



A Health Educational Program For Patients With Cardiac Resynchronization Therapy Device

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ABSTRACT

Background: Cardiac resynchronization therapy device (CRT) is a special device for heart failure patients are at high risk for sudden cardiac death. While functioning like a normal pacemaker to treat slow heart rhythms. **Aim:** This study evaluates the health education program for patients with cardiac resynchronization therapy devices. **Research design:** A quasi-experimental research design was used to utilize this study. **Sample:** Purposive sample includes 190 patients with cardiac resynchronization therapy devices. **Setting:** Outpatient clinics at the National Heart Institute. **Tool for data collection:** one tool used is composed of four parts, **1st part:** interviewing questionnaire including socio-demographic characteristics, **2nd part:** Past and current complaints of patients with heart failure, **3rd part:** patients' knowledge about heart failure disease and cardiac resynchronization therapy devices, **4th part:** patient's reported practice regarding cardiac resynchronization therapy device & device precautions. **Results:** Presents that, 66.80 % of the patients had total satisfactory reported practices while, 88.9% of the patients had an adequate level of total knowledge about heart failure disease and cardiac resynchronization therapy device post implementation of a health education program. **Conclusion:** The study concludes that there was a marked improvement on patient 's total knowledge & total reported practice regarding heart failure disease and cardiac resynchronization therapy devices after implementation of a health education program **Recommendations:** Continuous health education program for patients with cardiac resynchronization treatment devices in other places.

Keywords: Heart Failure Disease, Cardiac Resynchronization Therapy Devices and A Health Educational Program.

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INTRODUCTION:

Heart failure (HF) is a chronic illness that tends to deteriorate with time. Heart failure is the inability of the heart to properly pump blood throughout the body. Usually, it happens when the heart is too weak or stiff. Shortness of

breath with activity or when lying down, weakness and fatigue, swelling in the legs, ankles, and feet, a rapid or irregular heartbeat, the inability to exercise, a persistent cough or wheezing with white or pink blood-tinged mucus, and extremely quick weight gain from

fluid retention are some of the signs and symptoms of heart failure (**Abraham, 2021**).

According to the Centers for Disease Control and Prevention, a heart attack occurs in America every 40 second. 805.000 Americans get a heart attack each year, 605.000 of whom are first-time victims. The frequency of heart failure patients using a device for cardiac resynchronization treatment There are 30.3 million adults in the world were diagnosed with heart disease, and heart disease is the leading cause of mortality for both men and women of all races. The top cause of death in the United States is heart disease, which claims roughly 647.000 lives annually. One in four fatalities is due to heart disease (**CDC, 2020**).

According to the **World Health Organization (2020)**, 163.171 or 29.38 percent of all deaths in Egypt were caused by cardiovascular diseases (CVDs). More than one-third of all deaths in high-income industrialized nations are caused by CVDs, which are also the main cause of morbidity and mortality. With 25% of all fatalities attributed to CVDs, it is the major cause of non-communicable morbidity and mortality in low- and middle-income countries and is expected to overtake all other causes of death by the year 2030. a serious social and economic issue that affects public health and has ramifications for healthcare demands, lost productivity, and early death.

Cardiac resynchronization therapy (CRT) is one of the most effective treatments for heart failure with a low ejection fraction because it enhances the quality of life, reduces the frequency of hospitalizations for heart failure patients, and reduces all-cause mortality. CRT can be carried out using pacemaker systems (CRT-P) and devices with defibrillation capabilities (CRT-D). CRT presents a novel therapeutic approach for patients with ventricular desynchrony and moderate-to-severe heart failure. Patients have reported considerable improvements in their clinical

symptoms and a range of functional status and exercise capacity tests, and it has been shown to be both safe and effective in clinical trials (**Mullens et al.,2021**).

Cardiac Resynchronization Therapy devices system is made up of the pulse generator, often known as the gadget, and the tiny, insulated cables called leads. A CRT device delivers extremely brief electrical pulses to the heart through these wires. Because the fist is once again closing normally, this helps to restore the usual timing of heartbeats, causing both ventricles to pump more efficiently together (**Akerström et al., 2020**).

Cardiac Resynchronization Therapy devices are indicated for patients with heart failure who receive stable optimal pharmacologic therapy for heart failure and who meet any one of the following classifications: Moderate to severe heart failure according The New York Heart Association (NYHA Class III-IV) with EF \leq 35% and QRS duration \geq 120 MS; or left bundle branch block (L.B.B.B) with QRS duration \geq 130 MS, EF \leq 30%, and mild (NYHA Class II) ischemic or non-ischemic heart failure or asymptomatic (NYHA Class I) ischemic heart failure (**Allaw et al., 2022**).

