

The Effectiveness of Orem-Based Self-Care Education on Knowledge and Self-Care Behaviors among Patients with Heart Failure

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Abstract

Background: Self-care is an integral part of managing patients with heart failure. Extensive patient education on self-care is supported by the guidelines for the management of patients with heart failure. **The aim of the study is** to evaluate the effectiveness of Orem-Based Self-care Education on knowledge and Self-care behaviors among patients with Heart Failure. One group quasi-experimental **Research design** was used in this study. **Setting:** The Cardiology unit and Outpatient clinic at the Specialized Medical Hospital, Mansoura University Hospitals, Egypt served as the study setting. **Sample:** 65 patients were recruited to conduct the study. Three **tools** were used in data collection; Tool I: demographic and medical health status data, Tool II: Atlanta Heart Failure Knowledge Test, Tool III: The European Heart Failure Self-care Behavior Scale. **Results** validated the study's hypothesis since patients' mean scores of total knowledges improved statistically significantly ($P < 0.001$) both immediately after and 1 month later compared to before receiving Orem-based self-care education. Furthermore, the mean scores of patients' overall self-care behaviors improved statistically significantly with $P < 0.001$ (1 and 3 months after Orem-based self-care education) compared to before. **Conclusion:** The application of Orem-based self-care education significantly improved the knowledge and, consequently, the self-care behaviors of patients with heart failure. **Recommendations:** The utilization of Orem's philosophy of self-care in self-care education by staff nurses working in cardiology departments is highly recommended.

Keywords: Knowledge, Orem-Based Self-Care Education, Patients with Heart Failure & Self-Care Behaviors.

Introduction

Heart failure has one of the worst prognoses and imposes a significant burden on patients, caregivers, and the healthcare system (Kolasa et al., 2021). From the epidemiological perspective, heart failure imposes a relevant burden, with high prevalence and mortality rates. Worldwide, it has been estimated that there were over 37.7 million cases of heart failure in 2016, and this number is expected to increase continuously during the next few decades (Savarese & Lund, 2017; Lippi & Gomar, 2020). Benjamin et al. (2019) anticipated that, by 2030, the number of people diagnosed with heart failure is increasing and projected to rise by 46%, resulting in more than 8 million people with heart failure.

Heart failure is a slowly progressing, chronic condition that results from any anatomical or functional abnormality of the ventricular filling or blood ejection process. Patients typically present with fluid retention, dyspnea, tiredness, and a decreased tolerance to exercise (Hajouli & Ludhwani, 2022). According to Malik et al. (2022), coronary artery disease and myocardial infarction accounted for the majority of heart failure cases in the past. By then, the two main risk factors for heart failure had emerged

from coronary artery diseases and diabetes mellitus. Additional causes include congenital heart disease, myocarditis, hypertension, valvular heart disease, uncontrolled arrhythmia, restrictive cardiomyopathies, and constrictive pericarditis.

It can be difficult to pinpoint a specific cause of heart failure in an individual since heart failure is regarded as the chronic stage of any disease that results in cardiac functional impairment. The majority of comorbid illnesses share a set of risk factors, contribute to the pathophysiology of the syndrome, or are persistent variables rather than occurring independently of heart failure (Groenewegen et al., 2020). Many comorbidities are prevalent in most heart failure patients, and the proportion of patients with three or more chronic comorbidities increased from 68% in 2002 to 87% in 2014 (Conrad et al., 2018).

Management of heart failure includes both pharmacological and non-pharmacological interventions. Pharmacotherapy, surgical management (e.g., coronary artery bypass graft surgery, CABG), mitral valve repair, and device therapy (e.g., left ventricular assist device implantation) are popular therapeutic techniques in

the medical management of heart failure (Colucci, 2022). On the other hand, non-pharmacological interventions include patient education and self-care support. One of the primary responsibilities of heart failure nurses is to educate patients to enhance their understanding of the disease and their self-care practices (Huesken et al., 2021).

A healthy lifestyle is fundamentally based on self-care practices. Engaging in these activities can result in better mental and physical health (Torres-Soto et al., 2022). For patients with heart failure, self-care is doing what's required to avoid the disease's consequences in the first place: taking medication, exercising frequently, keeping an eye on symptoms (especially edema and weight control), and being prepared to respond to flare-ups (Jaarsma et al., 2021).

Heart failure patients who follow self-care guidelines report reduced symptoms, enhanced quality of life, fewer hospital readmissions, and lower mortality rates (Herber et al., 2021). Low health literacy, cognitive impairment, depressive symptoms, the existence of several comorbidities, and low self-efficacy to carry out self-care can all be factors that restrict individual's ability to practice self-care. Patients with heart failure who have low health literacy levels know less about their condition and practice worse self-care (Tinoco et al., 2021).

One of the most thorough theories of self-care is Orem's "Self-Care Deficit Theory" which offers a suitable clinical framework for developing and putting into practice self-care principles. Self-care, as defined by Orem's nursing theory, is defined as actions taken by patients to preserve, restore, or enhance their health. Patients should be viewed by nurses as strong, independent, responsible, and capable of making decisions who can effectively take care of their health, rather than as passive users of medical service (Rakhshani et al. 2022). Orem proposed three separate but interrelated theories that constitute the Self-Care Deficit Theory i.e., theory of self-care, theory of self-care deficit and the theory of nursing systems (JayaKumar et al., 2022).

In the theory of self-care, Orem explains self-care as actions an individual takes to take care of their own health. Self-care is practiced in order to meet the self-care requisites i.e., universal, developmental and health deviation self-care requirements. The patient will have a deficit in care if any of these requirements are not met. Nursing professionals identify this deficiency by carefully evaluating each patient's requirement and then choosing the best nursing system to meet their needs—a fully compensatory system, a partially compensatory system, or a supportive and educational system. In the framework of a supportive educational system, the nurse's roles

begin when the patient is ready to learn but needs assistance and direction to do so (Nasiri et al., 2023).

