

Effect of Educational Program on Dietary Diversity and Nutritional Status among Heart Failure Patients

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Abstract

Background: Heart failure represents a clinical condition, characterized by cardiac damage, altered systolic and diastolic function, exercise intolerance as well as fluid retention. Foodstuffs are classified into several classes based on the variation in nutritional density. **Aim:** this work was aimed at identifying the effect of educational program on dietary diversity and nutritional status among heart failure patients. **Subject & Methods:** A quasi-experimental study. A purposive sample was 50 adult HF cases. Data were collected from cardiology department. Tanta University Hospital. Tools, three tools utilized within our research; **Tool (1)** Structured Interview Questionnaire it involved three parts. Part (A): Socio-demographic data. Part (B): Health relevant assessment sheet. (C): Laboratory investigation. **Tool (2)** Household Dietary Diversity Score. **Tool (3)** The Stanford Nutrition Action Program questionnaire: Part (1): The nutrition knowledge evaluation was determined utilizing a survey tool. Part (2): The nutrition self-efficacy scale. **Results:** It was revealed that score of nutrition related self- efficacy scale (100%) of study group stronger belief immediate and after three months implementation of program and a highly significant difference was documented in study group before and after implementation program (P=0.000). **Conclusion:** Our study addressed that HF cases exhibited low dietary diversity pre implementing the program and improved after implementation. **Recommendations:** The study's replication on a larger population. Applying educational dietary diversity program for HF cases rather than the traditional care, following the guidelines of care as well as illustrated patient education handout

Keywords: Dietary diversity, Heart failure, Nutritional educational Program

Introduction:

Heart failure (HF) represents a clinical condition that are characterized by cardiac damage, altered systolic and diastolic function, exercise intolerance, and fluid retention. Individuals diagnosed with HF have significant symptoms that affect their quality of life and are at a heightened risk of hospitalization and death (**McDonagh et. al (2021)**). It is a prominent reason for hospitalization among patients, and it has an unfavorable prognosis, addressing a mortality rate of 50% within four years after diagnosis (**Bragazzi et al (2021)**).

It has become more prevalent and results in significant costs, affecting both the quality and duration of life, as well as having social and economic consequences. Initiating prognostic treatment earlier in the illness progression aims to prevent the expenses associated with emergency hospitalization and the negative consequences of the disease, Heart failure has a significant socioeconomic influence and requires continued focus on its care (Fernandes et. al 2020).

Dietary diversity refers to a variety of meals or dietary types ingested during a certain timeframe. Foodstuffs are classified into several classes based on the variation in nutritional density. Some foodstuffs are high in energy, while others are rich in protein, minerals, or vitamins. Classifying food based on these criteria helps to find alternative options with comparable nutritional supplies. (**Balestracci 2018**)

The Dietary Diversity Score (DDS) is an important metric used to determine nutritional adequacy. Dietary diversity represents a qualitative measurement of food intake that considers a household's

access to a range of foods. It also serves as an indication of the nutritional sufficiency of people' diets (**Farhangi & Jahangiry 2018**).

Dietary diversity significantly affects nutrition and vitamin supply in a healthy diet. Increasing variation in daily food intake is linked to higher consumption of both macro and micronutrients. Dietary diversity score (DDS) may be associated with the occurrence of some non-communicable chronic diseases, involving cardiovascular diseases, malignancies, as well as metabolic syndrome (**Wawrzeńczyk et.al 2019**). Increased nutritional variety may provide higher protection against several chronic conditions. (**Sarrafzadegan N, Mohammadifard 2019**).

Nurses in cardiology wards must be cautious for ensuring proper nutrition levels for admitted cases and managing their dietary regimens. Monitoring client conditions involving vomiting, input-output, and electrolyte levels to adjust food components and maintain proper hydration, is crucial. (**Roshan et. al 2021**)

A nutrition education program provides information and assistance on the types and quantities of food needed to achieve daily nutritional requirements, (**Roshan et. al 2021**).

The Nutritional Educational Program should aim to enhance knowledge and, crucially, to rebuild confidence and promote a heightened feeling of perceived personal control. The approach should be tailored for the individual, after a dialogue between the nurse and the patient. Education must be offered through a discursive manner not a didactic one wherever feasible. Only providing

information during scheduled educational sessions is insufficient. It is important to evaluate current knowledge levels and identify learning requirements for individuals and groups in order to customize content accordingly. It should also demonstrate cultural sensitivity. Patients along with supporters should actively participate in the educational process by exchanging information to enhance knowledge acquisition. **(World Health Organization 2018)**

Significant of Study:

Dietary diversity is linked to longer life expectancy and a lower risk of degenerative conditions, involving cardiovascular diseases, diabetes, and cancer. In the hospitals setting, lack of knowledge among patients especially heart failure patients, such as the lack of specific guidelines, are obstacles against delivering effective nutritional therapy. This research was the first study at Tanta University Hospital addressing this subject to assist those patients.

