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Assessment of Patient s' Knowledge and Practice Regarding Cardiac Resynchronization Therapy Device in outpatient clinic at the National Heart Institute

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Abstract

Background: Cardiac resynchronization therapy (CRT) uses a device called a biventricular pacemaker that sends electrical signals to both lower chambers of the heart (ventricles). **Aim**: This study aimed to assess patients' knowledge and practice regarding cardiac resynchronization therapy device in outpatient clinic at the National Heart Institute. **Study design:** A descriptive research design was used in this study. **Sample**: A purposive sample includes 190 patients with cardiac resynchronization therapy device. **Setting**: Outpatient clinics at the National Heart Institute. **Tool for data collection:** one tool used was 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 **Results**: revealed that, 74.70 % of the patients had an inadequate level of total knowledge while, 52.60 % of the patients had total unsatisfactory reported practices regarding heart failure disease and cardiac resynchronization therapy device. **Conclusion**: The current study concludes that the majority of patients had inadequate level of knowledge & unsatisfactory total reported practices regarding heart failure disease and cardiac resynchronization therapy devices. **Recommendations**: provide a health educational program to all patients regarding heart failure disease and cardiac resynchronization.

Key words*: Cardiac Resynchronization Therapy Devices, Patients Knowledge and Outpatient Clinic.*

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Introduction:

Heart failure 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 [(1)].

According to the Centers for Disease Control and Prevention, a heart attack occurs in America every 40 seconds. 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 who have been 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 [(2)].

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 [(3)].

There are two different types of CRT devices, including Cardiac Resynchronization Therapy with a Pacemaker (CRT-P), which includes three leads connecting the pacemaker to both the lower and upper chambers of the right side of the heart (ventricles). ICD and pacemaker-based cardiac resynchronization treatment (CRT-D) This device is for heart failure patients who also run the risk of sudden cardiac death. It can recognize risky cardiac rhythms and give a more powerful energy shock that can reset the heartbeat than a pacemaker can [(4)].

Right, and left ventricles are simultaneously paced during biventricular pacing, commonly referred to as multisite ventricular pacing or Cardiac Resynchronization Therapy (CRT). A CRT 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 [(5)].

The role of community health nurses in preoperative patient education is crucial. Patients must be made aware that CRT-D is an addition to medical therapy and that they must continue to follow the pharmacological and nonpharmacological regimens that have been prescribed for them. Early postoperative treatment is identical to that provided to individuals 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 [(7)].

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 people died from heart failure, patients with heart failure in 2018, representing 85% of all global deaths. According to World Health Organization 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 [(8)].

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

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treatment of HF patient and is in a unique position to lessen the progression of HF with early identification and intervention. Nursing interventions, such as control of hypertension and hyperlipidemia, smoking cessation, and educating patients about maintaining ideal body weight, limiting alcohol consumption, and restricting dietary sodium, will continue to have the greatest impact on HF patients. So, it is important to conduct this study ***(Hashii & Uiterwaal., 2018).***

Aim of the Study:

The aim of this study to assess patients' knowledge and practice regarding heart failure disease and cardiac resynchronization therapy devices in outpatient clinic at the National Heart Institute.

This aim is achieved through the following objectives:

A. Assessing the knowledge of patients regarding heart failure disease and cardiac resynchronization therapy devices.
B. Assess the patients reported practice regarding heart failure disease and cardiac resynchronization therapy devices.

Research Questions:

Q 1 - what is level of patient's knowledge regarding heart failure disease and cardiac resynchronization therapy devices?

Q 2 - what is level of patients reported practice regarding heart failure disease and cardiac resynchronization therapy devices**.**

SUBJECTS AND METHODS

Research design:

A descriptive study was applied to achieved the aim of the current study.

Research setting:

This study was conducted in the National Heart Institute outpatient clinic at Alkit kat, Agouza, Giza Governorate. Outpatient clinics in the National Heart Institute consist of two floors including seventeen clinics, six for adult patients (male & female) and one for children also there are four clinics for (heart failure, cardiothoracic surgery, dental, and medical examination clinic. In each clinic, there had one bed, office for the doctor and one window and sink for hand washing & one nurse and one physician. One head nurse to all clinics. About 100 patients with heart disease visit the clinics daily. All clinics were opened in the same direction. One room for lab investigation beside the clinics. Two bathrooms are available for all clinics. The clinics are located on the first floor.

Subjects:

The sample of the existing study were 190 patients in outpatient clinics in the National Heart Institute according to the following inclusion criteria; patients with heart failure disease and cardiac resynchronization therapy devices and accept to be participate in the study.

Sampling technique:

A purposive sample used in this study. Total number of patients in one year begin from august 2019 to end of July 2020 is 190 patients.