Significance of the study

Heart failure continues to be a condition with a high prevalence and a high one-year mortality rate (Emmons-Bell et al., 2022). There is typically a dearth of information regarding the frequency of heart failure throughout the Arab Middle East, including Egypt. In this region, an estimated 3.75 million people have been diagnosed with heart failure (Elasfar et al., 2020).

Even the advances in therapies, heart failure is still one of the most common reasons for hospitalization and readmission, and it is linked to a high rate of morbidity and death (Crespo-Leiro et al., 2018). Nurses on cardiology units play an important role in the health education and management of patients with heart failure (Arjunan & Trichur, 2020). However, not much is known about how well heart failure patients respond to self-care teaching. Thus, the goal of the current study was to assess the effectiveness of Orem-based self-care education on the knowledge and self-care behaviors of those patients.

Aim of the study

The study's aim was to evaluate the effectiveness of Orem-based self-care education on knowledge and self-care behaviors among patients with heart failure.

Research hypothesis:

- Heart failure patients who are exposed to Orem-based self-care education have better knowledge scores regarding their self-care behaviors, compared to before exposure.
- Heart failure patients who are exposed to Orem-based self-care education demonstrate an improvement in their self-care behaviors, compared to before exposure.

Subjects and Method

One group quasi-experimental research design was used.

Setting

The study was carried out at the Specialized Medical Hospital's outpatient clinic and cardiology unit, which are affiliated to Mansoura University Hospitals in Egypt. The cardiology unit has four rooms. Nearly nine beds, a handwashing sink, and a table for supplies and medications are found in each room.

Subjects

A Purposive sample of 65 male and female patients accessing the aforementioned setting and meeting the following inclusion requirements: had a confirmed diagnosis of heart failure for at least six months as confirmed by patients' medical records, able to communicate, willing to participate in the study, grant permission for telephone access, and available at the time of data collection. Unconscious patients, patients with mental illness, terminal illness, chronic kidney

disease on regular dialysis, or other medical diseases such as stroke or epilepsy were excluded.

Using the G*Power software version 3.1.9.7, the sample size was determined at a 95% significance level (alpha error probability of 0.05) and a 20% B error probability (80% power of study) and effect size (0.330) (Huesken et al., 2021). The calculated sample size was 59 and added 10% because of dropout to become 65 patients, so the study was conducted on 65 patients.

Data collection tools:

To get the required data and accomplish the study's objective, three tools were utilized:

Tool I: Structured Interview Questionnaire:

Researchers created this tool following a review of recent literature on the subject (Kolasa et al., 2022; Dalal et al., 2021; Hwang et al., 2020). It is divided into two parts:

Part 1: Demographic data of patients such as (age, sex, marital status, level of education, work, living situation, and income).

Part 2: Medical data like (disease duration, frequency of previous hospitalization, and other comorbidities).

Tool II: Atlanta Heart Failure Knowledge Test (AHFKT):

This tool was adopted from Reilly et al. (2009) and revised by Butts et al. (2018) to evaluate the level of knowledge required for patients with heart failure to engage in adequate and thorough self-care. With a total of 30 questions—24 multiple-choice and 6 true/false—it focuses on five knowledge domains: disease process/pathophysiology (2 items), nutrition (11 items), behavior (6 items), drugs (6 items), and symptom assessment/management (5 items).

Scoring system:

The total scores were calculated by summing the correct answers. Every right response receives one point, whereas missed or wrong answers receive zero. The total knowledge scores were computed out of thirty (30) grades and will be converted into percent, having poor knowledge (< 50%), having fair knowledge (50-74%), and having good knowledge (≥ 75%).

Tool III: The European Heart Failure Self-care Behavior Scale (EHFSBS):

This scale, which has been translated into 14 languages, was adopted by Jaarsma et al. (2003) to assess the self-care practices of patients with heart failure. This self-administered questionnaire addresses heart failure self-care behaviors, including daily weight monitoring, fluid restriction, rest, exercise, getting vaccinated, and contacting a physician. Twelve items make up the scale. Likert scales with five points are used to rate each item, with 1 representing total agreement and 5 representing

total disagreement. The twelve items incorporate questions about whether patients monitor their weight daily, take it easy if they experience shortness of breath, contact their physician or nurse in case of increasing shortness of breath, legs or feet swelling, weight gain of more than 2 kg in 7 days, experiencing fatigue, drink less fluid, taking rest during the day, eat a low salt diet, taking their medications as prescribed, getting vaccinated against severe cold, and exercising regularly.

Scoring system:

The item totals were added up to determine the overall scores. The overall ratings run from 12 to 60, with higher numbers denoting poorer self-care. Patients were categorized as follows: Having well self-care behavior (12-28) degree of the total score, having medium self-care behavior (29-44) degree of the total score, and having weak self-care behavior (45-60) degree of the total score (Bagheri –Saweh et al., 2018).

The validity of the study tools was evaluated by seven specialists in the domains of cardiology and medical surgical nursing to judge their clarity, relevance, understandability, and practicality. In light of that, the necessary modifications were made. Additionally, the consistency with which the research tools' score varied while being used was examined in order to evaluate their reliability by using Spearman's correlation coefficient. The study tools' respective values of 0.91, 0.89, and 0.90 ensured reliability.

Ten percent (7 patients) of the study subjects were used in a pilot study using the aforementioned tools to evaluate the clarity, feasibility, accuracy, and usefulness of the research tools in the previously described settings. Changes were implemented based on the findings from the pilot research. The study sample did not include any patients who took part in the pilot trial.