Heart failure has a significant socioeconomic influence and requires continued focus on its care. Heart failure rates in Egypt are increasing by 15.2% yearly, thus, it is recommended that comprehensive patient education sessions be conducted by heart failure nurses or clinical pharmacists. **(Hassanein et. al 2023)** The patients' knowledge greatly improved after the nutritional health education program was implemented, confirming the program's efficacy in enhancing patients' awareness regarding HF. Illiterate HF patients lack illness information and struggle with self-care due to low education levels. This results in worsened symptoms, reduced quality of

life, and higher risks of hospitalization and mortality.

Therefore, this work was aimed at identifying the effect of educational program on dietary diversity and nutritional status among heart failure patients.

Aim of the study: -

Identifying the effect of educational program on dietary diversity and nutritional status among heart failure patients.

Research Hypothesis: -

The patients with heart failure who are given the nutritional educational program on dietary diversity is expected to exhibit improvement in their nutritional status.

Subjects and Methods:

Design: A quasi- experimental was utilized for achieving the study's aim.

Setting: Tanta University Hospitals' cardiology department, contains six rooms, the rooms contain eight beds in every room.

Subjects: A purposive sample of (n=50) adult HF cases selected from previous setting depending on Epi- info program in accordance with the inclusion and exclusion criteria. The sample size was determined utilizing Epi Info 7 statistical program according to patients' admission within hospital at 95% confidence power of the study and accepted error 5%. (n=1308) patients annually.

Inclusion criteria:

- Adult patients.
- Both sexes, patients.
- Conscious patients and able to communicate verbally or nonverbally.
- BMI was ranged between 18.5 to 30

Exclusion criteria:

- Impaired mental functions patients
- Morbid obesity patients.

- Underweight patients.
- Defensive hearing alterations.

Tools of data collection:

Three tools utilized for gathering relevant information, thus obtaining the study's aim, they involve the following.

Tool (1) Structured Interview Questionnaire:

A structured questionnaire following extensive reviewed of recent literatures (**Beauchamp et.al 2020, Fernadez et al 2021, Gastelurrutia et al 2018, Hashad & Mohamed 2022**) it involved 3 parts, involving

Part (A): Socio-demographic data, involving patients' Code, age, sex, marital status, educational level as well as employment, socioeconomic status determined by family monthly income, smoking history.

Part (B): Health relevant assessment sheet that included clinical information about medical history, vital signs, previous hospitalization, and past surgical history. Anthropometric profile, involving weight, height, and BMI was measured. Heart failure duration years. **Part (C): Laboratory investigation:** CBC, FBS (mg/dl), TC (mg/dl), TG (mg/dl), HDL (mg/dl), LDL (mg/dl), and Ejection fraction (%).

Tool (2) Household Dietary Diversity Score (HDDS)

This tool was introduced through (**Swindale & Bilinsky, 2006**) which was adopted and translated into Arabic by the researchers. The HDDS was introduced in 2006 as a component of the FANTA II Project as a population-level measure of household food availability. Household dietary diversity refers to the food groups' number ingested by a household within a certain timeframe, and serves as a crucial measure of food security for several

causes. A more diversified household diet is linked to caloric as well as protein sufficiency, protein percentage from animal sources, as well as household income (**Swindale & Bilinsky, 2006**). The HDDS indicator offers insight into a household's food access and socioeconomic level during the last 24 hours. The following set involves 12 dietary groups: A. Cereals, B. Root and tubers, C. Vegetables, D. Fruits, E. Meat, poultry, offal, F. Eggs, G. Fish and seafood, H. Pulses/legumes/nuts, I. Dairy products, J. Oil/fats, K. Sugar/honey, L. Miscellaneous) are utilized for the HDDS calculation.

Scoring system: The HDDS variable is computed for every household. This variable will have a value between 0 and 12. HDDS (0-12). Total food groups' number ingested by the household's members. Values for A through L will be either "0" or "1". Sum (A + B + C + D + E + F + G + H + I + J + K + L) Second, the average HDDS indicator is determined for the sample population. The closer the dietary diversity score to 12, and the total score presented in percentage as the following: Average HDDS

Sum (HDDS)

Total Number of Household

- Very good equal to or more 85%
- Fairly good equal to 75% to less than 85%
- Fairly bad equal to 65% to less than 75%
- Very bad equal less than 65%

Tool (3) The Stanford Nutrition Action Program questionnaire

The Stanford Nutrition Action Program questionnaire developed by **Howard et.al 1997**. The questions involved components evaluating knowledge of nutrition, as well as self-efficacy.

