



Does Patient-Centered Educational Intervention affect Clinical Outcome of Egyptian Patients with Heart Failure?

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ABSTRACT

Background: Patient-centered education helps patients understand their problem and reach shared decisions on self-monitoring and management. **Objective:** To evaluate the effect of patient-centered education on self-care behavior, symptoms severity and need for hospitalization. **Method:** A quasi-interventional study was done among patients attending the outpatient clinic, Zagazig University hospital. Patients were alternatively allocated to the intervention or control groups. Intervention group received patient-centered care while control group received classic consultations. Patients at pre- and post-intervention phases underwent assessment of self-care behavior using self-care of HF index (SCHFI) and New York Heart Association (NYHA) class. Hospital admission data were collected from the hospital electronic medical records. **Results:** A total of 95 patients were included; 49 intervention and 46 control patients. The average age was 53.6 ± 12.8 years in the intervention patients (51% females) and 53.2 ± 15.3 years in the control patients (69.6% females). Pre-intervention scores of SCHFI domains did not significantly differ between intervention and control groups. Post-intervention adequacy of self-care behavior among the control group did not significantly change. For the post-intervention adequacy in the intervention group, 40.8% achieved adequacy in self-care maintenance behavior, 59.2% adequately practiced self-care management, and 91.8% had adequate self-care confidence behavior. About 41% showed improvement in NYHA class vs 15.2% of control group ($P=0.005$). At 9-month, 4.1% of the intervention group were admitted more than one time vs 23.9% of control group ($P=0.01$). **Conclusions:** Patient-centered approach can effectively enable patients with HF to adopt adequate self-care behavior and to have a favorable clinical outcome.

INTRODUCTION

Heart failure (HF) is a complex clinical syndrome branded by progressive debilitating symptoms, significant morbidity and mortality.¹ It is considered a global epidemic that financially exhausting healthcare systems worldwide.² The cost spent by patients who had HF equals four times that spent by those without HF. Inpatient hospital admissions

alone accounts for two thirds of total HF expenditure.³ Unexpected readmissions due to HF remain high.^{2,4} Egyptian studies had reported that at one year, 29.8% of patients with HF were re-admitted⁵ and the overall annual estimated expenditure of treatments of patients with HF was \$0.356 billion where 25 to 56% of this cost was due to inpatient admissions.⁶

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It is estimated that most of HF hospitalizations are potentially preventable.⁷ Since recurrent deterioration of symptoms and subsequent hospital readmissions can be due to non-compliance with the complex medical regimen⁸ and lifestyle recommendations such as sodium reduction and fluid restriction.⁹ Self-care is the process of raising the patients' awareness of symptoms occurrence and how to deal with such symptoms so enabling them to maintain stability of their health status.¹⁰ Patients' self-care and medication adherence had shown significant improvement with decrease of unexpected readmission after receiving HF tailored patient education in previous studies.^{7, 11-12} Despite potentially favorable effects of patient self-care educational interventions, the results about its effectiveness among patients with HF remain inconclusive.¹³ In Egypt, patient education interventions are poorly implemented in the practice while there are major deficiencies in self-care behavior. Also, there are lack in of the studies evaluating the effect of such interventions.¹⁴⁻¹⁵ Therefore, this study aimed to evaluate the effect of implementing patient-centered educational intervention among patients with HF on self-care behavior as primary outcome and NYHA class and hospitalization at 9-month as secondary outcomes.

METHODS

A quasi-interventional study. The study included three phases: pre-intervention data collection from both groups, exclusive intervention in the intervention group, and 6-month post-intervention data collection from both groups three months after finishing intervention phase. The study was done through the period from Augst 2022 to November 2023 at outpatient clinics at Zagazig University Hospitals.

Patients with established HF aged ≥ 18 years were the targeted population. Those who had barriers to communication (e.g., cognitive impairment, hearing or visual challenges), patients with advanced HF who were prescribed for artificial heart device or transplant and those had other organ failure were excluded from the study.