Procedure

- The research ethics committee of the faculty of Nursing at Mansoura University in Egypt provided ethical permission, along with an approval number was issued (Ref. No P. 0457).
- Formal administrative approval from the aforementioned setting was obtained prior to the study commencing. The general director of the Specialized Medical Hospital, which is affiliated to the Mansoura University Hospitals in Egypt, granted permission. The goal of the study, the date, and the time when the data collection began were communicated to the head of the cardiology unit.
- The framework of this study was developed using Orem's theory of self-care as a guide. The following sequences were used to apply Orem-based self-care education:

- **Step I (Preparation):** Tool I (the Structured Interview Questionnaire) was created by the researchers following a comprehensive review of the literature. The researchers adopted and translated Tool II (the Atlanta Heart Failure Knowledge Test) and Tool III (the European Heart Failure Self-Care Behavior Scale) into Arabic language.
- **Step II (Self-care agent):** From the aforementioned settings, the researchers selected the patients who met the inclusion criteria. They then introduced **themselves** to each patient and described the nature and purpose of the study. Each patient signed an informed permission authorization form. Using tool I (Structured Interview Questionnaire), an initial assessment was conducted for each patient individually through an interview in order to gather baseline data for the study subjects.
- **Step III (Self-care deficit):** the researchers interviewed each patient for approximately thirty minutes and **determined** each patient's knowledge as well as their self-care needs through Atlanta Heart Failure Knowledge Test (tool II).
- **Step IV (Educational booklet Preparation):** based on the previously determined self-care deficits and to encourage better self-care practices among heart failure patients, the researchers created an educational booklet, which was written in Arabic language and supported with pictures to help patients understand. It consisted of three units. The first unit covered heart functions, heart failure definition, causes, symptoms, diagnosis, and management. The second unit was about "living with heart failure" and included guidelines that must be followed to mitigate the severity of the disease as well as warning indicators that require contacting a physician. Lastly, the third unit which was about Self-care for heart failure patients and contained information about patients' diet, exercise, medications, energy conservation methods, warning indicators as well as common beliefs and facts regarding heart failure.
- **Step V (Implementation of Orem-based self-care education):** after developing the educational booklet, researchers scheduled educational sessions time and duration with each patient. The length of educational sessions ranged from 30 to 45 minutes based on each patient comprehension level and attention span. The material of the educational booklet was divided into three sessions "unit for each session". During these sessions, a variety of teaching techniques were used, such as interactive lectures, demonstration and redemonstration, and discussion between the researchers and the patients through questions and answers to assure understanding of each patient and any queries were

answered. Additionally, lectures were reinforced with videos, pictures, and handouts. A copy of the educational booklet on self-care as well as the researchers' phone numbers were given to each patient in case, they had any questions or needed to follow up.

- **Step IV (Evaluation):** Its main objective was to assess how well the Orem-based Self-care education affected the knowledge of patients with heart failure by administering tool II (AHFKT) both immediately after and one month later. **Furthermore**, tool III (EHFSBS) evaluated the self-care behaviors of patients for one and three months following the application of the Orem-based Self-care education.
- Over a span of six months, from the end of April 2023 to the end of October 2023, data was gathered by the researchers.

Ethical considerations

The Faculty of Nursing, Mansoura University, Egypt's Research Ethics Committee gave its authorization to the study (Ref. No P. 0457). Signed agreements from the studied patients were obtained after they were informed about the study objectives and reassured that the information gathered would only be used for research. The researchers emphasized that participation is entirely optional. Throughout the study period, confidentiality, privacy, safety, and anonymity were guaranteed. All data was coded, and all documents were kept in a locked cabinet to protect participants' confidentiality. Furthermore, all participants were made aware that their refusal to take part in the study would not affect their care.

Statistical analysis:

Data was collected, revised, tabulated, and statistically analyzed using Statistical Package for the Social Sciences (SPSS, Inc., Chicago, Illinois, USA) version 20.0. The mean, standard deviation (SD), range (minimum and maximum) were used to display the quantitative data, while numbers and percentages were used to present the qualitative data. The normality of data distribution was assessed using the Kolmogorov-Smirnov test before any calculations to verify whether the data was normally distributed. When comparing two groups of normally distributed data, the independent samples t-test was employed, and the F-test (ANOVA) was utilized when comparing more than two groups. The Mann-Whitney test (U-test) was used to compare data for abnormally distributed variables between two groups; Friedman and the Kruskal-Wallis test were used to analyze data between more than two groups. Using Pearson's coefficient (r), the study variables' correlation was evaluated. The results' significance was judged at the 5% level ($P \leq 0.05$).

Results

Table (1): Distribution of the studied patients based on their demographics (n =65)

Demographic data	No.	%
Age		
< 40 years	5	7.7
40 – <50 years	14	21.5
50-60 years	46	70.8
Min. – Max.	38.0 – 60.0	
Mean ± SD	53.82 ± 6.64	
Sex		
Male	43	66.2
Female	22	33.8
Marital status		
Single	3	4.6
Married	47	72.3
Divorced	4	6.2
Widow	11	16.9
Educational level		
Illiterate/ Primary education	33	50.8
Secondary /Technical education	17	26.1
University education	15	23.1
Work		
Worked	29	44.6
Not Worked	36	55.4
If yes (n = 29)		
Need physical effort	13	44.8
Not need physical effort	16	55.2
Residence		
Alone	9	13.8
With others	56	86.2
Income		
Enough	16	24.6
Not enough	49	75.4

SD: Standard deviation

Table (2): Distribution of the studied patients according to their medical data (n =65)

Medical Data	No.	%
Disease Duration (Years)		
< 4 years	13	20.0
4- < 8 years	23	35.4
≥ 8 years	29	44.6
Previous Hospitalization		
1 - 2 times	21	32.3
>2 times	44	67.7
Duration of Hospitalization		
< One week	18	27.7
One week	28	43.1
> One week	19	29.2
Presence of co-morbidities		
No	11	16.9
Yes	54	83.1
What are these co-morbidities (n=54)		
Diabetes Mellitus	24	44.4
Hypertension	42	77.8
Ischemic heart disease (IHD)	11	20.4
Liver Disease	15	27.8

Table (3): Comparison between the studied patients' knowledge prior to, just after, and 1 month after implementing the Orem-based Self-care education (n =65)