Part (1): The nutrition knowledge evaluation was determined utilizing a survey tool comprising of ten true and false item. **Scoring system;** The items were scored as 1=correct, and 0 =incorrect. It possessed a possible total score falling between zero and ten, undergoing scoring prior to educational intervention as well as following them.

Total level of patients' knowledge score.

Low level is below sixty percent
Moderate level falls between sixty and seventy-five percent

High level is above seventy-five percent

Part (2): The nutrition self-efficacy scale utilized while collecting data prior to and after intervention involves ten questions with Likert-like response choices comprising of five points. Each answer option regarding every question was rated over the scale from 1 (not at all certain) to 5 (extremely certain). The score range might vary from 1 to 50.

Scoring system:

Categorized as the following:

Low level: less than 15 score. Moderate level: 16-25 score. High level: 26-50 score

Methods of data collection.

Ethical consideration:

- Approval was granted by the faculty authorities to perform this research.
- Ethical permission was granted by the ethics committee of the Faculty of Nursing, Tanta University, with the code 300-9-2023.
- The study's nature did not cause any type of harm or pain to participants.
- Confidentiality as well as Privacy were considered while collecting data.
- All participants were asked to fill an informed consent after explaining the study's aim as well as their right to withdraw from participating at any point.

- Tools development: The researchers introduced all the study's tools following the revision of related literature with tools being utilized for gathering data except tool (2 & 3) which were introduced by (Swindale & Bilinsky, 2006 & Howard et.al 1997) respectively.

3- Validity of tools:

A panel of 10 experts in the fields of medical-surgical nursing, at the faculty of Nursing, cardiology field professor at the faculty of medicine, and public health at the faculty of medicine, assessed and confirmed the tools' content validity. The calculated content validity was found to be 98%. A code number was utilized as an alternative to a name.

4- Reliability of the tools

The tool (2) reliability: tested utilizing Alpha Crombachs factor as well as the result =0.91. the tool (3) reliability underwent testing utilizing Alpha Crombachs factor as well as the result =0.820.

5- A pilot study was carried out for testing the tools' practicality as well as applicability along with detecting any issues which could be faced during the data collection timeframe, being performed on a ten percent from patients accordingly, required modification was employed. Pilot study from patients was not included within the study sample.

- Duration of data collection from September 2023 to December 2023

6- Educational training program was conducted utilizing 4 phases involving; (assessment, planning, implementation and evaluation):-

- I. **Assessment phase:** In this tool used tools 1, 2 and 3, each patient was individually interviewed. The average time required for completing the questionnaire fell between ten to twenty mins, starting with the

sheets' distribution along with explaining the research's purpose as well as clarifying any questions-related issues, three assessments, before implementing the program, at the end of the program, and 3 month after the program.

Planning Phase: -

Each session began with a recap of the previous session's content and an outline of the next session's goals, utilizing basic language appropriate for the patients' level. Motivation and reinforcement were implemented in the educational sessions to improve learning. The booklets were given to the patients who were part of the study at the conclusion of the sessions.

-The program's primary objectives involve enhancing patients knowledges, with special focus on problems associated with nutrition.

Health teaching was employed for the study 10 group within 8 sessions; each session took twenty to thirty mins in five patients. The health teaching was created and delivered in Arabic.

This phase was developed using information gathered during the assessment phase and related literature study. During this phase, the teaching session was implemented. The teaching style involved group talks, demonstrations, as well as re-demonstrations. The teaching materials contained video tapes, PowerPoint presentations, and colorful handouts created by the researchers in Arabic language. These were provided to the patients as a guide and reference to help them understand all components of the education program.

Implementation phase:

Educational program was implemented by the researchers which were divided into 8 educational training sessions as following. During the first session, an introduction to

the health guideline and its objective was provided.

Session 1.

Researchers talked about prevalent problems associated with nutrition, involving overweight/obesity as well as cardiovascular disease. They also examined the vulnerability and severity of various health issues, as well as the advantages of proper nutrition for health. Furthermore, the researchers discussed barriers and several methods for avoiding detected barriers. Finally, the researchers discussed attitudes toward dietary change.

Session 2.

The researchers deliberated on foods categories, foods to restrict, as well as the foods they should consume more. Furthermore, they focused on the specifics of the dietary sugar as well as sodium, including secret sugar as well as sodium, along with their impact on health, and the ideal salt consumption. Furthermore, they spoke about choosing healthy options among the most suitable ones.

Session 3.