Sample size was calculated using Open Epi program at power 80% and confidence level 95% depending on the effect size as assuming that mean of self-care management after educational intervention among patients with HF of the control group was 65.5 ± 12.2 versus 72.5 ± 11.3 in the intervention group according to Liou et al.,¹² so the sample size was calculated to

be 90 patients. Considering 10% dropout, the total included sample size was 100 patients with HF who were assigned equally into control group (classic care group) and intervention group (who were subjected to patient centered education in addition to classic care). Patients who discontinued to post-test were not included in the final analysis. Patients who completed study were 46 within control group and 49 within intervention group. Two patients within control group died and two discontinued follow up while one patient within intervention group died.

The participants were selected using a systematic random sampling technique. Alternate allocation was done as follows; patients attending on Saturdays, Sundays and Mondays were recruited into intervention group while those attending on other workdays were enrolled as control group

Data collection tools: It consists of four parts. *First part*; assessment of socio-economic class according to modified Fahmy et al.⁽¹⁷⁾ depending on the total score calculated into either high ($\geq 70\%$), medium (40% to less than 70%) or low level ($< 40\%$). *Second part*: classic sheet where patients were asked about intensity of current symptoms to classify them according to NYHA class, past, family, drug, surgical and social history and previous hospitalization. *Second part*: SCHFI version 6.2 is used to assess self-care behavior of victims with HF. It comprises three self-care subscales: self-care maintenance (10 items), self-care management (6 items) and self-care confidence (8 items). The Likert scale was utilized for measuring CHF self-care with values that fluctuating from 0-4 or 1-4, each, based on the rate of performance of self-care activities. Self-care management scale is recorded when the patient had dyspnea or leg swelling during the past month. Scoring standardization ranges at each scale from zero to 100 points to make them comparable. As scale had no definite cutoff value, so, we considered patients' self-care behavior adequate when score is $\geq 70\%$.⁽¹⁸⁾ Arabic translation was done via forward backward translation technique by aid of two independent bi-lingual experts to guarantee accuracy of translation process (Cronbach alpha for Arabic version=0.81). *Third part* was the NYHA class, as per the following definitions.¹⁷ Class I: No symptoms and no limitation in ordinary physical activity, e.g. shortness of breath when walking, climbing stairs etc. Class II: Mild symptoms (mild shortness of breath and/or angina) and slight limitation during ordinary activity.

Table 1: Comparison of demographic characteristics at baseline between the two study groups

Variables	Control group (n=46)	Intervention group (n=49)	P- value*
Age (years):			
Mean ± SD	53.2±15.3	53.6±12.8	0.880
Range	21-70	23-72	
Gender:			
Female	32 (69.6%)	25 (51%)	0.065
Male	14 (30.4%)	24 (49%)	
Level of education:			
Illiterate	9 (19.6%)	8 (16.3%)	0.647
Primary	9 (19.6%)	10 (20.4%)	
Preparatory	5 (10.9%)	11 (22.4%)	
Secondary	17 (37%)	15 (30.6%)	
University	6 (13%)	5 (10.2%)	
Current working status:			
Working	7 (15.2%)	9 (18.4%)	0.682
Not working	39 (84.8%)	40 (81.6%)	
Residence:			
Rural	19 (41.3%)	20 (40.8%)	0.961
Urban	27 (58.7%)	29 (59.2%)	
Marital status:			
Single	11 (23.9%)	6 (12.2%)	0.385
Married	21 (45.7%)	30 (61.2%)	
Divorced	7 (15.2%)	6 (12.2%)	
Widow	7 (15.2%)	7 (14.3%)	
Social class:			
Low	12 (26.1%)	17 (34.7%)	0.363
Moderate	34 (73.9%)	32 (65.3%)	

Data were presented age number and percentage except age. SD, standard deviation. p-value was calculated from chi-square test, with exception of age (t-test)

Class III: Marked limitation in activity due to symptoms, even during less-than-ordinary activity, e.g. walking short distances (20 to 100 m). Comfortable only at rest. Class IV: Severe limitations. Experiences symptoms even while at rest. Mostly bedbound patients. *Fourth part* was clinical examination. Complete physical examination including weight measurement was implemented. Echocardiography was done to measure left ventricular ejection fraction (LVEF).