Domains	Before	Immediately after	After 1 month	Fr	P
Disease process/Pathophysiology					
Min. – Max.	0.0-2.0	1.0-2.0	0.0-2.0	114.136	<0.001*
Mean ± SD	0.49±0.56	1.49±0.50	1.46±0.56		
Nutrition					
Min. – Max.	2.0-10.0	4.0-11.0	4.0-11.0	121.247	<0.001*
Mean ± SD	6.03±2.25	8.74±1.81	8.62±1.88		
Behavior					
Min. – Max.	2.0-6.0	3.0-6.0	3.0-6.0	97.455	<0.001*
Mean ± SD	3.17±1.10	4.40±0.81	4.38±0.82		
Medications					
Min. – Max.	1.0-5.0	2.0-6.0	2.0-6.0	117.560	<0.001*
Mean ± SD	2.38±0.95	4.02±1.04	3.89±0.95		
Symptom assessment/Management					
Min. – Max.	1.0-5.0	2.0-5.0	2.0-5.0	107.663	<0.001*
Mean ± SD	2.71±0.84	4.35±0.79	4.22±0.78		
Overall Knowledge					
Min. – Max.	7.0-25.0	14.0-30.0	12.0-29.0	121.457	<0.001*
Mean ± SD	14.80±4.35	23.00±4.21	22.57±4.29		

SD: Standard deviation

Fr: Friedman test

*Significant at P ≤ 0.05

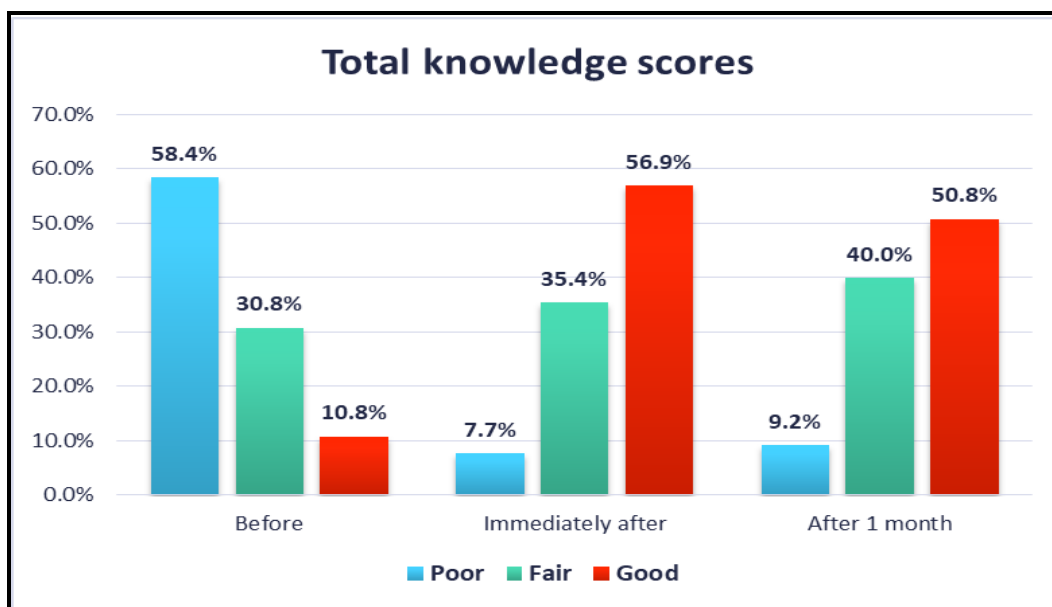


Figure (1): Percentages distribution of the studied patients regarding their total knowledge scores prior to, immediately after, and 1 month after implementing the Orem-based Self-care education.

Table (4): Comparison between the studied periods regarding patients' Self-care behaviors (n =65)

Items	Before	After 1 month	After 3 months	Fr	P
1. I weight myself every day.					
Min. – Max.	2.0-5.0	2.0-5.0	2.0-5.0	56.069	<0.001*
Mean ± SD	3.94±0.93	3.38±0.93	3.40±0.95		
2. If I get short of breath, I take it easy.					
Min. – Max.	1.0-5.0	1.0-4.0	1.0-4.0	79.355	<0.001*
Mean ± SD	3.45±0.87	2.66±0.76	2.67±0.75		
3. If my shortness of breath increases, I contact my doctor or nurse.					
Min. – Max.	1.0-5.0	1.0-4.0	1.0-4.0	64.389	<0.001*
Mean ± SD	2.88±0.82	2.25±0.79	2.28±0.80		

Items	Before	After 1 month	After 3 months	Fr	P
4. In case my feet inflammation increases, I contact my doctor or nurse.					
Min. – Max.	1.0-5.0	1.0-4.0	1.0-4.0	89.353	<0.001*
Mean ± SD	3.58±1.07	2.45±0.88	2.46±.89		
5. If I gain more than 2 kg weight in one week, I'll contact my doctor or nurse.					
Min. – Max.	1.0-5.0	1.0-5.0	1.0-5.0	99.442	<0.001*
Mean ± SD	3.97±0.92	2.85±0.83	2.87±0.84		
6. I limit the amount of fluids I drink (not more than 1½-2 L/day)					
Min. – Max.	1.0-5.0	1.0-5.0	1.0-5.0	82.409	<0.001*
Mean ± SD	3.71±1.18	2.45±0.90	2.52±0.89		
7. I take a rest during the day.					
Min. – Max.	1.0-5.0	1.0-5.0	1.0-5.0	70.056	<0.001*
Mean ± SD	3.51±1.36	2.77±1.01	2.78±1.02		
8. If I experience increased fatigue, I contact my doctor or nurse.					
Min. – Max.	1.0-5.0	1.0-4.0	1.0-4.0	65.360	<0.001*
Mean ± SD	3.12±1.01	2.52±0.75	2.54±.75		
9. I eat a low salt diet.					
Min. – Max.	1.0-5.0	1.0-5.0	1.0-5.0	82.178	<0.001*
Mean ± SD	3.28±0.93	2.42±0.88	2.42±0.88		
10. I take my medication as prescribed.					
Min. – Max.	1.0-3.0	1.0-3.0	1.0-3.0	53.529	<0.001*
Mean ± SD	2.15±0.81	1.66±0.69	1.69±0.71		
11. Every year, I get influenza vaccination.					
Min. – Max.	1.0-5.0	1.0-5.0	1.0-5.0	F= 0.000	1.000
Mean ± SD	3.95±1.77	3.95±1.77	3.95±1.77		
12. I exercise regularly.					
Min. – Max.	1.0-5.0	1.0-5.0	1.0-5.0	84.000	<0.001*
Mean ± SD	4.25±0.87	3.35±1.04	3.35±1.04		
Overall Self-care Behaviors					
Min. – Max.	23.0-48.0	16.0-45.0	19.0-45.0	125.980	<0.001*
Mean ± SD	41.78±6.98	32.69±7.93	32.97±7.87		