A health education program is crucial to raising patient understanding of CRT device use. Mental, physical, and social health are all included in health education. Health education informs patients about diet and exercise's role in leading healthy lives. Health education program promotes healthy behavioral modifications and reduces the likelihood of drug, alcohol, and risky sexual behavior addiction (**Althouse et al., 2022**).

Community health nurses have critical role in preoperative patient education. Patients must be made aware that CRT-D is an addition medical therapy and that must continue to follow the pharmacological and nonpharmacological regimens. Early postoperative treatment is identical to that provided to patients having traditional rhythm control devices implanted. However, the extent of CRT-D-associated

problems, which are primarily connected to coronary sinus leads, is greater than that reported with conventional pacing (*Arai et al., 2020*).

Significance of the study:

The incidence of heart failure in patients with Cardiac resynchronization therapy devices is the number 1 cause of death globally. An estimated 17.9 million patients died from heart failure, patients with heart failure in 2018, representing 85% of all global deaths. According to **World Health Organization (2019)**, indicates that cardiovascular diseases (CVDs) account for 46% of total deaths in Egypt; CVDs are a major public health concern with significant social and economic implications in terms of healthcare needs, lost productivity, and premature death.

Community health nurses provide health education programs which is the cornerstone of heart failure patients with Cardiac resynchronization therapy, which are encouraged to do the following practice that helps to an integral role in the treatment of HF patient and is in a unique position to lessen the progression of HF with early identification and intervention, such as control of hypertension and hyperlipidemia, smoking cessation, and educating patients about maintaining ideal body weight, and restricting dietary sodium, will continue to have the greatest impact on HF patients (*Hashii & Uiterwaal., 2018*).

AIM OF THE STUDY:

This study aimed to evaluate the health education program for patients with cardiac resynchronization therapy devices through the following objectives:

- Assessing patients' knowledge and reported practice regarding heart failure and cardiac resynchronization therapy devices.
- Designing and implementing health education programs in light of the actual need and assessment of the patient.
- Evaluating the health education program about

cardiac resynchronization therapy devices.

Research Hypothesis:

The patient's knowledge and practice will be improved after applying for a health education program regarding heart failure disease and cardiac resynchronization therapy devices.

SUBJECTS & METHODS:

Research design: A quasi-experimental research design was conducted.

Setting: This study was conducted in an outpatient clinic at the National Heart Institute outpatient clinic at Alkit kat, Agouza, Giza Governorate.

Sample: The purposive sample was used in this study. The total number of patients in one year beginning from august 2019 to the end of July 2020 was 190 patients in the National Heart Institute outpatient clinic at Alkit kat, Agouza, Giza Governorate. **According to the following inclusion criteria**, patients with cardiac resynchronization therapy devices accept to participate in the study.

Tool of data collection:

Data for this study were collected by using the following one tool include:

Tool: An interview questionnaire which consisted of four parts:

Part I: Socio-demographic characteristics of patients consisted of 11 items as sex, age, marital status, places of residence, crowding index.... etc.

Part II: Past medical history & current complaints of patients which consists of two sub-items:

- Concerning with Patient's past medical history consisted of 8 closed-end questions as type of inserted device, weight gain, how long has the device been installed.... etc.**
- Concerning with Patient's current complaints consisted of 8 closed-end questions as (pre-post format): suffer from dyspnea or persistent cough, especially at night.... etc.**

Part III: Patients' knowledge regarding heart failure disease& cardiac resynchronization therapy device which includes 15 closed-end questions (pre-post format): meaning, causes, signs and symptoms, risk factors, medical and non-medical treatment... etc.

The scoring system included 37 questions; the answer scored was 2 points for the complete correct answer, 1 point for an incomplete correct answer, and zero points to wrong the answer. The total score of patient's knowledge regarding cardiac resynchronization therapy devices and heart failure disease =74 scores which were divided into the following:

- Inadequate knowledge $\leq 50\%$ (≤ 37 scores).
- Adequate knowledge $> 50\%$ (≥ 37 scores).

Part IV: Patient's reported practice about the evaluation of health practices through information regarding cardiac resynchronization therapy device & device precautions which consists of two sub-items (pre-post format):

- A.** Concerning with Patient's reported practice about the evaluation of reported practices through information regarding the cardiac resynchronization therapy device which included 18 closed-end questions as dietary habits, exercise, medication, vaccination, follow-up sessions.... etc.
- B.** Concerning with Patient's reported practice regarding cardiac resynchronization therapy device precautions which included 18 closed-end questions as using a cellphone, device identification card, medical procedure, the periodical device follows up, sexual intimacy.... etc.

