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The Effect of a Cardiac Educational Program on the Level of Knowledge and Satisfaction among Patients with Coronary Artery Disease

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ABSTRACT

Background: Although patient education programs impart health-related knowledge that promotes the individual capacity to understand health-related information, there is a dearth of studies that examine the effect of cardiac educational programs on knowledge and satisfaction among patients with Coronary Artery Disease (CAD) in Jordan. ***Purpose:*** This study aimed to examine the effect of cardiac educational programs on knowledge and satisfaction among patients with CAD. ***Methods:*** A quasi-experimental design was used. Data was collected from 138 patients using the Coronary Artery Disease Education Questionnaire-Short Version and the Patient Satisfaction Scale. Participants were randomly allocated into an experimental group and a control group. Data was collected twice, before the intervention and one month after implementation. ***Results:*** There was a significant difference between the mean knowledge scores on the pre-test (M=10.3, SD= 3.80) and the post-test (M=12, SD=1.49) and a significant difference t (61) =-17.3 P< 0.001) between the mean satisfaction scores on the pre-test (M=3.5, SD= 0.38) and the post-test (M=4.41, SD=0.37). The results of paired t-test showed that there was a significant difference between the mean knowledge scores on the pre-test and the post-test for the experimental group. On the other hand, there was no significant difference t (64) = 1.01, P= 0.31 between the mean knowledge scores on the pre-test (M=10.8, SD=32.6) and the post-test (M=10.7, SD=2.96) for the control group. ***Conclusion:*** The used cardiac educational program enhanced the level of knowledge and satisfaction among CAD patients. ***Implications for Nursing:*** The findings of the current study support the significant effect of the cardiac educational program on the level of knowledge and satisfaction among patients with CAD, which encourages using such programs for CAD patients.

Keywords: Cardiac educational program, Knowledge, Satisfaction, Patients, Coronary artery disease.

What does this paper add?

1. This study adds clinical evidence about the effectiveness of the educational program in order to be used in clinical settings, research areas and educational settings.
2. This study emphasizes that patient education using appropriate and well-developed material could be effective in improving the level of knowledge and satisfaction among patients.

Introduction

Cardiovascular Disease (CVD) is considered the cause number one of death worldwide (World Health Organization (WHO), 2020). About 17.9 million people

died as a result of CVD in 2019, representing 32% of all global deaths (WHO, 2020). In Jordan, CVD is also considered the leading cause of death, accounting for 38.4% of the total population death. Deaths caused by Coronary Artery Diseases (CADs) in Jordan accounted for 17.1% of the total deaths, where Jordan ranked 52nd in the world with an average death rate of 239.8 per million citizens (WHO, 2020).

The high prevalence of CVD, as well as the high rates of mortality and morbidity associated with it, could be related to patients' lack of knowledge about the disease itself and its related risk factors (Magnani et al., 2018). Studies showed that there is poor knowledge regarding CAD risk factors, prevention and even complications among patients (Wei-Chien, et al, 2009; Kayaniyil et al., 2009; Choi et al., 2010; Ammouri et al., 2010; Ahmad & Tawalbeh, 2015).

Lack of knowledge of the disease process, causes, symptoms and risk factors may lead to emotional distress, disease maladaptation, negative healthcare behaviors like smoking, as well as disturbed psychosocial well-being and more disease complications (Ghisi, 2014). Thus, it is important to design an educational program that aims to improve patient knowledge (Ghisi et al., 2018).

Some scholars indicated that poor-health literate patients: (1) perceive low self-efficacy in dealing with their health conditions, (2) are not willing to be involved in the provision of care, (3) show larger risks of hospitalization and (4) are not aware of the determinants of well-being. (McCaughey, 2010). Furthermore, persons with limited health-literacy skills are more likely to have chronic conditions and are less able to manage them effectively (Schillinger et al., 2003). In addition, they tend to have a higher risk of heart attack, dying from a cardiovascular event, and overall death.

Cardiac educational programs (CEPs) were associated with improved knowledge, awareness, attitudes and beliefs toward cardiovascular health (McKinley et al., 2009; Kenyali, 2009; Eshah et al., 2010; Navidian et al., 2015; and Ahmad & Tawalbeh, 2014). Moreover, when patients possess adequate knowledge about their disease, this promotes adherence to a healthy lifestyle and slows down the disease process (Ammouri et al., 2010; Ahmad & Tawalbeh, 2015).

Findings of a systemic review by Ghisi et al. (2014) have confirmed the effect of educational interventions in CAD, showing that they bring about an increase in patients' knowledge and result in behavior change. A national study was conducted to assess the effectiveness of educational intervention in encouraging healthy lifestyle changes among Jordanian patients with CAD (Ahmad & Tawalbeh, 2015). The results of the study supported the hypothesis that implementing an educational program will improve patients' knowledge and adherence, noting that the study used a pre-post-test design based on demographics including educational level.