The researchers provided information about vegetable, fruits, potassium, fibers, vitamin A, vitamin C, cleaning techniques, storage, as well as cooking veges as well as fruits, alongside with suggested consumption quantities. The researcher examined the correlation between veges as well as fruits and health as a DASH diet principles' component aimed at reducing BP. They also addressed obstacles to consuming the appropriate amount of veges as well as fruits, providing strategies to deal with them. Furthermore, the researchers examined the phases of change readiness as regards increasing veges as well as fruits intake.

Session 4:

The researchers provided information about the types of whole grain foods, their significance, containing B vitamins, fiber, mostly iron-fortified, and others), storage safety, label identification, nutritional guidelines. Also, the researchers were discussed the whole grains' importance for health according to DASH dietary guidelines for reducing BP, and obstacles against obtaining optimum consumption, along with stating phases of change readiness as regards transition from favoring white-flour products towards whole grains' consumption.

Session 5:

The researchers provided information on meat, dairy products, beans, safety of food, preparing meals, calcium, iron, recommended caloric intake per day, fish, as well as lipids. The researchers spoke on the need of including dairy products containing low fats as well as others containing lean proteins into the diet to promote health, following the DASH dietary guidelines for managing hypertension. They also emphasized the distinction between dietary good as well as bad fats. The researchers examined obstacles to obtaining the necessary lean proteins along with strategies for dealing with them, as well as the phases of change involved in selecting low-fat choices.

Session 6:

The researchers provided information on facts about nutrition shown on labels, guidelines for interpreting labels, allergic foods, salt content, trans fats, and other related topics. They also reviewed the impacts of salt and trans fats on health and how to make optimal decisions by reading labels. The researchers also examined obstacles to reading and comprehending labels, as well as strategies for dealing

with them. The researchers examined the phases of change readiness to be considered for food labels.

Session 7:

The researchers provided information on meal planning, shopping, food safety, conserving money, and foods from community resources, including shopping to buy large amounts with and to other people. The researchers also spoke about creating menus that prioritize health, diversity, and attractiveness, as well as selecting healthier choices in fast food restaurants and convenience stores. Furthermore, the researchers were discussing obstacles to obtaining nutritious diets and strategies for dealing with them. The researchers examined the levels of change readiness regarding meal planning as well as food budgeting.

Session 8:

The researchers spoke on health promotion, illness prevention, adequate diet, obstacles, and behavior changes. The researchers received the assessment for their knowledge about nutrition and a self-efficacy survey at the start of the program for data collection.

Evaluation phase:

- Evaluation was done for patients three times before implementing the program by used all tools, at the end of the program and 3months used tool 1, part B, tool 2 and tool 3.

Statistical analysis of the data:-

The data went through organization, tabulation as well as statistical analysis utilizing statistical package for social studies (SPSS) version 23. As regards categorical data the number as well as percent were measured. Additionally, subcategories' variations underwent testing utilizing chi square X^2 through Friedman test. As regards numerical data the range,

mean as well as SD were measured. While comparing between more than 2 means the F variance of repeated measures analysis was employed. Also, while comparing 2 means paired sample t test was employed. Association among variables underwent an assessment utilizing Pearson's correlation coefficient (r). Significance level deemed to be set to $p < 0.05$ while interpreting tests' results of significance.

Results

Table (1) Illustrate distribution of the patients based on their socio- demographic characteristics. It reveals, near three quarters (72%) were in age of group 51-60 years, as well as (78%) were male and (84%) married. With regards to educational attainment and socioeconomic status, it was found that (60%) had diploma degree, while (64%) had low socioeconomic status.

Table (2): This table demonstrates, the studied cases based on the previous hospital admission, surgical history, and heart failure duration (years), it reveals that the majority (90%) had previous hospital admission, (76%) had no Previous surgical history, (40%) had history of hypertension, and (66%) had heart failure since from 3 to 5 years.

Table (3): Illustrate distribution of the cases based on the health assessment of vital signs and body mass index (BMI) pre, immediate and 3 months following the program intervention. This table reveals, there were significant and highly statistical significant variations were documented between groups as regards, temperature, blood pressure, and body mass index in pre, immediate and 3 months ($P= 0.018^*$, 0.000^* , 0.000^*) respectively.

Table (4): Illustrate distribution of the cases based on their clinical data about signs of heart failure pre, immediate and

three months post program intervention. A highly statistical highly significant variation was documented as regards signs of, swelling in feet or ankles, socks or shoes fit's, swelling go away by the next morning, abdomen is bloated, daily weight changed and patient's look frail ($P= 0.000^{**}$)

Table (5): Shows distribution of the cases based on the Personal barriers to healthy eating prior, immediate as well as 3 months following intervention. There were highly statistical significant difference within study group pre, immediate and post three months in low income, dislike of the taste of healthy food, cooking for one person and missing teeth ($P= 0.000^{**}$)

Table (6): Distribution of the cases based on the Laboratory investigation related to heart failure prior, immediate as well as 3 months following intervention, revealing that, a highly statistical significant variation was documented in study group before, immediate and post three months of implementation program intervention according to fasting blood sugar, serum cholesterol, HDL, LDL, serum triglycerides, ejection fraction. $P= 0.000$.