Tool of data collection:

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

Tool: An interview questionnaire:

Data for this study collected by using a questionnaire sheet which designed by the researcher after reviewing related literature it included four parts:

Part I: Socio-demographic characteristics of patients consisted of 11 items such as sex, age, marital status, place of residence, crowding index, level of education, occupation, and monthly income.

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

A. Concerning with Patients past medical history consisted of 8 closed-end questions such as type of inserted device, weight gain, how long has the device been installed, arrhythmias, disease discovery and previous heart attack.

B. Concerning with Patients current complaints consisted of 8 closed-end questions such as suffer from dyspnea or persistent cough, especially at night, suffer from lower limb edema, complain of chest pain, and suffer from inability to physical activity.

Part III: Patients' knowledge regarding heart failure disease& cardiac resynchronization therapy device which includes 15 closed-end questions meaning, causes, signs and symptoms, risk factors, medical and non-medical treatment, diagnosis, complications, prevention of heart failure disease, meaning, cardiac resynchronization therapy device types, and device malfunction signs.

The Scoring system included 15 questions; the answer scored was 2 points for the complete correct answer, 1-point for 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 ≤ 50 % (≤15 scores).
- Adequate knowledge > 50% (≥ 15scores).

Part IV: Patients reported practice about the evaluation of health practices through information regarding cardiac resynchronization therapy device & device precautions which consists of two sub-items:

A. Concerning with Patients 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**,** daily weight general hygiene, sleeping pattern, smoking cessation, physical activity, avoid lifting or pushing heavy objects while having a cardiac resynchronization therapy device or using cellphone, avoid electromagnetic gates during travel, the feeling of chest pain and dizziness or arrhythmia during exercise.

B. Concerning with Patients 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, driving, tide clothes, medication, standing within walking distance of welding equipment, high voltage transformers or engine generator systems, suffer from lower limb edema or fainting or inflammation or infection where the device was installed, passage through a metal detector at airports overlaps with the device, avoid stress and psychological emotion while having the device, climb the stairs after installing the device and the ability to communicate easily with the physician when there are any symptoms or problems with the device.

The scoring system included 36 questions; the answer scored 2 points for always answering1 point for some time 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 ≥ 60% degrees.
- Unsatisfactory reported practice < 60% degrees.

Tool validity and Reliability:

A) Validity content:

The revision of the tools 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 tool and the necessary modification done accordingly through adding some question to assess the patient's knowledge & reported practice regarding cardiac resynchronization therapy device. All recommended modifications were applied.

B) Tool Reliability:

For knowledge Cronbach's Alpha was calculated between two scores using SPSS computer package. It was 0.823 which indicates that the tool is reliable to detect the objective of study. For reported practice Cronbach's Alpha was

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calculated between two scores using SPSS computer package. It was 0.809 which indicates that the tool is reliable to detect the objective of study.

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.

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.

Field work:

A formal approval letter was obtained from the Dean of the faculty of nursing, at Helwan University to practice the study in the faculty of nursing. A written letter should be sent to the director of the National Heart Institute at Alkit kat, Agouza, Giza Governorate for conducting the study including the aim of the study to obtain permission to visit the hospital and conduct the study, including the aim of the study. formal approval was obtained from patients after the researchers introduced themselves to patients and after explaining the purpose of the study.

Statistical Item:

Upon completion of data collection, data 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, percentage, mean standard deviation (SD), will be used to describe the results. Appropriate inferential statistics such as “F” test or “t” test used as well.

-Degrees of Significance of the results were:

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

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Results:

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

Personal information	**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
$\bar{x}$ ± S. D= 51.36±2.48		
Marital status		
Single	13	6.8
Married	142	74.8
Divorced	8	4.2
Widow	27	14.2
Residence		
Rural	83	43.7
Urban	107	56.3
Number of family members		
2-4	50	26.3
5-7	140	73.7
$\bar{x}$ ± S. D= 5.21±1.06		
Number of home rooms		
<3	121	63.7
3-5	48	25.3
>5	21	11.0
$\bar{x}$ ± S. D= 2.94±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 (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 person in the home. Regarding their occupation, 50.5% were an officer. Additionally, 76.3% of the patients had not enough and were not efficient in essential need monthly income.

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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
$\bar{x}$ ± S. D= 6.80±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
No	0	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 (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 had 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 and 54.2% of the patients were suffered from a previous heart attack. In addition, 25.8% of them had a family member ever had heart failure 67.3% of them had a degree of their kinship as a father, and 35.8% & 35.3% of them discovered the disease by medical examination and medical tests respectively.