The scoring system included 36 questions; the answer scored 2 points for always answering 1 point for some time answering and zero points for never answering.

The total score of patient's reported practices about cardiac resynchronization therapy device = 72 scores which were divided into the following:

- Satisfactory reported practice $\geq 60\%$ degrees.

- Unsatisfactory reported practice $<60\%$ degrees.

Operational items: These include the preparatory phase, pilot study content validity, content reliability, and fieldwork.

Preparatory phase:

It included reviewing related literature and theoretical knowledge of various aspects of the study using books, articles, the internet, and magazines to develop tools for data collection.

Pilot study:

The pilot study was done on 10% of the sample which equals 19 patients to examine the clarity of questions and time needed to complete the study tools. Patients included in the pilot study included from the study because minor modifications were done.

Validity content:

The revision of the tool for clarity, relevance, comprehensiveness, understanding, and applicability was done by a panel of five experts (3 from community health nursing & 2 from medical surgical health nursing) at Helwan university to measure the content validity of the tools and the necessary modification done accordingly through adding some question to assess the patient's knowledge & reported practice about cardiac resynchronization therapy device. All recommended modifications were applied.

Tool Reliability:

Reliability was applied for testing the internal consistency of the tool, by administration of the same tools to the same subjects under similar conditions two times. Answers from the repeated testing were compared (Test- re-test reliability was 0.823 for knowledge) and Cronbach's Alpha reliability was 0.809 for reported practice.

Fieldwork:

- Before conducting the study, permission was obtained from the directors of the National Heart Institute outpatient.
- In the beginning, the researchers introduced herself and explained the purpose of the

study to the patient's ones to gain their confidence and trust and convince them to participate in the study, then formal consent was obtained from them.

- Actual fieldwork was carried out during the period Data was collected within 9 months in 2021.

The questionnaires were distributed to patients and completed by the researcher's assessment.

- All patients filled out a questionnaire sheet themselves except for cannot read and write who were helped by the researchers according to their answers.
- Data collected two days per week (Monday and Wednesday) from 8 am-12 pm, and interviews with patients with cardiac resynchronization therapy devices.
- Health education program was developed, implemented, and distributed by the researchers.

Health education program construction consists of the following phases:

Phase 1 (Preparatory phase):

tool of data collection based on the review of the past & current related literature reviewing various aspects of patients suffering from heart failure disease done using available books, periodical articles, and magazines. The aim is acquainted with the research problem to develop the study tool.

Phase 2 (Assessment phase):

This phase involved the pre-testing questionnaire to assess the present patient's knowledge and reported practice about cardiac resynchronization therapy devices. The researcher introduced herself and briefly explained the study's purpose to the patients. Every patient was met individually, and formal consent for participation was obtained. Patients were assured that the obtained information would be treated confidentially and used only for the purpose of the study.

Phase 3 (Program planning and implementation):

Planning phase:

- Determine the learning objectives of the program.
- Determine the learning contents of the program.
- Choose teaching methods as discussion and lecture.
- Determine education media as videos and educational booklet.

Implementation phase:

- After developing a health education program content.
- Data collected within 9 months in 2021, two days per week (Monday and Wednesday) from 8 am-12 pm, and interviews with patients with cardiac resynchronization therapy devices.
- A health education program improved patients' knowledge and reported practice about patients with cardiac resynchronization therapy devices and aims are explained to all participants. Based on the result of the pre-test questionnaire the researchers utilized 5 sessions each session needs from 30-45 minutes and meeting the patients two days per week.
- Five theoretical sessions by the end of this session each patient knew knowledge about heart failure diseases, such as its meaning, causes, signs, and symptoms, risk factors, complications.... etc.
- By the end of each session, the patients were concerned about the next session's content and time.

Program session:

Based on the result of the pre-test questionnaire the researchers utilized 5 sessions each session needs from 30-45 minutes and meeting 24-25 patients two days per week.

-Post-test did after applied sessions. The study sample equals 190 patients divided into 7

groups which consist of 6 groups containing about 25 patients and 1 group containing about 15 patients.

Phase 4 (Evaluation phase):

This phase aimed at the patient's knowledge and reported practice was improved after applying for a health education program regarding cardiac resynchronization therapy devices and heart failure disease.

Ethical consideration:

Official permission to conduct the proposed study was obtained from the Scientific Research Ethics Committee. Participation in the study is voluntary and informed consent. The ethical considerations include explaining the purpose and nature of the study, stating the possibility to withdraw at any time, and confidentiality of the information where it was not accessed by any other party without taking permission of the participants. Ethics, values, culture, and beliefs are respected. Patients were given complete full information about the study and their role before signing.