Table (7): Illustrate mean as well as SD of Household Dietary Diversity Score of the cases' prior, immediate as well as 3 months following intervention. The mean score was for the study group (7.088 ± 1.206) (12 ± 0.000) (12 ± 0.000) respectively before, immediate and post three months after implemented program, indicating highly statistical significant variation ($P= 0.000$).

Table (8) Illustrate distribution of the cases' prior, immediate as well as 3 months following intervention as regards their total knowledge score about nutrition. It reveals (100%) of study group exhibit

low levels of knowledge before implementing program while (100%) of the study group develop good knowledge after implementing program in immediate and after three months. A highly statistical significant variation was documented in study group before and after implementing program ($P=0.000$). Also, it represented in the Mean \pm SD, before, immediate and after three months. (0.98 ± 1.220) (9.98 ± 0.141) (9.98 ± 0.141) respectively.

Table (9) Illustrate distribution of the cases based on total score of Nutrition-Related Self-Efficacy scale prior, immediate as well as 3 months following intervention. This table showed, score of nutrition related self-efficacy scale, (100%) of study group stronger belief immediate and after three months of program implementation and a highly significant difference was documented within study group before and following program implementation

($P=0.000^*$), also represented Range in pre, immediate and 3 months after implementing program 10-11, 30-40, 35-40 respectively and also the Mean \pm SD = 10.34 ± 0.479 , 38.96 ± 1.124 , 35.42 ± 4.238 respectively.

Table (10): Shows association between total household dietary diversity Score (HDDS), total knowledge and total self-efficacy scores as well as the socio-demographic characteristics of the cases' preprogram intervention. Regarding, education a significant negative association was documented between education as well as Total household dietary diversity Score $r = -0.403$ & $P = 0.004^{**}$, Additionally, a significant positive association was documented between Socio-economic status, smoking and total household dietary diversity score with Total knowledge $P= 0.002^{**}$, 0.002^{**} and 0.000^{**} respectively.

Table (1): The studied cases' distribution based on their socio- demographic characteristics

Variables	The studied patients (n =50)	
	n	%
Age in years		
40 - 50	8	16.0
51 - 60	36	72.0
More than 60 years	6	12.0
Sex		
Male	39	78.0
Female	11	22.0
Marital status		
Married	42	84.0
Divorced	3	6.0
Widow	5	10.0
Occupation		
Clerical support workers.	13	26.0
Service and sales workers.	20	40.0
Skilled agricultural, forestry, and fishery workers.	6	12.0
house worker	11	22.0
Education		
Illiterate or read and write	9	18.0
Primary education	11	22.0
Diploma education	30	60.0
Household size, no(%) .		
1	7	14.0
2	22	44.0
3	13	26.0
4 or more	8	16.0
Socioeconomic status		
Low	32	64.0
Middle	18	36.0
Smoking status		
Non-smoker	23	46.0
Former-smoker	10	20.0
Current smoker	17	34.0

Table (2): Distribution of the studied cases based on the previous hospital admission, surgical history and heart failure duration (years)

Variables	The studied patients (n=50)	
	No	%
Previous hospital admission		
- Yes	45	90.0
- No	5	10.0
Previous surgical history		
- Yes	12	24.0
- No	38	76.0
History of diseases (Comorbidities)		
- Diabetes	18	36.0
- Hypertension	20	40.0
- Hyperlipidemia	12	24.0
Heart failure duration (years) among the studied patients		
- from 1- 3 years	9	18.0
- More than 3-5 years	33	66.0
- More than 5 years	8	16.0

Table (3): Distribution of the studied cases based on the health assessment of vital signs and body mass index (BMI) prior, immediate as well as 3 months following intervention

Items	The studied patients (n =50)						X ² P
	Prior to intervention		Immediate post intervention		3 months following intervention		
	(I)	(II)	(II)	(III)	(III)	(III)	
	(n= 50)	(n= 50)	(n= 50)	(n=50)	(n=50)	(n=50)	
	N	%	n	%	n	%	
Temperature							
- Normal	46	92.0	50	100.0	50	100.0	8.000
- hyperthermia	4	8.0	0	0.0	0	0.0	0.018*
Pulse							
- Bradycardia	7	14.0	0	0.0	0	0.0	2.632
- Normal	31	62.0	50	100.0	50	100.0	0.268
- Tachycardia	12	24.0	0	0.0	0	0.0	
Blood pressure							
- Normal	21	42.0	43	86.0	50	100.0	47.379
- Hypertension	29	58.0	7	14.0	0	0.0	0.000*
BMI category							
- Normal	20	40.0	20	40.0	50	100.0	60.00
- Overweight	30	60.0	30	60.0	0	0.0	0.000*