Pilot study: was performed on 10% of the sample size (10 patients) and its feedback exhibited the clarity and the relevance of interviewing questionnaires that took about 20 minutes to be completed and there were no administrative obstacles. There weren't any modifications applied on the questionnaires, so the patients of pilot study completed the study.

The study was conducted at three phases; pre-intervention, Intervention, post-intervention. *Pre-intervention phase* at first interview included all

participants who were subjected to (a) Building initial rapport to launch an effective doctor-patient relationship. (b) collecting personal and medical history data about history of present illness particularly dyspnea severity grounded on NYHA functional classification and history of hospital admission, current medications and its financial funding. Patients were classified according to (LVEF).¹³ (c) Filling in SCHFI version 6.2 (d) At the end of this phase, patients were alternatively allocated into intervention group who included in intervention phase or control group who underwent classic care provided in the outpatient clinic. *Intervention phase* included tailored educational sessions according to in-depth interview for intervention group in the form of personal interview lasted for about 30 minutes. Patients were invited as possible to be accompanied by a family member or informal caregiver to be able to ask for support. The educational session started with needs assessment using responses from baseline questionnaires and in-depth interview to determine the individualized

Table 2: Comparison of the clinical data at baseline between the two study groups

	Control group (N=46)	Intervention group (N=49)	p-value
LVEF %, median (IQR)**	39 (35-56)	38 (31-45)	0.340
Duration of disease, median (IQR, years)**	3.5 (2-6)	3 (2-6)	0.856
Number of previous hospitalizations, median (IQR)**	1 (1-3)	2 (1-3)	0.291
Previous hospitalization:	36 (78.3%) 10 (21.7%)	43 (87.8%) 6 (12.2%)	0.217
No. of comorbidities:			
1-2	31 (67.4%)	29 (59.2%)	0.407
>2	15 (32.6%)	20 (40.8%)	
Smoking:			
Yes	9 (19.6%)	14 (28.6%)	0.589
No	32 (69.6%)	30 (61.2%)	
Ex-smoker	5 (10.9%)	5 (10.2%)	
Current medication:			
ACEI/ARBs	26 (56.5%)	22 (44.9%)	0.257
Beta blockers	27 (58.7%)	33 (67.3%)	0.382
Diuretics	27 (58.7%)	29 (59.2%)	0.961
Sacubitril/valsartan	11 (23.9%)	10 (20.4%)	0.169
Phenotypes according to LVEF%:			
HFpEF ($\geq 50\%$)	17 (37%)	11 (22.4%)	0.205
HFmrEF (41-49%)	5 (10.8%)	10 (20.4%)	
HFrEF ($\leq 40\%$)	24 (52.2%)	28 (57.2%)	
NYHA class:			
Class II	21 (45.7%)	23 (46.9%)	0.900
Class III	25 (54.3%)	26 (53.1%)	
Financing of treatment:			
Health insurance	12 (26.1%)	8 (16.3%)	0.442
Ministerial decisions	11 (23.9%)	11 (22.4%)	
Self-funded	23 (50%)	30 (61.2%)	

Data were presented age number and percentage unless indicated. IQR, inter-quartile range. p-value was calculated from chi-square test, unless indicated **Mann-Whitney test. LVEF, Left Ventricular Ejection Fraction; HFpEF, HF with preserved Ejection Fraction; HFmrEF, HF with minimally reduced Ejection Fraction; HFrEF, HF with reduced Ejection Fraction; ACEI, Angiotensin Converting Enzyme Inhibitor; ARBs, Angiotensin Receptor Blockers.

learning needs, styles, and obstacles that generally included information about basic knowledge about HF, medications, different aspects of self-care behavior and HF action plan. Arabic booklet about HF (including definition, understanding symptoms, living with HF entailing food and fluid, physical activity, adherence to medical advice, and red flags) were delivered to patients in intervention group to remind them with the needed information. Follow-up visits were done every one month for six visits through personal interview. During these visits, we reinforced the educational message and measure the ability of practicing self-care behavior.