Statistical Item:

Upon completion of data collection, data was computed and analyzed using Statistical Package for the Social Science (SPSS), version 24 for analysis. The P value set at 0.05. Descriptive statistics tests as numbers, percentages, mean standard deviation (SD), will be used to describe the results. Appropriate inferential statistics such as the "F" test or "t" test used as well.

Significance of results:

- When $P > 0.05$, it is a statistically insignificant difference.
- When $P < 0.05$, it is a statistically significant difference.
- When $P < 0.01$ or $P < 0.001$, it is a statistically highly significant difference.

RESULTS

Table (1): Reveals that 72.1% of the patients were male, 50.0% were 50 years old or more, and 74.8% were married. Moreover, 56.3% of

them lived in the urban area and 73.7% of them from 5 to 7 rooms & 82.1% of their crowding index was 1-2 persons in the home. 50.5% were an officer. Additionally, 76.3% of the patients had insufficient and were inefficient in essential need monthly income.

Table (2) Shows that 58.9% of the patients had cardiac resynchronization therapy pacemaker, while 41.1% of them had cardiac resynchronization therapy defibrillator. Moreover, 41.6% of them have implanted cardiac device 3 months ago, 67.9% of them from shortness of breath and 43.2% of them suffer from weight gain because of fluid retention, all of them 100% suffer from arrhythmia.

Table (3): Demonstrates that, there was a highly significant difference regarding the meaning & types of cardiac resynchronization therapy devices with marked improvement in their knowledge with a highly statistically significant difference where $P < 0.01$ between phases of implementation of a health education program as regard all domains listed.

Figure (1): illustrates that 88.9% of the patients had an adequate level of total knowledge about heart failure disease and cardiac resynchronization therapy devices post-implementation of a health education program.

Table (4): Shows that there was a highly significant difference regarding patients' total reported practices domains pre-and post-implementation of a health education program where the p-value equals.000. It also presents that 66.8 % of the patients' had total satisfactory reported practices post-implementation of a health education program while only 33.2 % of them had total satisfactory reported practices pre-program.

Table (5) Portrays that, there was a statistically significant relationship between the patients' total reported practice post implementation of a health education program and the patients' occupation ($P=0.010$), age ($P=0.001$), marital status ($P=0.017$), Place of residence ($P=0.044$), an education level ($P=0.000$) and family monthly income ($P= 0.04$).

Table (1): Number and Percentage Distribution of the Patients according to Socio-demographic Characteristics (N=190).

Items	N	%
Gender		
Male	137	72.1
Female	53	27.9
Age		
30-<40	19	10.0
40-<50	76	40.0
≥50	95	50.0
$\bar{x} \pm S. D= 51.36 \pm 2.48$		
Marital status		
Single	13	6.8
Married	142	74.8
Divorced	8	4.2
Widow	27	14.2
Place of Residence		
Rural	83	43.7
Urban	107	56.3
Number of family members		
2-4	50	26.3
5-7	140	73.7
$\bar{x} \pm S. D= 5.21 \pm 1.06$		
Number of home rooms		
<3	121	63.7
3-5	48	25.3
>5	21	11.0
$\bar{x} \pm S. D= 2.94 \pm 0.25$		
Crowding index		
<1	19	10
1-2	156	82.1
>2	15	7.9
Occupation		
Officer	96	50.5
Technical job	35	18.4
Not working/ housewife	59	31.1
Monthly income		
Not enough for the needs	145	76.3
Safe and enough for the needs	45	23.7

Table (2): Number and Percentage Distribution of the Patients according to their Past Medical History (N= 190).

Items	N	%
The type of cardiac device		
Cardiac resynchronization therapy pacemaker	112	58.9
A cardiac resynchronization therapy defibrillator	78	41.1
Time of the implanted cardiac device		
3 months	79	41.6
6 months	46	24.2
>1 year	65	34.2
$\bar{x} \pm S. D= 6.80 \pm 3.68$		
Suffer from shortness of breath		
Yes	129	67.9
No	61	32.1
Suffer from weight gain as a result of fluid retention		
Yes	82	43.2
No	108	56.8
Suffer from arrhythmia		
Yes	190	100.0
previous heart attack		
Yes	103	54.2
No	87	45.8
Has a family member ever had heart failure		
Yes	49	25.8
No	141	74.2
If yes, what is the degree of kinship n=49		
Mother	11	22.4
Father	33	67.3
Brothers	5	10.3
Disease Discovered		
By symptoms	55	28.9
Medical tests	67	35.3
Medical examination	68	35.8

Table (3): Comparison between the Patients pre and post Implementation of a Health Education Program Regarding their Knowledge of Cardiac Resynchronization Therapy Device (N=190).