*Significant at (p < 0.05)

**Highly Significant at (p < 0.01)

Table (4): Distribution of the cases based on the clinical data about sings of heart failure prior, immediate as well as 3 months following intervention

Items	The studied patients (n = 50)						X ² P
	Prior to intervention (I) (n= 50)		Immediate post intervention (II) (n= 50)		3 months following intervention (III) (n=50)		
	N	%	n	%	n	%	
	Swelling in feet or ankles.	30	60.0	16	32.0	2	
Socks or shoes fit's.	20	40.0	38	76.0	48	96.0	40.267 0.000*
Swelling go away by the next morning.	41	82.0	50.0	100.0	48	96.0	14.889 0.001*
Abdomen bloated.	50	100.0	5	10.0	0	0.0	91.000 0.000*
Daily weight changed.	22	44.0	50	100.0	0	0.0	86.560 0.000*
Patients look frail.	50	100.0	8	16.0	0	0.0	86.560 0.000*

*Significant at (p < 0.05)

**Highly Significant at (p < 0.01)

Table (5): Distribution of the cases based on Personal barriers to healthy eating prior, immediate as well as 3 months following intervention.

Barriers for healthy eating	The studied patients (n = 50)						X ² P
	Prior to intervention (I) (n= 50)		Immediate post intervention (II) (n= 50)		3 months following intervention (III) (n=50)		
	N	%	n	%	n	%	
	Low income	24	48.0	35	70.0	38	
Dislike of the taste of healthy food	11	22.0	0	0.0	0	0.0	
Cooking for one person	10	20.0	10	20.0	7	14.0	
Missing teeth	5	10.0	5	10.0	5	10.0	

*Significant at (p < 0.05)

**Highly Significant at (p < 0.01).

Table (6): Distribution of the cases based on the Laboratory investigation related to heart failure pre, immediate and three months post program intervention.

Items	The studied patients (n = 50)						X ² P
	Prior to intervention		Immediate post intervention		3 months following intervention		
	(I) (n= 50)		(II) (n= 50)		(III) (n=50)		
	N	%	n	%	n	%	
Fasting blood sugar FBS (mg/dl)							6.000 0.05*
- Hypoglycemia	3	6.0	0	0.0	50	100.0	
- Normal	37	74.0	45	90.0	0	0.0	
- Hyperglycemia	10	20.0	5	10.0	0	0.0	
Serum Cholesterol (mg/dl)							40.00 0.000*
- Normal	24	48.0	44	88.0	24	48.0	
- Hyper	26	32.0	6	12.0	26	52.0	
Serum Triglycerides (mg/dl)							43.143 0.000*
- Hypo	0	0.0	0	0.0	0	0.0	
- Normal	22	44.0	40	80.0	50	100.0	
- Hyper	28	56.0	10	20.0	0	0.0	
HDL (mg/dl)							42.071 0.000*
- Normal	28	56.0	15	30.0	50	100.0	
- Hyper	22	44.0	35	70.0	0	0.0	
LDL (mg/dl)							54.889 0.000*
- Normal	14	28.0	36	72.0	50	100.0	
- Hyper	36	72.0	14	28.0	0	0.0	
Ejection fraction							73.678 0.000*
- HFrEF (EF < 40 %)	0	0.0	0	0.0	2	4.0	
HFmrEF (EF= 40% - 49%(-	35	70.0	6	12.0	31	62.0	
- HFpEF (EF > 50%)	15	30.0	44	88.0	17	34.0	

*Significant at (p < 0.05)

**Highly Significant at (p < 0.01)

Table (7): Mean and standard deviation of Household Dietary Diversity Score of the cases' prior, immediate as well as 3 months following intervention

Items	Mean ± SD	F P
Prior to program intervention	7.088± 1.206	583.4 0.000*
Immediate post-program	12 ± 0.000	
3 months following intervention	12 ± 0.000	

*Significant at (p < 0.05)

**Highly Significant at (p < 0.01)

Table (8) Distribution of the cases' prior, immediate as well as 3 months following intervention as regards the total knowledge score about nutrition.

