6			2	4		
4. Pain/ Discomfort								
- No problem	0	0	2.80	0.404	28	56	1.46	0.542
- Some Problems	10	20	HS		21	42	LS	
- Extreme Problems	40	80			1	2		
5. Anxiety/ Depression								
- No problem	0	0	2.68	0.471	33	66	1.34	0.479
- Some Problems	16	32	HS		17	34	LS	
- Extreme Problems	34	68			0	0		

No. = Number, M.S.= Mean of score, SD= Standard deviation, LS = Low significance, MS = Moderate significance, HS= High significance. Level of significance (LS = 1- 1.66, MS = 1.67- 2.32, HS= 2.33- 3).

Table (4) showed that most of the study sample at pre-test period were having some problems in mobility (76%), usual activities (66%) and self-care (66%) while most of them were having extreme problems in pain\ discomfort (80%) and anxiety\ depression (68%). Compared to pre-test results, the post-test results showed that most of patients were having no problems in items concerning with mobility (72%), pain\ discomfort (56%) and anxiety\ depression (66%). While most of them had some problems in self-care (82%) and usual activities (90%).

Table (5): Comparison Significance in Patient's Knowledge about Cardiac Rehabilitation and Their Health-related Quality of Life

Variables	M.S.	SD	Paired t Test		
			t test value	df	Sig.
Cardiac Rehabilitation Program	2.92	0.274	15.903	49	0.000 HS
Health-related Quality of Life	1.60	0.494			

M.S.= Mean of score, SD= Standard deviation, df = Degree of freedom, Sig= significance, HS= High significance.

Table (5) showed that there were high significant statistical differences at p 0.05 between patient's knowledge about CRP and their health-related quality of life.

Table (6): Association between Patient's Health-related Quality of Life and Their Sociodemographic and Clinical Characteristics.

Socio-demographic and Clinical Characteristics	M.S.	SD	Paired t Test		
			t test value	df	Sig.
1. Age	4.68	0.913	21.207	49	0.000 (HS)
2. Gender	1.34	0.479	2.449	49	0.018 (HS)
3. Educational Level	5.12	0,773	28.847	49	0.000 (HS)
4. Occupation	3.18	1.155	9.080	49	0.000 (HS)
5. Smoking	2.14	0.984	3.764	49	0.000 (HS)
6. BMI	2.66	0.593	8.891	49	0.000 (HS)
7. Diagnosis	2.44	0.577	8.723	49	0.000 (HS)
8. NYHA Classification	2.42	0.499	7.757	49	0.000 (HS)

BMI= Body mass index. NYHA= New York Heart Association, SD= Standard deviation, df= Degree of freedom, Sign.= Significance, HS= High significance

Table (6) showed that there were highly significant statistical differences at p 0.05 between HRQoL and patient's sociodemographic and clinical characteristics, this means that there is significant positive relationship between HRQoL and patient's age, gender, educational level, occupation, smoking, BMI, Diagnosis and NYHA classification.

Discussion

The study findings concerning patient's socio-demographic characteristics revealed that majority of patients were males and married, these findings were supported by a study on adult patients undergoing CABG surgery in which revealed that the majority of study sample were male patients [18].

Concerning the educational level and occupation, the results showed that majority of patients were secondary school graduate and only third of them were employed, this result agrees with a multi-site study among cardiac rehabilitation patients in Canada, in which about one-third of sample were graduated from high school and were employees [19].

Most of patient were within age group (48-57) years, half of them were ex-smokers and overweight ranging from (25-29.9 kg/m^2) according to BMI classification. These results are similar to another study that discussed the patients' awareness about CVD, which revealed that most of sample were ex-smokers and overweight [7].

Majority of patients diagnosed with CAD since 1-5 years, two-thirds of them were having 3-blocked coronary artery and tested with an ejection fraction (EF) at borderline (41- 49%). Similar studies reflected that such results where most patients with borderline EF are Classified into class II according to NYHA classification [20] [21].

Regarding patients' past medical history; the results showed that all patients have at least two chronic diseases. All patients were suffering from ischemic heart disease. Most of the patients were having diabetes and hypertension. While the majority of them were not suffering from rheumatoid arthritis and respiratory infections. These results agree with several studies done locally and worldwide that reported that there are no significant differences in baseline characteristics and chronic diseases; ischemic heart disease, hypertension, diabetes, and rheumatoid arthritis) [21,] [22].

According to the analysis of patient's knowledge about cardiac rehabilitation program, the results revealed that patient's knowledge before applying the program was poor in all items except in (4) items concerning with anesthesia, goal of ICU care, patient's assurance patient's encouragement and preparations before training exercises, which was fair. While their knowledge after applying the program were good in all items except in items concerning with heart-lung machine, used grafts, discussion of discharge plan and the main focus of phase II which were fair. These results were similar to meta study discussing the effects of applying CR programs in patients undergone open heart surgery [23].

Patient's knowledge about CR program were increasingly enhanced after applying the program. These findings have been verified by an Indian scientific review through structured literature search in discreet scientific databases for studies focusing on CR programs and their impact on physical activity and patient's quality of life following open heart surgery [24].

Most of patients were experiencing some problems in pre-tetb period while the post-test results showed that there were less problems. These results supported by a study tracing participation and completion of CR programs among Medicare patients [25] [26].

Furthermore, the comparison between patient's knowledge about CR program and their HRQoL revealed that there were high significant statistical differences at p 0.05. This means that the applied CR

instructional program affects the patient's HRQoL in post-test period suggesting further futuristic improvements which indicates the effectiveness of the program.. This result supported by Mount Sinai St. Luke's hospital study reviewed a fifty years of CABG surgery [(4)].

In contrary, it disagrees with a CR study investigating survival outcomes following a cardiac event [(27)].

There were high significant statistical differences at p 0.05 between HRQoL and patient's sociodemographic and clinical characteristics. These results are agreed with several studies in which its results reflect the presence of strong relationship between HRQoL and certain characteristics; age, gender educational level occupation and smoking) [(23) (28)]. Moreover, additional study supports that relationships between HRQoL and patients' BMI, diagnosis and NYHA classification [(29)].

Conclusions

The study confirmed the effectiveness of cardiac rehabilitation instructional program on knowledge and health-related quality of life.

Furthermore, there was significant positive relationship between HRQoL and patient's sociodemographic and clinical characteristics.

Recommendations

The study recommends the application of current CRP within Iraqi cardiac hospitals and centers and the need for further studies on more representative sample.

Conflict of Interest

None.

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