Furthermore, patient education can improve patient satisfaction with health status and care and can decrease medical-service requests (Bird & Wallis, 2002; Murdock & Griffin, 2013; Oyetunde & Akinmeye, 2015). A study by Mahgoub et al. (2013) aiming to explore the effect of education on early ambulation post-percutaneous coronary intervention (PCI) on patients' satisfaction revealed a significant improvement in all parameters related to the knowledge scores on satisfaction. Similar results of a study by Franzon et al. (2018) to evaluate the level of satisfaction with discharge education among cardio- or cerebro-vascular patients revealed that the respondents were largely satisfied. However, the communication of important discharge information to older respondents and women was less likely to meet their perceived needs.

Although several studies have been conducted to examine the effect of cardiac education on the level of knowledge among patients with CAD, limited studies are conducted in Jordan on this subject. Further, there are limited studies that examined the effect of educational programs on CAD patients' level of satisfaction. Therefore, the current study aimed to measure the level of knowledge and satisfaction and to examine the effect of a cardiac educational program on knowledge and satisfaction among patients with CAD.

Methods

Design

A quasi-experimental design was used to examine the effect of cardiac education on the level of knowledge and satisfaction among patients with CAD. The pre-test data was collected for control and interventional groups before the implementation of a CEP. A post-test was administered one month after the application of the CEP.

Sample

A random sampling technique was obtained using a

simple randomization tool to recruit 138 patients with CAD who were admitted to cardiac units in a university-affiliated hospital in the north of Jordan. The selection criteria for the study sample included participants who were (a) able to communicate verbally; (b) able to read and write in Arabic; (c) more than 18 years old; (d) diagnosed with CAD (including patients with acute myocardial infarction (AMI) and angina). Patients who were suffering from a chronic condition that could affect their participation and comprehension of the educational-program contents (e.g. patients with pacemaker or implantable cardioverter defibrillator (ICD) and any type of chronic cardiac arrhythmias) were excluded, because these conditions will need special education according to their complexity, which could also influence the data.

The sample size was calculated using G power with the following parameters: alpha = 0.05 for two-tailed significances, a power of 0.80, a medium effect size (0.5) and independent *t*-test. The estimated sample size was 128 for both groups and to overcome the attrition problem, 10% was added (Bhandari, 2021). Thus, the total sample size was 138. These individuals were divided randomly into an experimental group and a control group, having 69 participants in each, using a simple randomization tool.

The primary researcher performed the simple randomization selection and assigned the participants either to the intervention group or the control group by using two folded papers. On one of the papers, “control group” was written and on the other one “intervention group” and the participant was asked to choose one paper blindly to be in either of the groups. This is just like the flipping-coin idea, where flipping a coin is considered a good, physical illustration of random selection. When you flip a coin, there's a 50/50 chance of getting heads (Clark & Westerberg, 2009). So, using the two folded papers is serving the same purpose and eliminates the bias of the researcher while assigning the participants. In this way, all participants have an equal probability of being selected either in the control group or the intervention group.

Data Collection Measures

All participants were asked to complete a demographic and clinical data sheet that includes age, gender, educational level, marital status, medical diagnosis, hypertension or diabetes, previous heart attack and previous participation in cardiac education. To test the participant’s knowledge, the Arabic version of the Coronary Artery Disease Education Questionnaire – Short Version (CADE-Q SV) was used (Ghisi et al., 2015). The design of CADEQ-SV was a true/false/I don’t know questionnaire. The questionnaire includes 20 items (4 in each domain). The score ranged from 0 to 20 with higher scores indicating a higher knowledge level about CAD. The CADE-Q SV covered five domains, which are medical condition, risk factors, nutrition, physical exercise and psychological factors. Items were tested for internal consistency in this study and the results revealed a Cronbach’s alpha of 0.7.

According to Ghisi et al. (2015), (CADE- Q) SV has strong psychometric properties, providing preliminary evidence of its reliability and validity to assess patients' knowledge about CAD. It is expected that this tool can support educational programs’ evaluation of their education component and promote the greater provision of information consistent with patients' educational needs.

Test-retest reliability has been evaluated through the interclass correlation coefficient (ICC) for each item and all coefficients met the minimum recommended standard. So, the reliability of each area has been assessed by Cronbach’s alpha. All areas were considered internally consistent ($\alpha > 0.7$).