Knowledge about cardiac resynchronization therapy	Pre-program (N=190)				Post-program (N=190)				Chi-Square	
	Correct		Incorrect		Correct		Incorrect		X ²	(p-value)
	No	%	No	%	No	%	No	%		
Meaning of cardiac resynchronization therapy device	53	27.9	137	72.1	178	93.7	12	6.3	14.02	.001**
Types of a cardiac resynchronization therapy device	25	13.2	165	86.8	155	81.6	35	18.4	16.73	.000**
Signs of malfunction of a cardiac resynchronization therapy device	29	15.3	161	84.7	183	96.3	7	3.7	12.52	.000**
Warning with the cardiac resynchronization therapy device	48	25.3	142	74.7	170	89.5	20	10.5	7.630	.008**

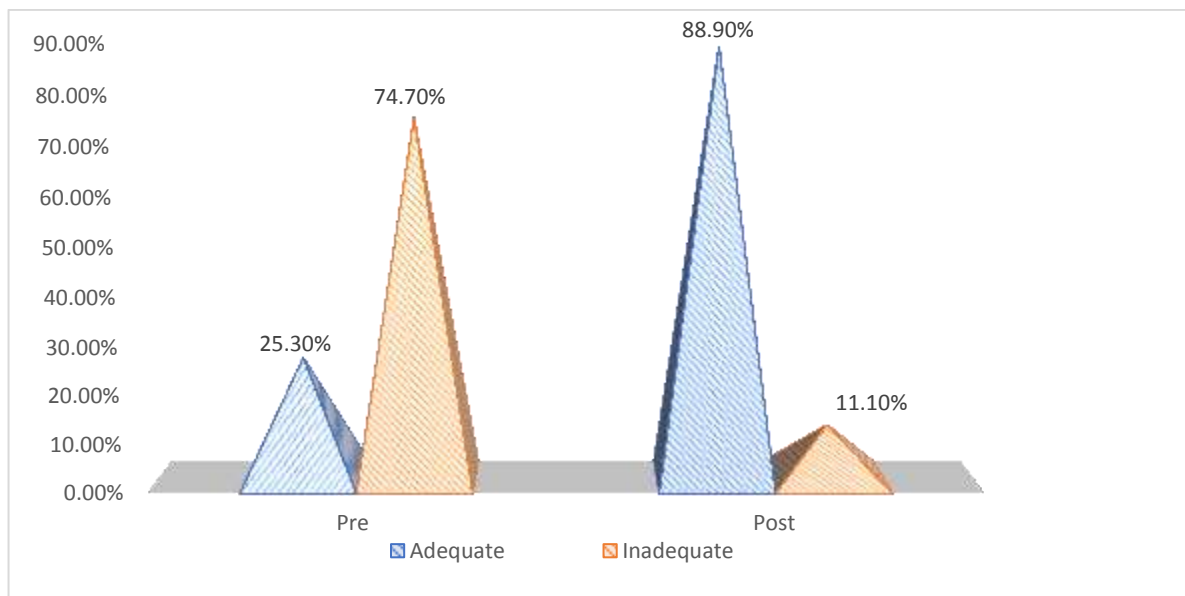


Figure (2): Comparison between the Patients at Pre and Post Implementation of a Health Education Program Regarding their Total Knowledge about Heart Failure Disease and Cardiac Resynchronization Therapy Devices (N=190).

Table (4): Comparison between the Patients at Pre and Post Implementation of a Health Education Program Regarding their Total Reported Practices (N=190).

Total reported practices domains	Pre-program (N=190)		Post-program (N=190)		t-test	(p-value)
	No	%	No	%		
Patient practices						
Satisfactory reported practice	58	30.5	151	79.5	21.52	.000**
Unsatisfactory reported practice	132	69.5	39	20.5		
Patient exercise						
Satisfactory reported practice	65	34.2	56	70.5	24.15	.000**
Unsatisfactory reported practice	125	65.8	134	29.5		
Precautions with cardiac resynchronization therapy						
Satisfactory reported practice	67	35.3	93	51.1	25.36	.000**
Unsatisfactory reported practice	123	64.7	97	48.9		
Total						
Satisfactory reported practice	63	33.2	100	66.8	33.42	.000**
Unsatisfactory reported practice	127	52.6	90	47.4		

Table (5): Relationship between Socio-demographic Characteristics of Patients and their Total Reported Practice Post-Education Program (N=190).