Variables	The studied patients (n = 50)					
	Prior to intervention (I) (n= 50)		Immediate post intervention (II) (n= 50)		3 months following intervention (III) (n= 50)	
	No	%	No	%	No	%
Levels of knowledge						
Good	0	0.0	50	100.0	50	100.0
Poor	50	100.0	0	0.0	0	0.0
X ²	100.000					
P	0.000*					
Range	0-4		9-10		9-10	
Mean ± SD	0.98 ± 1.220		9.98 ± 0.141		9.98 ± 0.141	
F	2681.7					
P	0.000*					

*Significant at (p < 0.05)

**Highly Significant at (p < 0.01)

Table (9) Distribution of the cases based on total score of Nutrition-Related Self-Efficacy scale prior, immediate as well as 3 months following intervention.

Levels of Nutrition-Related Self-Efficacy	Nutrition-Related Self-Efficacy patients					
	Prior to intervention (I) (n= 50)		Immediate post intervention (II) (n= 50)		3 months following intervention (III) (n= 50)	
	No	%	No	%	No	%
Stronger belief	0	0.0	50	100.0	50	100.0
Negative belief	50	100.0	0	0.0	0	0.0
X ²	79.959					
P	0.000*					
Range	10-11		30-40		35-40	
Mean ± SD	10.34 ± 0.479		35.42 ± 4.238		38.96 ± 1.124	
F	29641.4					
P	0.000*					

*Significant at (p < 0.05)

**Highly Significant at (p < 0.001)

Table (10): Correlation between total household dietary diversity Score (HDDS), total knowledge and total self-efficacy scores and sociodemographic characteristics of the studied patients' preprogram intervention

Variables	Total household dietary diversity Score	Total knowledge	Total self-efficacy scores
	r P	r p	r p
Sex	-0.189 0.0188	0.111 0.442	0.177 0.218
Age	0.135 0.351	-0.158 0.273	0.134 0.352
Marital status	-0.059 0.682	-0.313 0.027	-0.307 0.030
Occupation	-0.196 0.173	0.074 0.609	-0.171 0.236
Education	-0.403 0.004**	0.054 0.711	0.091 0.532
Socio-economic status	0.250 0.080	0.288 0.002**	-0.011 0.942
Smoking	0.129 0.185	0.427 0.002**	0.240 0.093
Total household dietary diversity Score	-	0.622 0.000**	0.037 0.800

*Correlation is significant at the 0.05 level (2-tailed)

**Correlation exhibits a highly significance at the 0.001 level (2-tailed)

Discussion

Proper diet is crucial for HF cases due to electrolyte and vitamin imbalances and micronutrient deficiencies induced by diuretics usage (Roshan et. al 2021). nutritional recommendations state that nutritional diversity represents a key aspect of a healthy diet. Consuming a diverse range of meals is the greatest defense against chronic conditions. (Schuetz et al 2020)

Alliterated in dietary diversity consumption is linked to a higher likelihood of adverse events as well as worse clinical results among HF cases when hospitalized (Farhangi & Jahangiry 2018).

The nutrition process involves screening for nutritional risk, doing a nutritional assessment, creating a nutrition plan, monitoring progress, and communicating with the individual (Motoki et al 2019). Nursing duties include serving meals and preparing patients for eating by ensuring they are adequately positioned. Nurses are responsible for monitoring food intake, evaluating it, and trying to enhance oral intake. They also assess resistance to eating, either alone or in cooperation with dieticians and doctors. Research has shown that focusing on nutritional treatment and receiving support from nurses may boost food consumption in

hospitalized HF cases (**Rossello et al 2019**).

There is little research on the nursing care quality as well as organization as regards food service and assisting HF cases in meal selection. Therefore, it has been emphasized that HF cases should have adequate understanding of dietary risk screening and status assessment. Despite meticulous nutrition assessments and planning, the direct nutritional treatment along with serving for individual patients may be restricted in practice. (**Hassanein et. al 2023**)

Therefore this study aimed to, identifying the effect of educational program on dietary diversity and nutritional status among heart failure patients. The study's demographic data revealed that almost two-thirds of the cases examined were between 50 and 60 years old. This research aligned with McMurray et al (2020), who found that over 50% of their studied cases were between 50 and 60 years old. Bozkurt B et al (2021) found that most of the samples were over sixty years old and widowed, which contradicts the current research. No research included cases under 60 years old, except for a study by Mohamed M. G et al (2017) which found that Egyptians are more susceptible to cardiac conditions at a younger age. Possible explanations of this growth involve the gradual aging of the population, dietary changes, sedentary lifestyles, smoking, as well as stress.

This research found that most cases were male, comprising almost three quarters of the total. This finding aligns with the research conducted by **Awoke et al (2019)** that highlighted the previous

sentences. The current study aligns with **Elmaghraby et al.'s (2023)** findings, indicating that in Egypt, HF is more prevalent in rural areas due to a lack of medical education on disease risk factors, clinical manifestations, as well as treatment.