Criterion validity of total CADE-Q SV scores was compared by education level and by duration in cardiac rehabilitation (CR) based on the previous literature. The idea here is that this scale was used for cardiac-rehabilitation programs to address the level of knowledge of patients in previous literature; therefore, we can use it for the purpose of this study, since one of the variables is the knowledge of cardiac patients.

Patients with lower educational levels had significantly lower knowledge than those with higher education ($p<0.01$). Regarding duration in cardiac rehabilitation, there was a correlation between this characteristic and knowledge ($r=0.13$; $p<0.05$); patients in the first 3 months of the program had significantly lower knowledge compared to patients finishing the program (5-6 months of duration). In this context, the results of the CADE-Q SV were consistent with those presented in previous versions of this instrument, particularly regarding criterion validity (correlation to educational level) and all areas have been considered internally consistent ($\alpha > 0.70$) (Ghisi et al., 2015).

The patient satisfaction scale (PSS) was designed to evaluate patients' attitudes toward nurses and nursing. The PSS is a 25-item Likert-type rating scale with three dimensions of patient satisfaction, which are technical-professional care, educational relationship and trusting relationship. The Arabic version was used. The patient satisfaction scale (PSS) showed a high degree of internal-consistency reliability and the average alpha coefficient values for the three sub-scales were 0.79, 0.78 and 0.88, respectively (Hinshaw & Atwood, 1982).

The total score of PSS ranged from 25 to 125 with a higher score indicating a higher level of satisfaction. The first domain is the technical-professional (TP) domain, which includes seven items (12, 13, 15, 16, 18, 20 and 25) concerning technical issues in care and measurement of the nurses' behaviors and the total score ranged from 7 to 35. The second domain includes seven items, representing the educational-relationship (ER) domain (2, 7, 8, 11, 17, 21 and 24) concerning nurses' attitudes to patients and the exchange of information between the nurse and the patient and the total score ranged from 8 to 40. Finally, the trusting-relationship (TR) domain approaches eleven items (1, 3, 4, 5, 6, 9, 10, 14, 19, 22 and 23), which are related to interpersonal-relationship situations between nurses and patients and the verbal and non-verbal communication that occurs between the nurse and the client. The total scores ranged from 11 to 110. The negative items are 1, 2, 5, 8, 10, 11, 13, 18, 19, 20 and 22 and these were recorded using the SPSS program. In each sub-scale, both positive and negative items were included. A five-point Likert measurement scale ranging from "strongly agree" (=5) to "strongly disagree" (=1) in each question was assessed.

The higher the PSS score, the higher the patient satisfaction with the nursing care provided (Hinshaw & Atwood, 1982). Internal consistency estimates appear satisfactory and stable across the various studies: e.g. the alpha coefficient for the technical- professional sub-scale average was 0.786, the education coefficient average was 0.784 and the trust coefficient average was 0.876, respectively (Charalambous & Adamakidou, 2012). For the current study, the average coefficient alpha values were 0.79, 0.78 and 0.88, for the three sub-scales, respectively.

The Cardiac Educational Program

The Arabic version of the Heart Foundation Booklet entitled "Love Your Heart" (NHFA, 2016) was used as the educational program in this study. This version was already found in Arabic language and was already developed and validated by the Heart Foundation. The program has been adopted from related articles in the evidence-based literature. The program is considered as a guide to supporting recovery and good heart health and includes the following topics: anatomy and physiology of the heart, causes, symptoms and risk factors of CAD, physical activity, weight management, healthy diet and risk factor management.

The educational session lasted for 50-60 minutes. The first 5-minute part of the session, entitled "in hospital" gave facts about anatomy, causes, risk factors and questions to ask in hospital. The second part, named "getting ready to leave hospital" described the treatment that patients receive in hospitals, such as cardiac catheterization and a recovery checklist that helps patients understand what happens and match their risk factors with CAD risk factors. This part took 10 minutes.

The third and longest section, entitled "recovery plan" was a 30-minute session, where patients were given information about (a) follow-up appointments with the doctor to manage heart health; (b) the importance of medication compliance and questions to ask about medications; (c) how to manage their risk factors; (d) how to take care of their own emotions; (e) how to recognize the warning signs of a heart attack and how to manage them till reaching the hospital; (f) how to return to everyday activity including when to drive a car, getting back to work, when to travel and what everyday activity is safe to do; (g) setting goals for a healthy heart including monitoring optimal blood pressure and cholesterol levels; (h) tips on how to eat healthily; (i) how to maintain healthy body weight; (j) exercise table guide; (k) giving up smoking; and (l) how to manage diabetes mellitus. The fourth and last part included important phone numbers to seek any service or help when needed, which took 5 minutes. Patients were given a 5-minute break in the middle of the session to prevent fatigue and further 10 minutes were allocated for patients to talk about their experiences.