SD: Standard deviation

Fr: Friedman test

F: ANOVA test

*Significant at P ≤ 0.05

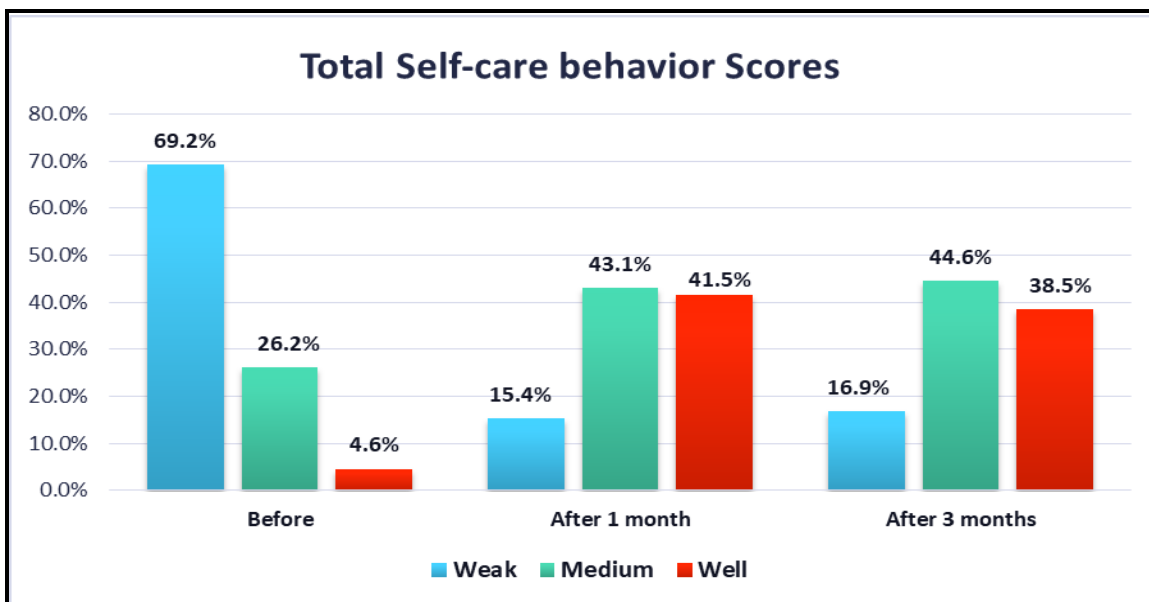


Figure (2): Percentages distribution of the studied patients regarding their scores of Self-care behaviors before as well as 1 & 3 months after education Orem-based Self-care education.

Table (5): Relation between the studied patients' total knowledge scores and their demographics before, immediately after, and 1 month after Orem-based Self-care education (n =65).

Demographic data	Total Knowledge Score		
	Before	Immediately After	1 month After
	Mean \pm SD	Mean \pm SD	Mean \pm SD
Age			
< 40 years	21.00 \pm 2.45	26.80 \pm 1.92	26.60 \pm 1.52
40 – <50 years	16.86 \pm 4.19	24.85 \pm 4.04	24.57 \pm 3.96
50-60 years	13.50 \pm 3.74	22.02 \pm 4.07	21.52 \pm 4.15
F(p)	11.580 (<0.001*)	5.249 (0.008*)	5.893 (0.005*)
Sex			
Male	14.41 \pm 3.92	22.58 \pm 4.44	22.21 \pm 4.43
Female	15.54 \pm 5.10	23.81 \pm 3.70	23.27 \pm 4.00
t(P)	-0.988 (0.327)	-1.122 (0.266)	-0.946 (0.348)
Marital status			
Single	13.67 \pm 3.79	20.00 \pm 6.00	20.00 \pm 6.00
Married	15.55 \pm 4.29	23.36 \pm 4.34	22.96 \pm 4.42
Divorced	15.25 \pm 7.68	24.25 \pm 4.35	24.00 \pm 3.92
Widow	11.72 \pm 1.49	21.82 \pm 2.96	21.09 \pm 3.177
F(p)	2.556 (0.063)	1.030 (0.386)	1.076 (0.366)
Educational level			
Illiterate/ Primary	11.64 \pm 1.674	20.33 \pm 3.51	19.79 \pm 3.48
Technical/ Secondary	15.94 \pm 2.88	24.88 \pm 3.14	24.47 \pm 3.22
University education	20.47 \pm 3.31	2.40 \pm 0.620	26.53 \pm 2.23
F(p)	68.711 (<0.001*)	24.719 (<0.001*)	27.468 (<0.001*)
Work			
Worked	16.62 \pm 4.35	24.62 \pm 3.83	24.34 \pm 3.80
Not Worked	13.33 \pm 3.80	21.69 \pm 4.10	21.14 \pm 4.16
t(P)	3.248 (0.002*)	2.946 (0.005*)	3.208 (0.002*)
If yes (n = 29)			
Need physical effort	13.62 \pm 3.15	22.38 \pm 4.50	22.15 \pm 4.43
Not need physical effort	19.06 \pm 3.64	26.44 \pm 1.82	26.13 \pm 1.93
t(P)	- 4.251 (<0.001*)	-3.295 (0.003*)	-3.237 (0.003*)
Residence			
Alone	13.44 \pm 3.13	21.44 \pm 4.64	21.00 \pm 4.97
With others	15.02 \pm 4.50	23.25 \pm 4.13	22.82 \pm 4.16
t(P)	-1.008 (0.318)	-1.197 (0.236)	-1.187 (0.240)
Income			
Enough	17.06 \pm 5.20	25.13 \pm 3.16	24.69 \pm 3.16
Not enough	14.06 \pm 3.81	22.31 \pm 4.31	21.88 \pm 4.40
t(P)	2.493 (0.015*)	2.409 (0.019*)	2.356 (0.022*)

SD: Standard deviation

*Significant at $P \leq 0.05$

t: Independent samples t-test

F: ANOVA test

Table (6): Relation between the studied patients' self-care behavior scores and their demographics before, immediately after, and 1 month after Orem-based Self-care education (n =65).