Items		Total reported practice				X ²	P-Value
		Satisfactory N=127		Unsatisfactory N=63			
		N	%	N	%		
Gender	Male	97	76.4	40	63.5	2.584	0.169
	Female	30	23.6	23	36.5		
Age	30-<40	2	1.5	17	27.0	12.78	.001**
	40-<50	34	26.8	42	66.7		
	≥50	91	71.7	4	6.3		
Marital status	Single	10	7.9	3	4.8	7.109	.017*
	Married	88	69.3	54	85.7		
	Divorced	7	5.5	1	1.6		
	Widow	22	17.3	5	7.9		
Residence	Rural	69	54.3	14	22.2	11.45	.044*
	Urban	58	45.7	49	77.8		
Level of education	Can't read and write	7	5.5	0	0	13.08	.000**
	Read and write	21	16.5	2	3.2		
	Secondary school	98	77.2	8	12.7		
	Bachelor's degree	1	0.8	53	84.1		
Occupation	Officer	45	35.4	51	81.0	5.781	.010*
	Technical job	31	24.4	4	6.3		
	Not working/ housewife	51	40.2	8	12.7		
Monthly income	Not enough	123	96.9	22	34.9	9.516	0.04*
	Safe and enough	4	3.1	41	65.1		

DISCUSSION

Heart failure is a complicated clinical condition caused by a structural or functional issue with the heart that affects ventricular filling or the ejection of blood into systemic circulation. It is a failure to meet circulation's fundamental demands. Heart failure is still a condition with a high death and morbidity rate throughout the world. It is estimated that 26 million people are affected globally, and it contributes to increased healthcare costs. Heart failure can result from a wide range of illnesses. The recommended course of treatment varies to some extent depending on the underlying cause of heart failure, although most recommendations are made based only on the

diagnosis of heart failure, regardless of the underlying cause (**Malik et al., 2022**).

Cardiac resynchronization therapy includes implanting a device in the chest to organize and effectively force the heart's chambers to contract. It is a type of therapy that encourages a healthy cardiac rhythm. It is a special device for persons with heart failure who are at high risk for sudden cardiac death and employs a pacemaker to return the heartbeat to its regular rhythm. Similar to a normal pacemaker, a CRT device cures irregular heartbeats but the device sends tiny electrical impulses to the left and right ventricles to promote coordinated contraction (**American Heart Association, 2019**).

Regarding the socio-demographic characteristics of the patients' the current study revealed that half of the ages of patients were 50 years old or more, and almost three-quarters of them were married. These results agree with **Nakai et al.'s study (2021)** titled "Efficacy of cardiac resynchronization therapy in patients with a narrow QRS complex in Japan," in which they reported that the mean age of patients was 34.12 and 65 % of them were married.

Concerning the level of education, occupation, degree of kinship, and monthly income, the current study revealed that more than half of the patients had a secondary school diploma education, and more than half of the patients' jobs were as officers. Also, more than three-quarters of them have a degree of kinship through their fathers and have an inefficient monthly income. These results disagree with **Mullens et al. (2021)**, whose study titled "Optimized implementation of cardiac resynchronization therapy: a call for action for referral and optimization of care by the European Society of Cardiology" reported that 50% of the patients were higher educated and employed, 53% of them had a mother as their closest kin, and 56% had a safe but inefficient income. From the researcher's point of view, this might be due to some of the persons from 30 to 40 years old a had physical problem and needing help to go outpatient.

As regards the patients past medical history, the current study revealed that more than half of the patients were implanted with a cardiac resynchronization therapy pacemaker, less than half of them with a cardiac resynchronization therapy defibrillator, and less than half of them were implanted with devices 3 months ago, with $\bar{x} \pm SD$ equal 6.80 and 4.68 months, respectively. These results agree with **Schrage et al., (2022)**, whose study titled "Cardiac Resynchronization Therapy with or without Defibrillator in Patients with Heart Failure". Which reported that 65% of the patients were implanted with a cardiac resynchronization therapy pacemaker, and 75% of the patients were implanted with a device implanted device six months ago.

As regards the patients' knowledge about cardiac resynchronization therapy, the present study showed that there was a significant

improvement in the patients' knowledge after the implementation of a health education program regarding the meaning and types of cardiac resynchronization therapy devices. The findings of the present study reported that more than three-quarters of them had correct knowledge about the meaning and types of cardiac resynchronization therapy devices after the post-program assessment. This finding is equivalence with **El Nihum et al., (2022)** whose study titled in "Renal Dysfunction in Patients with Left Ventricular Assist Device". they found that 75% of patients were poorly informed about the functions and different kinds of cardiac resynchronization treatment devices. From the researcher's point of view, this might be due to the patients' not receiving health education and training regarding various types of cardiac resynchronization therapy devices.