The study demonstrated a significant improvement in patients' vital signs and BMI after the program compared to before. This aligns with **Walters et al (2020)**, who found that physical activity, exercise, a healthy diet, avoiding obesity, and staying away from all forms of tobacco are linked to good cardiovascular health. In line with the current research, **Beauchamp et al. (2020)** emphasize that health behavior modification and education are crucial aspects of cardiovascular prevention and rehabilitation, particularly in addressing individual requirements. Embracing healthy habits is crucial for preventing along with managing CVDs.

In this research, involving HF cases, a significant number of them exhibited a poor Household Dietary Diversity Score (HDDS) before the program commenced, with a mean HDDS of 7.088 ± 1.206 . This conclusion is consistent with the findings of **Wawrzeńczyk et al. (2019)**, research assessing the relationship of HDDS with CVDs risk factors was found lower than this study.

Geographical and cultural factors significantly influence dietary and nutritional habits and should be taken into consideration. The recent research found a significant correlation between the, period developing HF, hypertension, smoking habits, as well as

dietary diversity. Cases having hypertension along with those developing prolonged history of HF exhibited a less diverse diet, but former smokers exhibited more family dietary diversity as opposed to non-smokers. Our findings indicated that those with elevated cholesterol levels and reduced ejection fraction were prone to have a less diverse diet. This conclusion is consistent with the findings of **Vaccaro et al. (2019)**, who also obtained similar outcomes.

The research found that hypertension is the most frequent medical condition linked to the HF occurrence. This finding aligns with the research of **Anker et al. (2021)** and **Bachmann et al. (2021)**, which identified hypertension as well as DM as the predominant risk factors among HF cases.

Regarding the feet edema as well as bloating in the belly, over half of the patients exhibited ankle edema and all cases developed abdominal bloating along with a fragile appearance. **Cleland et al. (2021)** found that 50% of the study participants had edema, which is an indicator for clinical HF.

Edema results from fluid retention in the body, often indicating deteriorating cardiac function. A larger proportion of cases post-program implementation exhibited no edema as opposed to most cases tested pre-program implementation who developed edema.

Koikai and Zahid Khan (2023) addressed that their educational program included topics such as HF, obstacles to seeking treatment, dry weight review, indications of fluid overload, as well as

the advantages of self-care and nutrition. The teach-back approach was implemented for verifying comprehension. The examined group exhibited lower cardiac death rates as opposed to controls. This outcome aligns with our findings.

Virani et al (2020) observed that a crucial aspect of the proposed criteria for clinical stability in chronic HF is the lack of congestion symptoms, involving orthopnea as well as edema.

The majority of the individuals investigated had prior hospital admissions. **Tsutsui et al. (2019)** observed that following recommendations led to a reduction in hospital readmissions from 5 to 0, reduced the duration of hospital stay from 15 to 3 days, and cut hospitalization costs by \$7,264 US. **Halliday et al. (2019)** contradicted this finding by reporting that the studies did not show statistically significant results regarding rehospitalization. However, they did find that the educational intervention decreased the risk of readmission by forty percent after twelve months. This might be attributed to the fact that the hospitals where these studies took place were already providing excellent treatment even without the use of an Educational Program.

In China, **Cui et al. (2019)** conducted an RCT on a nurse-led structured education program to enhance self-management skills along with decreasing hospital readmissions among chronic HF cases. The intervention group exhibited lower readmission rates as opposed to controls. A pilot

study conducted by Mizukawa et al. (2019) shown the feasibility and benefits of self-management as well as collaborative management techniques, suggesting future investigation in a larger sample.

Positive and significant correlations were recorded between total household dietary diversity Score (HDDS), as well as the mean adequacy ratio of nutrients (MAR). However, dietary diversity score is often considered a reliable method for assessing nutritional adequacy.

Conclusion:

Our study addressed that HF cases exhibited low dietary diversity pre implementing the program and improved after that. Additionally, among the cases, individuals developing hypertension, non-smokers as well as smokers along others experiencing high cholesterol level had less Dietary diversity score (DDS). Compared to post implementing the program. Also the findings addressed, the statistical significant variations on admission as regards symptoms as well as signs of heart failure in addition to signs of fluid accumulation between pre and after implementations of program.

Recommendations:

- The study's replication on a larger population.
- Applying educational dietary diversity program for HF cases rather than the traditional care, following the guidelines of care as well as illustrated patient education handout.
- Performing competency skills' evaluation annually, thus preserving high skilled nurses caring for HF cases along

with enhancing dietary diversity quality for patients' care.

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