Demographic data	Total self-care behavior score		
	Before	1 Month After	3 Months After
	Mean \pm SD	Mean \pm SD	Mean \pm SD
Age			
< 40 years	30.60 \pm 1.95	22.80 \pm 2.77	23.00 \pm 2.35
40 – <50 years	40.93 \pm 8.30	31.64 \pm 9.45	31.86 \pm 9.10
50-60 years	43.26 \pm 5.72	34.09 \pm 7.07	34.39 \pm 7.09
H(p)	9.520 (0.009*)	9.622 (0.008*)	9.847 (0.007*)
Sex			
Male	42.28 \pm 6.50	33.02 \pm 7.87	33.28 \pm 7.84
Female	40.82 \pm 7.90	32.05 \pm 8.22	32.36 \pm 8.08
U(P)	414.500 (0.408)	446.500 (0.712)	441.500 (0.661)

Demographic data	Total self-care behavior score		
	Before	1 Month After	3 Months After
	Mean ± SD	Mean ± SD	Mean ± SD
Marital status			
Single	42.00 ± 8.66	36.00 ± 10.82	36.00 ± 10.82
Married	41.15 ± 7.33	32.38 ± 8.09	32.77 ± 8.02
Divorced	37.75 ± 8.46	26.50 ± 8.10	26.50 ± 8.10
Widow	45.91 ± 1.13	35.36 ± 5.62	35.36 ± 5.63
H(p)	5.078 (0.166)	4.083 (0.253)	3.969 (0.265)
Educational level			
Illiterate/ Primary	46.03 ± 0.98	37.03 ± 5.64	37.15 ± 5.74
Technical/ Secondary	40.06 ± 7.17	30.71 ± 7.71	30.71 ± 7.71
University education	34.40 ± 7.57	25.40 ± 6.42	26.33 ± 6.73
H(p)	24.980 (<0.001*)	22.771 (<0.001*)	20.201 (<0.001*)
Work			
Worked	39.17 ± 7.52	30.17 ± 7.83	30.55 ± 7.93
Not worked	43.89 ± 5.80	34.72 ± 7.53	34.92 ± 7.37
U(P)	319.500 (0.006*)	346.500 (0.020*)	362.000 (0.034*)
If yes (n = 29)			
Need physical effort	43.69 ± 5.76	35.23 ± 7.62	35.31 ± 7.62
Not need physical effort	35.50 ± 6.85	26.06 ± 5.28	26.69 ± 5.95
U(P)	38.000 (0.004*)	38.500 (0.004*)	41.500 (0.006*)
Residence			
Alone	43.67 ± 5.22	34.89 ± 8.28	35.00 ± 8.29
With others	41.48 ± 7.22	32.34 ± 7.90	32.64 ± 7.83
U(P)	208.000 (0.394)	198.000 (0.302)	200.500 (0.325)
Income			
Enough	38.50 ± 8.79	28.69 ± 6.90	28.94 ± 6.63
Not enough	42.86 ± 6.00	34.00 ± 7.88	34.29 ± 7.86
U(P)	243.500 (0.021*)	247.000 (0.026*)	243.500 (0.023*)

SD: Standard deviation

*Significant at P ≤ 0.05

U: Mann-Whitney test

H: Kruskal-Wallis test

Table (7): Correlation between total knowledge and self-care behavior scores during the studied periods (n =65)

Total mean score of self-care behavior	Mean ± SD	Total mean score of Knowledge	Mean ± SD	r (p)
Before	41.78 ± 6.98	Before	14.80 ± 4.35	-0.800 (<0.001) **
After 1 month	32.69 ± 7.94	Immediately after	23.00 ± 4.21	-0.770 (<0.001) **
After 3 months	32.97 ± 7.87	After 1 month	22.57 ± 4.29	-0.781 (<0.001) **

r: Pearson coefficient

** Significant at the 0.01 level (2-tailed)

Table (1): Displays that two thirds of patients were males, married, and aged between 40 to 50 years old with age (53.82 ± 6.64). Almost half of patients were illiterate or completed only primary education. Regarding studied patients’ work, the study showed that more than two fifths of the studied patients were engaged in physically demanding jobs. Most of the studied patients live with others and didn’t have enough income.

Table (2): Indicates that over half of patients suffered from the disease for 8 years or less. Moreover, 67.7% of the studied patients were previously hospitalized for more than two times with over two fifths of them spent a week in the hospital. Comorbidities were

found in 83.1% of the patients, with the majority having hypertension (77.8%) and over two fifths (44.4%) having diabetes mellitus.

Table (3): Compares the studied patients’ knowledge scores prior to, just after, and a month after the implementation of the education. It is clearly shows that the mean scores of patients' overall knowledge before (14.80±4.35), immediately after (23.00±4.21), and one month after (22.57±4.29) implementing the Orem-based Self-care education improved in a highly statistically significant way with “P” less than or equal 0.001.

Figure (1): Displays the percentage distribution of the studied patients regarding their total knowledge

scores prior to, immediately after, and 1 month after receiving Orem-based self-care education. Before the Orem-based Self-care education was implemented, it was found that more than half (58.4%) of the patients in the study had low knowledge scores, which became good in half (56.9% & 50.8%) of the studied patients respectively immediately and 1 month following the implementation.

Table (4): Compares the studied patients' self-care behavior scores before and 1 & 3 months following the implementation of the Orem-based Self-care education. The results showed that the studied patients reported highly statistically significant lower (better) scores on their self-care behaviors one month (32.69 ± 7.93), and three months (32.97 ± 7.87) following applying the Orem-based self-care education than before application (41.78 ± 6.98).