Additionally, the present study showed that there was a significant improvement in the patients' knowledge after the implementation of a health education program regarding signs of malfunction and warning signs of cardiac resynchronization therapy devices. The present study revealed that more than three-quarters of the patients had adequate knowledge about signs of malfunction and warning signs of a cardiac resynchronization therapy device in post-program. The results matched **Jastrzębski et al., (2019)**, whose study titled in "Cardiac resynchronization therapy-induced acute shortening of QRS duration predicts long-term mortality only in patients with left bundle branch block". They revealed that 69% of patients have well-illustrated knowledge of the warnings and malfunction indications of cardiac resynchronization therapy devices. From the researcher's point of view, this might be due to the adequate knowledge may be due to the patients recognizing the importance of prevention of heart failure disease and disease progress & cardiac resynchronization therapy device, and this part answered research hypothesis: "The patient's **knowledge** and reported practice will be improved after applying health education program regarding cardiac resynchronization therapy device and heart failure disease".

Regarding patients reported practices toward limiting fluids, salt, and fat consumption, the

current study revealed a significant improvement in the patients' practices in post-program compared to pre-program regarding fluid, salt, and fat consumption, using cell phones, and avoiding electromagnetic gates. Patients were also advised to stop smoking, avoid using cell phones directly, and use electromagnetic gates while traveling. The current study found that more than half the patients had satisfactory reported practices toward limiting fluid, salt, and fat consumption, avoiding using cell phones directly, and using electromagnetic gates while traveling post-program. These results disagree with **Nakai et al., (2021)** in the study titled "Cardiac Resynchronization Therapy Status and near-future prospects" They found that 56% of the study subjects had inadequate practice in dealing with fluids and salt intake, but 65% had inadequate practice in avoiding using cell phones directly and electromagnetic gates while traveling.

As regards the patients' reported practice regarding administering necessary vaccinations and appropriate physical activity, the present study showed that there was a significant improvement in the patients' reported practice in post-program than in the pre-health education program regarding administering necessary vaccinations and appropriate physical activity. According to the current study finding that more than three-quarters of the patients had satisfactory reported practice toward follow-up visits post-program, these results agree with **Madjid et al., (2019)** In a study titled "Effect of High Influenza Activity on the Risk of Ventricular Arrhythmias Requiring Therapy in Patients with Implantable Cardiac Defibrillators and Cardiac Resynchronization Therapy Defibrillators". They found that 50% of the study's sample had adequate practice regarding administering necessary vaccinations.

Furthermore, the results disagree in the post-program report with **Krauze et al., (2022)**, whose study titled "Patient-Reported Quality of Life, Depression, Anxiety, and Physical Activity in Patients Receiving an Implantable Cardioverter-Defibrillator for Primary versus Secondary Prevention in Poland" found In both groups, the preferred activities are walking and cycling; however, following implantation, the percentage of participants involved in these activities is significantly lower in the secondary

prevention group ($p = 0.016$ for walking and $p = 0.010$ for cycling). Additionally, 64.9% of participants in the secondary prevention group versus 42.5% of participants in the primary prevention group ($p = 0.026$) admit that they have limited their physical activity due to fear of electrical shock, which leads to a reduction in physical activity after implantation in 73.0% of participants in the secondary prevention group versus 38.4% in the primary prevention group ($p = 0.002$).

Furthermore, the resulting agreement in the post-program study with **Tong et al., (2022)**, whose study is titled "Cloud Follow-Up in Patients with Cardiovascular Implantable Electronic Devices". They found that 61.5% of the CIED patients completed routine in-office visits spontaneously. While 38.5% of the CIED patients did not attend visits until they had received notifications from the follow-up clinics. The overall compliance with in-office visits in this region was 60.6%. 70.5% of CIED patients completed routine in-office visits within 4–12 weeks post-implantation.

From the researcher's point of view, this might be due to the positive performance may be due to the patients were recognize the importance of care pre & after cardiac resynchronization therapy device implementation. This part answered the research hypothesis " The patient's knowledge and **reported practice** will be improved after applying for a health education program regarding cardiac resynchronization therapy device and heart failure disease".