The researchers were mindful of achieving consistency of conditions by controlling any external factors that could influence the results at a later point. Care was taken to ensure that all participants received the same information and that there was the same commitment to the study procedure and protocol. More specifically, the educational program was provided to all

participants by the primary researcher. Questions were included between the participants and the primary researcher and the participants' experiences were faithfully transferred.

Also, appropriate modification and cultural adaptation of the educational program were carried out regarding the knowledge questionnaire used in the current study, such as referral phone numbers, cardiac catheterization procedures, medications, physical exercise and how to manage risk factors. Regarding the translation and back-translation into Arabic, the researchers found and used a translated and validated version prepared by the Heart Foundation.

Data Collection Procedure

Data collection was started after the issuance of the Institutional Review Board (IRB) accreditation number (579/2018). Data collection was carried out between October 2018 and January 2019. CONSORT's (Moher et al., 2010) explanation and elaboration guideline for reporting parallel group randomized trials of this study was used (Figure1).

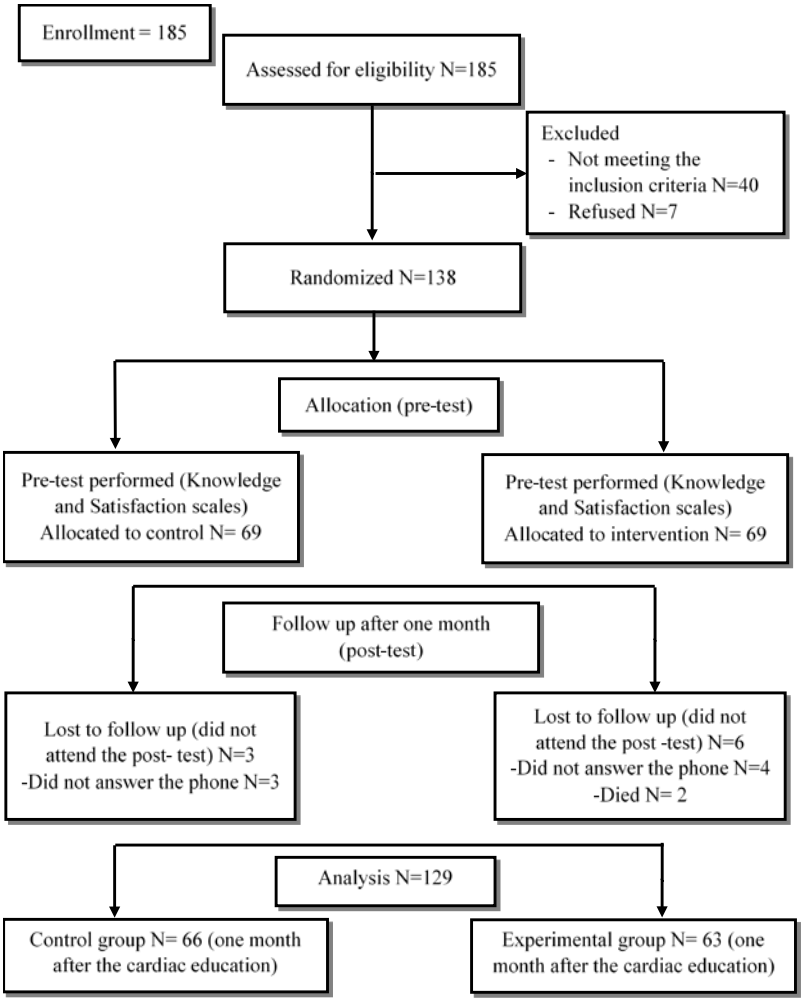

Figure 1. Consolidation standards of reporting trials (CONSORT) 2010 diagram of study phases

Medical records for all participants were reviewed by the primary researcher to ensure the eligibility of the participants to take part in the study and a list was compiled of the eligible participants and their room numbers. Subsequently, the primary researcher, who is qualified; as she has participated in several educational programs as a health educator; introduced the study purpose and the pre-and post-test protocol, including the time of obtaining data for the selected participants. Then, using simple randomization, participants were randomly selected and assigned to the control group or to the experimental group.

After participants signed the consent form, the pre-test data regarding knowledge and satisfaction was

collected by means of a self-reporting technique using the CADEQ-SV and PSS scale on the first day of admission. This took 15- 20 minutes and the participants were informed that the primary researcher was available to answer any questions at that time. Two groups were involved; the control group that received the usual care from nurses (admitting the patients, monitoring their vital signs and symptoms, administering treatments as ordered by a physician) and the experimental group that received the usual care from the nurses in addition to the cardiac educational program booklet distributed by the primary researcher. After that, a room with good lighting and good ventilation was chosen to conduct the educational session (study intervention) for the experimental group consisting of 2-6 participants in each session. Each participant had the Heart Foundation booklet and two fact sheets with a presentation of images included. This way of intervention was applied in the pilot study which was performed before the data-collection process.