Compliance of patients was reassured via telephone calls to them in between visits. Control group was also followed up on monthly basis and underwent

personal interview and classic care. Classic care included causal consultation visits. *Post-intervention phase* was conducted after three months from the last interview and included all participants who refilled SCHFI version 6.2 to allow comparison of patients' responses and clarify the effect of the conducted intervention. In addition to, assessment of NYHA class. Hospital admission history, at either inpatient or cardiology intensive care unit, during the period from first interview to end of study (nine months) was obtained from hospital electronic medical records. All patients were interviewed and examined and followed up by same family physician, Internist and cardiologist.

Statistical analysis: Statistical Package for Social Science (SPSS) version 26 was used to analyze the

collected data. Categorical variables were expressed as a number and percentage. Shapiro-Wilk test was utilized to check data distribution normality. Quantitative variables were expressed as mean $\pm$ SD (standard deviation) or median, IQR (inter-quartile range) according to data distribution type. For quantitative variables, independent samples t-test (t) was used to compare means of two groups was used for normally distributed data while Mann Whitney U test was used for non-normally

distributed data. For categorical variables, Chi square (X^2) test was used to compare the two studied groups. Percentage of change was calculated using the following equation; (after intervention scores minus before intervention scores) divided by before intervention scores) multiplied by 100. P value is defined as statistically significant at <0.05 and highly significant at <0.001 .

Table 3: Self-care behavior among both studied groups before and after intervention.

Domains of SCHFI	Control group (N=46)	Intervention group (N=49)	P-value ¹
Self-care maintenance domain' scores			
Before intervention	30.0 (20.0-48.3)	30.0 (23.3-33.3)	0.952
After intervention	33.3 (23.3-56.7)	70.0 (66.7-73.3)	$<0.001^{**}$
P-value²	$<0.001^{**}$	$<0.001^{**}$	
Self-care management domain' scores			
Before intervention	45.0 (25.0-50.0)	40.0 (27.5-45.0)	0.656
After intervention	45.0 (45.0-60.0)	95.0 (85.0-95.0)	$<0.001^{**}$
P-value²	$<0.001^{**}$	$<0.001^{**}$	
Self-care confidence domain' scores			
Before intervention	44.5 (33.4-51.4)	33.4 (27.8-50.0)	0.119
After intervention	50.04 (43.1-62.6)	83.4(77.8-89.0)	$<0.001^{**}$
P-value²	$<0.001^{**}$	$<0.001^{**}$	

Data were presented as median and inter-quartile range. P-value 1 was calculated using Mann-Whitney test, P-value 2 was calculated using Wilcoxon signed rank test, * $P<0.05$ is statistically significant, ** $P\leq 0.001$ is highly significant.

RESULTS

A total of 95 patients were included; 49 intervention and 46 control patients. The average age was 53.6 ± 12.8 years in the intervention patients (51% females) and 53.2 ± 15.3 years in the control patients (69.6% females). There were no statistically significant differences between both studied groups as regards their sociodemographic and clinical data (Tables 1 and 2). Scores of all SCHFI domains revealed statistically non-significant differences when comparing intervention and control groups before intervention, however, there were highly statistically significant differences between both groups after intervention where the higher scores were achieved by intervention group (Table 3). The percentage of change in all self-care behavior domains was significantly higher among intervention group than control group. Adequacy of self-care behavior including maintenance, management and confidence domains before