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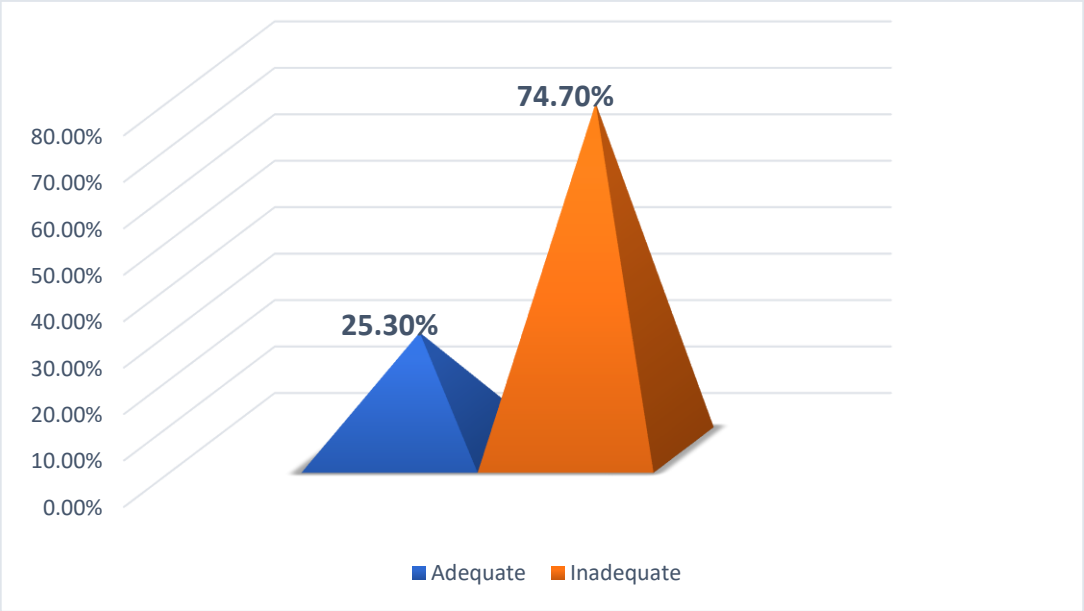

Fig (1): Number and Percentage Distribution of the Patients Regarding their Total Knowledge of Heart Failure Disease and Cardiac Resynchronization Therapy Devices (N=190).

Fig (1): illustrates that 74.70% of the patients had an inadequate level of total knowledge about heart failure disease and cardiac resynchronization therapy device, while 25.30% had adequate total knowledge with a highly statistically significant where $\chi 2$ equal 29.46, p-value equal 0. 000.

Table (3): Number and Percentage Distribution of the Patients Regarding their Total Reported Practices (N=190).

Total reported practices domains	(N=190)		t-test	(p-value)
	No	%		
Patient practices Satisfactory reported practice Unsatisfactory reported practice	58 132	30.5 69.5	21.52	.000**
Patient exercise Satisfactory reported practice Unsatisfactory reported practice	65 125	34.2 65.8	24.15	.000**
Precautions with cardiac resynchronization therapy Satisfactory reported practice Unsatisfactory reported practice	67 123	35.3 64.7	25.36	.000**
Total Satisfactory reported practice Unsatisfactory reported practice	**63** **127**	**33.2** **52.6**	33.42	.000**

TABLE (3): Presents that, 52.6 % of the patients had total unsatisfactory reported practices only 47.40 % of them had total satisfactory health practices pre-program, while only 33.20 % of them had total satisfactory reported practices.

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TABLE (4): Correlation between Study Variables

Variables	Total practice	
	R	P value
Total knowledge	0.627	.000**

TABLE (4) Shows that there was a negative correlation between the patient's total knowledge regarding studied variables and their total practice, where the P- value equals 0.000.

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 [(9)].

Cardiac resynchronization therapy devices are a clinically proven treatment option for some patients with heart failure. A CRT device sends small electrical impulses to both lower chambers of the heart to help them beat together in a more synchronized pattern. This may improve the heart's ability to pump blood and oxygen to your body. A CRT system is made up of two parts. The heart device, which is a tiny computer, plus a battery, is contained in a small titanium metal case that is about the size of a pocket watch [(10)].

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 was 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," who 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 researchers' 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 a mean x 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". They 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.

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Concerning the patients' knowledge about heart failure disease, the present study showed that the majority of them had inadequate knowledge regarding the meaning and causes of disease causes, disease risk factors, signs and symptoms and more than three-quarters of them had inadequate knowledge about the prevention of heart failure. These results agree with **Gold et al., (2021)** in study titled "Redefining the Classifications of Response to Cardiac Resynchronization Therapy in the United States". They reported that 75% of patients had incorrect knowledge related to heart failure meaning and disease causes, disease risk factors, and signs and symptoms of the disease. While these results conflict with the study conducted by **Kolasa et al., (2021),** in study titled in "Factors Associated with Heart Failure Knowledge and Adherence to Self-Care Behaviors in Hospitalized Patients with Acute Decompensated Heart Failure Based on Data from "the Weak Heart" Educational Program in Poland". They found that 85 % of the patients had correct knowledge about the prevention of heart failure.