A total of 185 patients with CAD who were admitted to cardiac units in the selected hospital during data collection were assessed for eligibility to participate in the study. A total number of 145 patients were eligible, among whom seven have refused to participate. Thus, 138 patients agreed to participate in the study with a response rate of 95%. Nine participants dropped out and did not answer their mobile numbers in the post-test. Thus, the final sample size was 129. Each participant had the Heart Foundation booklet and two fact sheets with a presentation of images included.

Ethical Considerations

Approval to conduct this study before patient recruitment was obtained from the (IRB) of the selected institution, number 2018/579. Patients who met the criteria for inclusion received a booklet containing information about the purpose of the study, its procedure and data confidentiality. Patients were informed about their right to withdraw at any time during the study period and that such a decision would pose no risk of influencing their treatment or care. Patients were informed that their participation in the study was voluntary and that their data would be kept anonymous. A consent form was signed by the patients who agreed to participate in the study and they were provided with a contact number in case of having any questions.

Data Analysis

Data was analyzed using the Statistical Package for Social Sciences (SPSS), version 24. Descriptive statistics, frequencies, percentages, means (M) and standard deviations (SD) were used to assess the patients' characteristics. Furthermore, an independent *t*-test was used to examine the effect of cardiac education on knowledge and satisfaction among patients with CAD. The significance level was set at $P < 0.05$. In addition, to determine whether there were significant differences between the pre-test and the post-test for the experimental and control groups, a paired t-test was used.

Results

Demographic Characteristics of Participants

The total number of participants in the present study was 138 Jordanian patients who were diagnosed with CAD. Of the participants, 105 (76.1%) were males and 123 (89.1%) were married, aged (33-75) with a mean age of 54 years (SD=0.97) (40.9%). Almost 33% (n=43) of the sample held a diploma or a bachelor's degree, 25 (18.1%) and 18 (13.0%), respectively. In addition, 68.7% (n=88) of the participants were hypertensive, 48.6% (n=67) were diabetic, 40.6% (n=56) had suffered only one heart attack and 50% (n=69) had a previous history of CAD. Sample characteristics are indicated in Table 1.

There were no significant differences between the two groups in terms of demographic characteristics and CVD risk factors. Chi-square indicated that there were no significant differences between the control group and the experimental group concerning demographic and clinical variables. So, this indicated that the two groups are homogenous and no pre-existing differences were found at the baseline.

Pre-test Results

The analysis of the results revealed that the mean level of knowledge in the pre-test was 10.6 (SD=-3.53) and ranged from 4 to 18 out of 20. The highest knowledge domain was the medical-diagnosis domain with a mean of 3.43(SD=0.048), followed by the psychological-factor domain at 2.58 (SD=1.06). Next came the risk-factor domain with 2.25 (SD=1.04), followed by the nutrition domain with 1.79 (SD=1.04) and the physical-exercise domain, which got the lowest score at 1.06 (SD=1.48).

Table 1. Participants' demographic data (N=138)