intervention was reported in the minority among control group (and intervention group. Percentage of adequate self-care maintenance behavior among intervention and control groups was 10.2% vs 13%, respectively ($P=0.666$) before intervention and was 40.8% vs 13%, respectively ($P=0.002$) after intervention. The percentage of patients who achieved adequate behavior among intervention and control groups before intervention was 8.2% vs 4.3%, respectively ($P=0.699$) while after intervention was 59.2% vs 17.4%, respectively ($P<0.001$). The percentage of adequate self-care confidence behavior among intervention and control groups was 8.2% vs 10.9%, respectively ($P=0.653$) and after intervention was 91.8% vs 17.4%, respectively ($P<0.001$, Figure 1). Regarding NYHA class and hospital admission rate there were statistically significant improvements after intervention among intervention group (Table 4). About 41% showed improvement in NYHA class vs

15.2% of control group ($P=0.005$). At 9-month, 4.1% of the intervention group were admitted more than one time vs 23.9% of control group ($P=0.01$).

Table 4: NYHA class and hospital admission among both studied groups.

Variables	Control group (N=46)	Intervention group (N=49)	P- value
NYHA class:			
I	5 (10.9%)	20 (40.8%)	0.003*
II	23 (50%)	19 (38.8%)	
III	18 (39.1%)	10 (20.4%)	
Percentage of improvement			
	7 (15.2%)	20 (40.8%)	0.006*
Hospital admission:			
Yes	28 (60.9%)	24 (49%)	0.245
No	18 (39.1%)	25 (51%)	
No. of hospital admission:			
1	17 (37%)	22 (44.9%)	0.010*
>1	11 (23.9%)	2 (4.1%)	

Data were presented age number and percentage. p -value was calculated from chi-square test. * $P<0.05$ is statistically significant.

DISCUSSION

To our knowledge, it is the first Egyptian study to evaluate effect of patient-centered approach on outcome of patients with HF. The current study revealed that pre-intervention inadequate level of self-care behavior while after intervention self-care behavior had improved in both groups particularly among intervention group who reported a highly significant improvement when compared with control group. This highlights the outstanding benefits of our educational intervention that was tailored according to patients' needs and. Numerous studies conducted in various countries and cultures as Jordan,¹¹ Faroe Islands,¹⁹ Tiawan,¹² China,²⁰ Northwest Ethiopia.²¹ in concordance with our findings. On the contrary, an Australian study showed that self-care scores did not significantly differ between both groups following multimedia educational intervention⁷. This can be attributed to that all patients received the same message with disrespect to their own needs and literacy level. Multimedia message can improve outcome, but personal interview and tailored education empowers patients making them a partner not such a receiver cutting out passivity and convalescence. So, the authoritarian role of physician which served as a root of illness denial and imprudent personal care will be conquered. This strengthens doctor patient relationship and improves outcome.

Emphasis on self-care and obligation for certain guidance gain utmost importance when an individual had diagnosed with a long-lasting disease like HF.

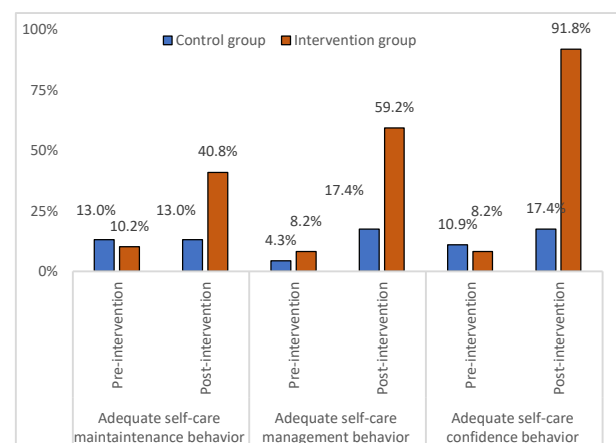


Figure 1: Multiple bar chart showing the percentage of adequate self-care maintenance, management and confidence behavior among both studied groups before and after intervention