Concerning the patients' reported practice regarding exercises, the present study showed that there was a significant improvement in the patients' reported practice after the implementation of a health education program regarding exercises. The present results revealed that the majority of patients had satisfactory reported practices regarding a rapid or irregular heartbeat, pain in the chest, neck, arms, jaw, or shoulders during exercise, and more than half of the patients' avoided lifting or pushing heavy objects while using a pacemaker or defibrillator in the post-program. These results agreed with **Tedjasukmana et al., (2021)** in the study titled " Aerobic exercise prescription in heart failure patients with cardiac

resynchronization therapy". They found that exercise provided significant improvement in heart failure patients after the implantation of CRT. Prescribing exercise to this patient group was also found to be safe, and thus it is recommended for CRT patients who have been medically stable for the past 1 month. Regardless of response to the CRT device, aerobic exercise training is both safe and effective in providing adequate functional capacity improvement and, therefore, is highly recommended.

Alternatively, the present results revealed that half of the patients were doing exercises, and this result is in agreement with the study done by **Chen et al. (2019)**, whose study was titled "Are Traditional Forms of Exercise Feasible and Acceptable for Chronic Heart Failure Patients in China?" In a Mixed-Method Pilot Study". They found that the intervention group had done the required home exercises (27.5 min/day, 5.6 days/week), and total home practice time had a significant positive correlation with baseline self-efficacy scores ($r = 0.83$, $P = 0.011$).

Regarding the patients' reported practice regarding cardiac resynchronization therapy device precautions, the present study showed that there was a significant improvement in their reported practice after the implementation of a health education program regarding using cell phones and holding device identification (ID). The present study also revealed that the majority of the patients had satisfactory reported practice regarding using cell phones and holding device ID after applying for the program. This result agrees with the result of a study performed by **Schernthaler et al., (2020)** In a published study under the title "Safe application of extensive radiotherapy to a cardiac resynchronization device" the authors found 64.1% of patients had good practices regarding cardiac resynchronization therapy device precautions.

On the other hand, regarding the patients' reported practice regarding cardiac resynchronization therapy device precautions, the present results revealed that the majority of the patients had satisfactory reported practice regarding stand-within high voltage

transformers and magnetic resonance imaging post-applying program. This result agrees with the result of the study performed by **Yang et al., (2021)** titled "Magnetic resonance imaging safety in patients with cardiac implantable electronic devices ". They found that there was significant concern regarding the safety of performing these imaging studies in patients with cardiac implantable electronic devices.

Alternatively, the present results revealed that the majority of studied subjects had satisfactory reported practices regarding device programming and the prevention of infection post-application of a program. This result agrees with the result of the study performed by **Biffi et al., (2020)** whose conducted published a study under the title of "Prevention of Infection: Indications, Device Programming, Patient Follow-Up. In Infections of Cardiac Implantable Devices". They found that there was a significant relation between regular device programming and follow to prevent infection.

Also, the patients' reported practices regarding cardiac resynchronization therapy device precautions and the present results revealed that the majority of the patients had satisfactory reported practices regarding sexual activity, emotional stress, and daily life activities. This result agrees with the result of the study performed by **Krauze et al., (2022)** whose conducted published a study under the title "Patient-Reported Quality of Life, Depression, Anxiety, and Physical Activity in Patients Receiving an Implantable Cardioverter-Defibrillator for Primary versus Secondary Prevention: A Single-Centre, Prospective, Observational Cohort Study". They found that there was a significant relationship between quality of life and an implantable cardioverter-defibrillator for primary versus secondary prevention. Also, these findings were in line with **Magula et al., (2021)** whose conducted a published study under the title of "Successful maintenance: Electroconvulsive therapy in a patient with a cardiac rhythm management device at a tertiary hospital in South Africa". They found that there was a significant improvement in patient practice.

CONCLUSION:

Based on the present study and research hypothesis it can be concluded that:

The result of the study supported the study's hypothesis and showed that there was a marked improvement in the patients' knowledge regarding heart failure disease and cardiac resynchronization therapy devices after the implementation of a health education program compared to the pre-program, with statistical significance. Additionally, the patients' total reported practice score regarding heart failure disease and cardiac resynchronization therapy devices after implementation of a health education program, than pre-program with statistical significance.

RECOMMENDATIONS:

Based on the findings of the present study, the following recommendations are suggested:

1. Give the patients' health education booklets regarding cardiac resynchronization treatment devices, including information on different kinds of devices and how to manage them, necessary vaccinations, and warning signs following the use of these devices.
2. Encourage the study participants to hold a group discussion via what's up app about cardiac resynchronization treatment devices to share information while being observed by a community health nurse at the National Heart Institute outpatient clinic.
3. Make posters or banners about safety precautions with cardiac resynchronization treatment devices and put them in the outpatient clinic at the National Heart Institute under observation from a community health nurse.
4. Apply further research in large samples and other settings for generalization.

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