Variable	Control Group n= 71	Control Group (%)	Experimental Group n= 67	Experimental Group (%)	Total n= 138	Total (%)	Chi Square
Age							
31-40	4	(5.70%)	7	(11.30%)	11	(8.30%)	0.69
41-50	15	(21.10%)	15	(24.20%)	30	(22.70%)	
51-60	31	(44.30%)	23	(37.10%)	54	(40.90%)	
61-70	18	(25.40%)	14	(22.60%)	32	(24.20%)	
71-80	3.0	(2.80%)	8.0	(12.0%)	11	(3.90%)	
Total	71	(100%)	67	(100%)	138	(100%)	
Gender							
Male	50	(70.40%)	55	(82.10%)	105	(76.10%)	0.10
Female	21	(29.60%)	12	(17.90%)	33	(23.90%)	
Total	71	(100%)	67	(100%)	138	(100%)	
Educational level							
Primary school	9.0	(12.70%)	13	(19.40%)	22	(15.90%)	0.75
Preparatory school	12	(16.90%)	13	(19.40%)	25	(18.10%)	
High school	21	(29.60%)	18	(26.90%)	39	(28.30%)	
Diploma	15	(21.10%)	10	(14.90%)	25	(18.10%)	
Bachelor	9.0	(12.70%)	9.0	(13.40%)	18	(13.0%)	
Master and PhD	5.0	(7.0%)	4.0	(6.0%)	9.0	(6.50%)	
Total	71	(100%)	67	(100%)	138	(100%)	
Marital status							
Single	5.0	(7.00%)	2.0	(3.0%)	7.0	(5.10%)	0.60
Married	61	(85.90%)	62	(92.50%)	123	(89.10%)	
Divorced	0	0	1.0	(1.50%)	1.0	(1.50%)	
Widowed	4.0	(5.60%)	2.0	(3.0%)	6.0	(4.30%)	
Total	71	(100%)	67	(100%)	138	(100%)	
Hypertension							
Yes	47	(66.20%)	40	(59.70%)	88	(63.70%)	0.41
No	24	(33.80%)	27	(40.30%)	50	(36.20%)	
Total	71	(100%)	67	(100%)	138	(100%)	
Diabetes Miletus							
Yes	37	(52.10%)	30	(44.80%)	67	(48.60%)	0.38
No	34	(47.90%)	37	(55.20%)	71	(51.40%)	
Total	71	(100%)	67	(100%)	138	(100%)	
Medical diagnosis							
Stable angina	45	(63.40%)	38	(56.70%)	83	(60.10%)	0.37
Unstable angina	22	(31.0%)	26	(38.80%)	48	(34.80%)	
MI	4.0	(5.60%)	3.0	(4.50%)	7.0	(5.0%)	
Total	71	(100%)	67	(100%)	138	(100%)	
Previous heart attack							
Yes	28	(39.40%)	41	(61.20%)	69	(50.0%)	0.01
No	43	(60.60%)	26	(38.80%)	69	(50.0%)	
Total	71	(100%)	67	(100%)	138	(100%)	
Previous participation in cardiac education							
Yes	8.0	(11.30%)	4.0	(6.0%)	12.0	(8.70%)	0.04
No	63	(88.70%)	63	(94.0%)	126	(91.30%)	
Total	71	(100%)	67	(100%)	138	(100%)	

The level of satisfaction was assessed using the three domains of the PSS with a score from a 1-5 Likert scale. The total mean score for the TP sub-scale was 34.3, SD= 4.5 and the answers ranged from 22-45; for the ER total mean score, it was 26.4, SD= 3.1 and the range was 13-33; whereas for the TR total mean score, it was 24.03, SD= 3.41 and the range was 12-34.

The maximum score was 5 and the minimum score

was 1 for positive and negative items for the total sample with a mean of 3.55 and a standard deviation of 0.39 on the pre-test. The highest satisfaction domain was the technical-professional domain with a mean of 3.77 (SD= 0.45), followed by the interpersonal-trusting domain with 3.55 (SD= 0.39) and then came the educational-relationship domain which reported the lowest score of 3.43 (SD= 0.48).

Post-test Results

To examine the effect of the cardiac educational program on the five domains of knowledge, an independent-sample t-test was used. It includes medical condition, medical diagnosis, risk factors, physical exercise, nutrition and psychological factors, while the three domains of satisfaction were interpersonal-trusting, interpersonal education and technical-professional domains among patients with CAD between the control and experimental groups.

The results showed that there was a significant difference t (127) =3.13, P=0.002 in the total mean score of the knowledge of post-test between the experimental group (M=12.00, SD=1.49) and the control group (M=10.70, SD=2.69).

The highest improvement in the knowledge level after the application of the CEP was in the exercise domain with a mean difference of 1.38 (*t*= -8.51, P<0.001). This is followed by the nutrition domain with a mean difference of 0.82 (*t*= -5.66, P<0.001), then the risk-factor domain with a mean difference of 0.06 (*t*= -0.38, p= 0.70). On the other hand, the medical-diagnosis and the psychological-factor domains had the lowest mean scores showing a decrease in mean scores of 0.14 (*t*= -3.12, p=0.003) and 0.48 (*t*= 3.01, p=0.004), respectively. The results of the independent-sample t-test are indicated in Table 2.

Table 2. Independent-sample t-test to examine the difference in knowledge and satisfaction means in the post-test between the experimental group (n=63) and the control group (n=66)

Variable	Experimental group n=63 M	Experimental group n=63 (SD)	Control group n=66 M	Control group n=66 (SD)	t (127)	P-value
Knowledge	12	(1.49)	10.7	(2.96)		
Medical diagnosis	2.20	(0.57)	2.46	(0.83)		
Risk factors	2.23	(0.58)	2.22	(2.90)	-3.13	0.002
Nutrition	2.58	(0.58)	1.93	(0.90)		
Psychological aspects	2.09	(0.4)	2.4	(1.08)		
Physical exercise	2.90	(0.61)	1.63	(1.00)		
Satisfaction	4.41	(0.37)	3.79	(0.39)		
Interpersonal education	4.36	(0.42)	3.7	(0.49)		
Interpersonal trusting	4.43	(0.38)	3.7	(0.44)	-8.98	0.000
Technical-professional domain	4.42	(0.40)	3.9	(0.42)		

M=Mean; SD=Standard Deviation.