Figure (2): States the percentage distribution of the studied patients regarding their total self-care behavior scores before as well as 1 & 3 months following implementation of the Orem-based self-care education. Before implementing the Orem-based self-care education, 69.2% of the studied patients exhibited weak self-care behaviors which improved 1&3 months following implementation of the Orem-based self-care education to be well in two fifths of patients (41.5% & 38.5%) respectively.

Table (5): Demonstrates the relation between the patients' overall knowledge scores and their demographics before, immediately after, and 1 month after receiving Orem-based self-care education. It is quite evident that the knowledge of patients was highly statistically significantly correlated with their age, income, work status, and educational attainment. This means that better knowledge levels were linked to younger ages, work that doesn't require physical effort, better levels of education, and enough income.

Table (6): Shows the relation between the patients' overall self-care behaviors scores and their demographics before, 1 & 3 months following receiving Orem-based self-care education. It is clear that self-care behavior of patients was highly statistically significantly correlated with their demographics in terms of age, educational level, work status as well as income. This means that higher levels of education, work in occupations that doesn't require physical effort, younger ages, and having enough income were associated with improved self-care behaviors.

Table (7): Explains correlation between total knowledge and self-care behavior scores, which revealed a highly statistically significant correlations (with p-value <0.001) between them during the studied periods. This suggests that increasing the studied patient's knowledge led to improvement in their self-care behavior.

Discussion

Guidelines for heart failure patients emphasized the significance of educating patients about self-care. Improving patient outcomes, reducing mortality, and reducing readmission rates all depend heavily on self-care. A health care provider's role is crucial in providing patients with information, skills training, information adaptation, support for unique needs and talents, and collaboration in decision-making with patients (Jaarsma et al., 2021). Therefore, in order to improve the heart failure patient's knowledge and self-care behaviors, an Orem-based self-care education intervention was implemented after the patients' knowledge and behaviors were assessed in this study.

Regarding demographics of patients, the study found that almost two thirds of patients were males, married, and aged from forty to fifty years old with a mean of (53.82 ± 6.64). These results agreed with Abozead et al. (2021) who conducted their study in Egypt and revealed that married men made up the majority of patients in the study and control groups, with mean values of 55.6 ± 10.4 and 55.8 ± 10.7 respectively. Additionally, Mansouri et al. (2019) observed that most of subjects in control and treatment group were males, married with a mean age 54.14 ± 68.10 and 56.45 ± 78.11 , respectively. conversely, in a clustered randomized controlled trial in Northwest Ethiopia, Dessie et al. (2021) found that participants in the control group had a median age of 37.5 years and were significantly more likely to be female.

According to the study, half of the patients were either illiterate or only had primary education. It is agreed with Fahim et al. (2019) in their Egyptian study entitled "Determination of Knowledge and Self Care Behavior of Heart Failure Patients" who found that most of participants were uneducated or read and write. Furthermore, according to Mohammadzadeh et al. (2022), most of patients in the intervention and control groups were illiterate. Additionally, Jiang et al. (2021) said that over half of participants in the control and experiment groups had only completed primary school or no formal education. Nevertheless, Liljeroos et al. (2020) discovered that 61% of patients had completed their education beyond the primary level. Also, Abdolahi et al. (2020) said that the majority of participants in both control and intervention groups had bachelor's degrees. This could be as a result of the diverse study settings and different nature of the studied patients.

When it came to the work of the patients, it is observed that over two fifths of the studied patients worked in physically demanding jobs. This comes in accordance with an Egyptian study done by Fahim et al. (2019), which reported that over two fifths of

patients worked in a physically demanding job. Furthermore, the current study found that most of the studied patients live with others and didn't have enough income. This is in line with a study by **Ghattas et al. (2022)** that was conducted in Egypt and discovered that all of the participants lived with their family and had insufficient income. However, more than half of the control and examined groups live alone, according to **Wallström et al. (2020)**. Different study settings and the patients being studied may account for this.

According to the medical data of the patients under study, more than half of them had the disease for 8 years or less. Similarly, **Fahim et al. (2019)** indicated that most patients experienced heart failure for 7 years or less. Furthermore, more than half of both control and intervention groups had the disease for one to ten years, according to **Abdolahi et al. (2020)**. In contrast, **Hudiyawati et al. (2021)** reported that the majority of patients (78.1%) had heart failure for less than five years.

In reference to previous hospitalization, this study found that 67.7% of the studied patients had been hospitalized for more than two times. It agreed with **Pobrotyn et al. (2021)** who showed that 73.45 percent of participants had hospital stays in the previous year. Furthermore, approximately two fifths of patients had been hospitalized once or more in the previous year, according to **Kolasa et al. (2021)**.

According to the present study, comorbidities were present in 83.1% of the patients with hypertension making up most of such conditions (77.8 %). These outcomes agree with the findings of **Hudiyawati et al. (2021)**, who claimed that all participants had comorbidities and hypertension accounted for two fifths of them. In addition, **Yu et al. (2022)** discovered that more than half of the subjects had hypertension. Also, **Mohamed et al (2019)** found in both the study and control groups, almost two fifths of the patients had hypertension. On the other hand, **Dessie et al. (2021)** found that fewer patients in the treatment and control groups had comorbidities.

Concerning the effectiveness of the Orem-based self-care education on patient's knowledge, the current study demonstrated that there was a highly statistically significant ($P \leq .001$) improvement in the mean scores of patients' total knowledge before, immediately following, and one month following the implementation of the Orem-based Self-care education. These outcomes are consistent with the findings of **Tawalbeh (2018)**, who examined how cardiac education affected patients' knowledge and self-care behaviors and found that, compared to the control group, the experimental group's knowledge mean score improved significantly between the pretest and both the first and second posttests at P

$\leq .001$. These outcomes were corroborated by **Ghattas et al. (2022)** who found that the patients' overall knowledge of congestive heart failure disease significantly improved after the guidelines were implemented at $p < 0.001$. Also, **Wang et al. (2020)** clarified that the intervention group's posttest mean scores on heart failure knowledge had increased, and this improvement was highly statistically significant ($p < 0.001$).