As regards the patients' knowledge about cardiac resynchronization therapy, the present study showed that more than three-quarters of them had inadequate knowledge about the meaning and types of cardiac resynchronization therapy devices. This finding is disagreed with **El Nihum et al., (2022)** who study titled in "Renal Dysfunction in Patients with Left Ventricular Assist Device in the United States". who found that 75% of patients were poorly informed about the functions and different kinds of cardiac resynchronization treatment devices. From researcher point view, this might be due to the studied subjects not receiving health education and training regarding various types of cardiac resynchronization therapy devices.

Additionally, the present study showed that more than three-quarters of patients had inadequate knowledge about signs of malfunction and warning signs of a cardiac resynchronization therapy device. The results disagreed **Jastrzębski et al., (2019),** who study titled in" Cardiac resynchronization therapy-induced acute shortening of QRS duration predicts long-term mortality only in patients with left bundle branch block in the United States". who revealed that 69% of patients have well-illustrated knowledge of the warnings and malfunction indications of cardiac resynchronization therapy devices. From researchers point view, this might be due to the inadequate knowledge may be due to the patients not recognize the importance of prevention of heart failure disease and disease progress & cardiac resynchronization therapy device. This part answered the research **Q 1** - what is level of the **patient's knowledge** regarding heart failure disease and cardiac resynchronization therapy devices?

Regarding patients' reported practices the current study found that more than half the patients had unsatisfactory reported practices toward limiting fluid, salt, and fat consumption, avoiding using cell phones directly and using electromagnetic gates while travelling. These results agree with **Nakai et al., (2021)** in study titled "Cardiac Resynchronization Therapy Status and near-future prospects in Japan" 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, according to the current study finding that more than three-quarters of the patients had unsatisfactory reported practice toward follow-up visits, these results disagree 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 in the United States". They found that 50% of the study's sample had adequate practice regarding administering necessary vaccinations.

Furthermore, the results agree 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

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participants in the secondary prevention group versus 42.5% of participants in the primary prevention group (p = 0.026) admit that they had 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).

From researchers point view, this might be due to the negative performance may be due to the patients not recognize the importance care pre & after cardiac resynchronization therapy device implementation. **This part answered the research Q 2** (what is level of the patients **reported practice** regarding heart failure disease and cardiac resynchronization therapy devices.

Concerning the patients' reported practice regarding exercises, the present results revealed that the majority of patients had unsatisfactory 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. These results were disagreement with **Tedjasukmana et al., (2021)** in study titled in "Aerobic exercise prescription in heart failure patients with cardiac resynchronization therapy in the United States". 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 had 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.

Regarding the patients' reported practice regarding cardiac resynchronization therapy device precautions, the present study revealed that the majority of the patients had unsatisfactory reported practice regarding using cell phones and holding device ID. This result disagreement with the result of study performed by **Schernthaner 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 unsatisfactory reported practice regarding stand-within high voltage transformers and magnetic resonance imaging. This result disagrees with the result of the study performed by **Yang et al., (2021**) titled in "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 patients had total unsatisfactory reported practices regarding device programming and the prevention of infection. This result disagrees with the result of the study performed by **Biffi et al., (2020**) whose conducted published study under title of "Prevention of Infection: Indications, Device Programming, Patient Follow-Up. In Infections of Cardiac Implantable Devices". who found that there was significant relation between regular device programing and follow up prevent infection.

Regarding the correlation between the patients' total knowledge and total reported practice regarding heart failure disease and cardiac resynchronization therapy devices, the present study revealed negative correlation between the patients' total knowledge and their total reported practice regarding heart failure disease and cardiac resynchronization therapy devices. These results disagreed with **Ingadottir et al., (2020)** in study title "Patients are expecting to learn more: a longitudinal study of patients with heart failure undergoing device implantation in Swedish". They reported a statistically significant improvement in the total mean results of the practices of the study group regarding heart failure disease and cardiac resynchronization therapy devices from pre-program to post-program. From researchers point view, this result may be due to

inadequate patients' knowledge regarding heart failure disease and cardiac resynchronization therapy devices reflecting on their practice after cardiac resynchronization therapy device implementation.

Conclusion

On the light of the current study result, it could be concluded that:

The current study concludes that the majority of patients had inadequate level of knowledge & unsatisfactory total reported practices regarding heart failure disease and cardiac resynchronization therapy devices. there was negative correlation between the patient's total knowledge regarding studied variables and their total practice where the P- value equals 0.000.

Recommendations:

In the light of the finding of this study, the following recommendation are suggested:

- Provide a health educational program to all patients regarding heart failure disease and cardiac resynchronization.
- 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.

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