* P ≤0.001 (2-tailed).

Furthermore, there was a significant difference t (127) = -8.98, P<0.001 in the total mean scores of satisfaction in the post-test between the experimental group (M=4.41, SD=0.37) and the control group (M=3.79, SD=0.39). In addition, the highest improvement in the post-test in the satisfaction scores was in the interpersonal-trusting domain with a mean difference of 0.91 (*t*=-16.3, P<0.001), followed by the technical-professional domain with a mean difference of 0.64 (*t*= -10.5, P= 0.00). The lowest mean difference was in the interpersonal-educational domain with 0.07 (*t*=-16.3, P<0.001). The results of the independent-simple t-test are indicated in Table 2.

Paired t-test Results

A significant difference was shown in the results with t (61) = -3.12, P= 0.03 between the mean knowledge scores on the pre-test (M=10.3, SD= 3.80) and the post-test (M=12, SD=1.49) for the experimental group. On the other hand, there was no significant difference t (64) = 1.01, P= 0.31 between the mean knowledge score on the pre-test (M=10.8, SD=32.6) and the post-test (M=10.7, SD=2.96) for the control group.

Also, there was a significant difference t (61) =-17.3, P< 0.001 between the mean satisfaction scores on the pre-test (M=3.5, SD= 0.38) and the post-test (M=4.41, SD=0.37) for the experimental group. On the other hand,

there was also a significant difference t (64) = -7.6, P= 0.00 between the mean satisfaction scores on the pre-test (M=3.5, SD=0.41) and the post-test (M=3.7, SD=0.39) for the control group.

Discussion

The analysis of the current study revealed that there was a statistically significant improvement in the respondents' level of knowledge and satisfaction after the implementation of the CEP. There is a broad consensus that educational programs will influence the level of knowledge and satisfaction positively, which is supported by other studies (Shahrbabaki, Farokhzadian & Hasanabadi, 2012; Frick, Gutzwiller, Maggiorini, & Christen 2012; Mahgoub et al., 2013; Kapko & Krzych, 2016; Bahadori et al., 2016; Eshish, 2017; Ahmad & Tawalbeh, 2014; Tawalbeh, 2018). Previous studies showed an improvement in the level of knowledge and satisfaction after implementing educational programs.

Several factors could account for the significant improvement in the level of knowledge found by the current study after one month of the application of the CEP. The cardiac educational program was standardized and consistent for all respondents with oral information and the educational booklet being distributed to all respondents. Ahmad and Tawalbeh (2015) indicated that oral information and printed educational material significantly help boost knowledge after the CEP application. Also, the CEP was modified to suit the Jordanian culture, like referral phone numbers, cardiac catheterization procedures, medications, physical exercise and how to manage risk factors. In addition, the respondents were allowed to discuss their own experiences and pose questions during the educational sessions, which may be a vital reason behind the marked improvement in the level of knowledge after CEP. Borzou et al. (2020) indicated that group discussion plays a significant role in increasing participants' knowledge and skills and leading to interpersonal interaction and behavioral change.

Moreover, in this study, the experimental group showed a statistically significant increase in the satisfaction mean score in the post-test compared to the pre-test (P<0.001). In addition, the experimental group showed a statistically significant higher knowledge level after the educational intervention compared to the knowledge level in the control group after receiving routine instructions (P<0.001). Moreover, the respondents in the control group indicated a significant improvement in the level of satisfaction in the post-test phase. This result could indicate that the respondents were satisfied with the care provided by their nurses, which implies that the respondents trust their nurses and consider them to be accessible (Aiken et al., 2017).

It is highly beneficial for all CAD patients, whenever possible, to undergo an educational program to improve their level of knowledge about the disease. This matter needs further assessment to ensure that patients become more engaged, not only in gaining knowledge, but also in adopting the appropriate behaviors and adhering to the learned knowledge. This would encourage patients to participate more in the treatment process, promote healthcare decision-making, enhance medical-recommendation adherence and promote health-related behavior modification, all of which would lead to better outcomes.