These results are in opposition to those of a randomized controlled trial study about "Self-care educational intervention to reduce hospitalizations in heart failure" carried out by **Boyde et al. (2018)**, which found that although knowledge scores improved for both groups, there were no statistically significant differences between the intervention and control groups at the baseline ($p = 0.854$), after 3 months ($p = 0.166$), and after 12 months ($p = 0.612$).

The current study also showed that, prior to the Orem-based Self-care education being implemented, 58.4% of the studied patients received poor knowledge scores, which improved to good in over half of them (56.9% & 50.8%) immediately and one month later, respectively. It is consistent with research conducted in Egypt by **Abd Elaty et al. (2021)** who conducted their research on how adult congestive heart failure patients' health outcomes were affected by the implementation of a discharge plan and found that all patients (100%) in the study group had low knowledge scores on the pretest, but those scores improved to be good on the immediate and one-month posttests, respectively (82.9% & 80%). Furthermore, according to **Ghattas et al. (2022)**, only 25% of patients had adequate pretest knowledge scores, which improved to 66.7% in the posttest. Furthermore, **Roussia et al. (2023)** found that 83.3% of respondents had poor pretest knowledge scores, whereas 93.3% of respondents had adequate posttest knowledge scores.

Study findings on how well patients' self-care behaviors affected by Orem-based self-care education showed that the studied patients reported highly statistically significant lower (better) scores on their self-care behaviors one month (32.69 ± 7.93), and three months (32.97 ± 7.87) following applying the Orem-based self-care education than before application (41.78 ± 6.98). These results are in line with those of **Hwang et al. (2020)**, who discovered that patients in both intervention groups reported significantly lower (better) ratings on self-care behaviors as compared to patients getting standard care. Similarly, **Huesken et al. (2021)** found that self-care behavior and disease awareness in heart failure patients are persistently affected by nurse-led education and reported that the studied patients reported highly statistically significant lower (better)

scores on their self-care behaviors in posttest (25.69±9.60), and in follow up (29.66±11.70) compared to pretest (42.34 ±10.07).

Furthermore, **Peyman et al. (2020)** found that following the intervention and at the three-month follow-up, the intervention group's mean score for self-care behaviors was improved than those of the control group. Also, **Al-Sutari & Ahmad (2017)** revealed a significant difference ($P < 0.001$) in the mean self-care behavior scores between the intervention and control groups. Moreover, **Sahlin et al. (2022)** revealed that, prior to intervention, there was no difference in the self-care behaviors of the intervention and control groups; however, following intervention, the intervention group exhibited improved self-care behaviors. These results conflicted with those of **Boyde et al. (2018)**, who reported that despite improvements in the control and intervention groups' self-care behavior scores, there were no significant differences in any of the self-care behavior domains between them at baseline, as well as after three or twelve months.

About the relations between the study variables and patients' demographics, the present study discovered a highly statistically significant relationship between the patients' knowledge and their age, educational achievement, work status, and income, with higher knowledge levels being linked to younger ages, less physically demanding jobs, higher educational achievement, and sufficient income. **Kolasa et al. (2021)** reported a similar result, identifying a strong correlation between heart failure patients' knowledge level and their work and educational level, with patients had higher educational backgrounds and employed tend to have higher knowledge scores. Additionally, **Hailu Gebru et al. (2021)** discovered that respondents who were younger had better knowledge scores compared to those ≥ 55 years old. Conversely, **Roussia et al. (2023)** discovered no statistical correlation ($p > .05$) between the demographics and the degree of self-care knowledge.

For those who suffer from chronic conditions like heart failure, self-care is essential. It is intricate and affected by several elements, such as sociodemographic status. In this study, the findings demonstrated that the studied patient's self-care behavior significantly differed from each other in terms of age, educational level, work status as well as income before and 1 & 3 months after applying Orem-based self-care education, which means that higher levels of education, work in occupation that doesn't require physical effort, younger ages, and having enough income were linked to better self-care behaviors. This is corroborated by the findings of **Ghattas et al. (2022)** regarding educational level,

who found that, prior to and during the implementation of the guidelines, there was a highly statistically significant relationship between the patients' overall knowledge and their educational attainment, with knowledge increasing with education level. **Bagheri-Saweh et al. (2018)** also discovered a significant relation between patient's self-care behavior and educational attainment. Furthermore, younger persons were more likely than older adults to have better self-care, according to **Koirala et al. (2018)** in their integrative review about "Factors affecting heart failure self-care".

Conversely, **Patidar et al. (2021)** discovered no statistically significant correlation between the patient's age and educational achievement and heart failure self-care. **Getachew et al. (2022)** found no statistically significant association between the age and educational background of patients and their self-care behavior. As well, **Asadi et al. (2019)** discovered no statistically significant correlation between patient's self-care behavior and their demographics in terms of job status, education, and income level.

Regarding the correlation between the overall knowledge and self-care behavior scores, the research found that, during the studied periods, there was a highly statistically significant correlation, suggesting that improving the patient's knowledge would also enhance their self-care behavior. Similarly, **Roussia et al. (2023)** found that knowledge is a single, powerful factor that determines self-care behavior ($p < .001$), as patients with heart failure exhibit improved conduct in proportion to their increased understanding of self-care principles. However, **Jaarsma & Strömberg (2019)** asserted that knowledge by itself is insufficient to enhance patients' self-care behaviors.

Considering the importance of self-care behaviors promotion in the management of patients with heart failure, application of educational intervention based on Orem's theory is shown to be beneficial in enhancing the patient's ability to adopt effective self-care behavior through identifying patients' needs and gaps in knowledge (self-care deficit) and then providing necessary knowledge to enable them to recognize their symptoms, choose the best course of action, and adapt to their treatment.

Conclusion

The study concluded that, application of Orem-based self-care education significantly improved the knowledge and, consequently, the self-care behaviors of heart failure patients.

Recommendations

These recommendations are made considering the study's findings:

- Establishing an educational guideline based on Orem's theory to be used as a guide for nurses in giving adequate self-care education to heart failure patients before discharging from the cardiology units.
- To ascertain the long-term impacts of the educational interventions for patients with heart failure, a long-term follow-up is recommended.
- Future studies are required to identify effective strategies to enhance heart failure patients' comprehension of self-care.

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