Erroneous beliefs and knowledge impair adequacy of self-care, consequently patient education is imperative.²² Self-care involves new behavioral adjustment such as acquisition the skills that empower them to energetically observe and manage symptoms, learning how to adhere to the conglomerate medical regimens along with rehearsing strict lifestyle adjustments as sodium,

and fluid restriction, legitimate exercising and smoking cessation. Assessment of patients' attributes and learning needs help in attaining favorable planned consequences from HF self-care education.²³

Classic care in the current study recruited significant yet insufficient change in self-care scores. This clarifies value of integrated care in providing patients with patient-centered education through their family physician as a part of multidisciplinary team who provide preventive, continuous and follow-up services for these patients.

Our study demonstrated enhancement in clinical sequels among intervention group where NYHA functional class revealed significant upgrading in concordance with Liou and his colleagues¹². With respect to this study, hospital admission due to cardiac causes did not significantly differ at 9-month, however, number of hospitalizations significantly fell down among intervention group. Boyde et al.⁷ reported a significant reduction in hospital readmissions at 12 months in the intervention group with 30% cut of the risk of readmission due to adopted self-care educational intervention and Sezgin et al. denoted fewer hospital readmissions at three months yet with non-significant difference at 9-month.²⁴ A meta-analysis certified 20% reducing the probability of hospitalization due to HF with incorporating such programs within routine patients' care.²⁵ A recent systemic review conveyed that giving essential tailored information to those with HF can contribute to great cut-down in hospital readmissions and thus reaching better health outcomes and reducing healthcare costs.²⁶ Contrariwise, a large multi-center study in Canada ensued that transitional patient-centered care model in comparison to with classic care could not improve all readmission triggers at 30 days, conversely, they advocated need for further research.²⁷

This study was strengthened by the presence of comparative control group along with comparing intended measures pre-post intervention that makes the effect of conducted intervention clear. Current study was limited by being a single-center study conducted at one university hospital and on a relatively small sample size. Hospital admission data was recruited from records with potential bias. There are some difficulties during the process of our educational intervention, such as inability to supply each patient with a balance weight scale to enable them daily weigh themselves and non-compliance of most patients with regular exercise regimen.

However, we tried to overcome such difficulties by weight measurement at each visit, tailored education to overcome some myths and phone calls to increase patient compliance. Patients who were noncompliant despite these measures were excluded from study

CONCLUSIONS

Patient-centered educational intervention could effectively enable patients with HF to practice adequate self-care behavior leading to favorable clinical outcomes in respect to NYHA class and rate of hospital admissions due to cardiac causes at 9-month. We recommend integrating patient-centered educational intervention with usual care for patients with HF. HF-associated self-care behavior through validated disease-specific tools to identify changes should be evaluated on regular basis. Family physicians should have an active role in managing HF patients and act in multidisciplinary team with internist and cardiologist to improve their outcome.

Ethical Considerations

All participants understand the objectives of the study and their rights through a written informed consent obtained at the start of the study. They were reassured about the strict privacy of any given information. The protocol of the study was approved from the ethical committee and IRB "institutional review board" at Faculty of Medicine Zagazig University (IRB#:9279-2-2-2022).

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Conflict of Interest

All authors have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Author contributions

Amany M. AbdAllah: Idea, literature search, shared in data analysis, field work and writing; Nearmeen M. Rashad: Critical review and literature search, Randa M. Said: critical review, and literature search; Islam Elsayed Shehata: clinical examination, patient consultation, and critical review, Lamiaa Lotfy El Hawy: drafting and revising manuscript, Esraa Ibrahim Khalil: Patient interview, field work, literature search, shared in data analysis and

writing, Mahmoud A. Sharafeddin shared in field work, writing and drafting manuscript.

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