Regarding the present level of knowledge, using CADEQ-SV in the current study, compared with Ghisi et al. (2018) who used the same instrument, the highest knowledge mean score in this study was for the medical-condition domain, followed by the psychological-factor domain, then came the risk-factor domain and the nutrition domain, while the physical-exercise domain got the lowest score. In contrast, Ghisi et al. (2018) revealed a different rank. The risk-factor domain had the highest mean score, followed by the medical-diagnosis domain, the exercise domain, the nutrition domain and the psychological-factor domain. This could be considered important in validating the appropriateness of the instrument to be used in different cultures and settings like the Middle East culture.

In the current study, the highest mean score in the level of knowledge was for the item: "stress is a large risk for heart attack and is as important as high blood pressure and diabetes" in the psychological domain. Whereas, in Ghisi et al. (2018) study, the highest score was for the item: "to help control your blood pressure, eat less salt and exercise regularly".

On the other hand, the lowest-mean item in the current study was: "if someone gets chest discomfort during a walking exercise session, he or she should speed up to see whether the discomfort goes away" in the physical-exercise domain. This result indicates the need for more focus on the physical-exercise domain. However, in Ghisi's et al. (2018) study, the item with the lowest knowledge mean score was for: "'statin'

medications (such as atorvastatin and simvastatin) limit how much cholesterol your body absorbs from food" in the medical-condition domain. This result may be due to the lack of appropriate information about patients' education about their medication (Perera et al., 2012).

Differences between the current study and other studies in the order of the highest and lowest mean scores of the level of knowledge could be due to implementing the studies in different contexts in terms of knowledge background, setting and culture, which can affect the values and attitudes towards the awareness and disease prevention, as well as towards behavioral changes.

Limitations and Strengths of the Study

The main limitation of the current study was that the sample was recruited from one teaching hospital in the north of Jordan, a point which can affect the generalizability of the study results. Another limitation was that one month between the pre-test and the post-test to measure the level of knowledge and satisfaction may be considered short compared to previous literature which applied educational programs and follow-up for three, six and even 12 months after the application of the program. In addition, the educational program did not cover all the knowledge domains, such as stress-management aspects. Finally, although the authors tried to take measures to control for confounding variables, this was impossible to be achieved. Consequently, the authors recommend that future longitudinal studies be conducted with samples recruited from different settings all over Jordan.

To the best of the researchers' knowledge, the current work is the first interventional study to carry out a pre-test and a post-test to measure the knowledge and satisfaction among CAD patients in the north of Jordan. The sample size of 129 respondents is considered larger than those of most other published trials of cardiac educational program interventions published in international literature. Moreover, the use of the teach-back method during the educational intervention of this study ensured good information retention and patients' understanding of what the researchers implemented. In addition, the instrument for knowledge and satisfaction was translated and back-translated according to CONSORT 2010 (Moher et al., 2010), which can be considered as a guideline intended to improve the reporting of parallel-group randomized controlled trials. In addition, the use of the theoretical framework can be seen as a guide to support the theory of the current study.

Implications for Nursing

The focus of any cardiac educational program should be placed on patients with low levels of education and patients who have recently experienced CAD for the first time, as these groups showed a lower level of knowledge in the current study. Also, the application of the CEP could improve the continuity of care for patients with CAD by following-up strategies to improve patients' outcomes. Enhanced knowledge and understanding of the disease may in turn help change attitudes and lifestyle practices.

In addition, the application of this type of research, which aims to explore the effect of CEP application among CAD patients in the north of Jordan, can be considered as a baseline to fill the existing gap. Therefore, rigorous research is needed to prove the efficacy of this educational method (educational booklet, awareness sessions and written instructions) against other methods, such as videotapes, multi-media educational programs, group discussions and so on. In addition, it is worthwhile to replicate the study using a sample from other regions of Jordan and from different hospitals, such as those in the private and military sectors. It would also be beneficial to study various factors, like BMI, cholesterol level and HBA1C, for CAD patients and link them to their level of knowledge and satisfaction.

The National Institute for Health and Care Excellence (2011) asserted that CEPs remain the most appropriate and cost-effective clinical interventions in cardiovascular-disease management. Moreover, this study can be an initial step in considering the application of cardiac rehabilitation programs, since they are viewed as customized inpatient and outpatient programs of exercise and education (Longtin et al, 2010).

Conclusion

The results of the current study showed that the level of knowledge was relatively low before the application of the CEP. This indicates the need for applying such programs to improve the level of knowledge and satisfaction of CAD patients. Respondents with a higher educational level and those who had experienced a previous heart attack revealed a higher level of knowledge.

The findings of the current study confirm the significant effect of the CEP applied among patients with CAD. It emphasizes that patient education using appropriate and well-developed materials could be

effective in improving the level of knowledge and satisfaction among patients.

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Conflict of Interest

No conflict of interest has been declared by the authors.

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