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The Role of Nursing Educational Program in Improving Nutritional Status among Patients with Heart Failure

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ABSTRACT

Background: Heart failure (HF) is characterized by cardiac dysfunction, fluid retention, and subsequent exercise intolerance, significantly impacting patients' quality of life. Nutrition plays a pivotal role in managing HF, as dietary modifications can alleviate symptoms and improve clinical outcomes. Foods are categorized based on their nutritional density, which is critical for optimizing health in HF patients. Nurses play a key role in healthcare by providing education, empowering patients to make informed decisions, and enhancing healthcare efficiency through structured interventions. **Methods:** From (August 2 to February 8, 2024), 200 patients with HF were treated in the Sulaimani Cardiac Hospital in Sulaimani City using a quasi-experimental technique. The participants were divided into two groups: Intervention (100) and control (100). They completed a detailed questionnaire that included demographics, medical data, and a variety of examinations. The interventional group had exclusive access to the nutrition education program. Data were collected through direct interviews and processed with the Statistical Package for the Social Sciences, version (26). **Results:** The average age of the respondents was (68.3 ± 11.2) years. At first, both groups comprised (100) patients, however, the intervention group dropped to (94) and the control group to (90) owing to fatalities. The nutrition education program resulted in significant differences between the groups in high-density lipoprotein and cholesterol levels, blood electrolytes, waist-hip ratios, and hospitalization rates. **Conclusions and recommendations:** The intervention group showed greater improvements in nutritional status than the control group. A 12-week educational program improved eating habits, reduced hypertension, diabetes, cholesterol levels, and body weight, and increased awareness of healthier food alternatives. This demonstrates that such programs can enhance quality of life, and dietary habits, and perhaps reduce death rates in the intervention group compared to the control group.

Index Terms: Eating Habits, Heart Failure, Nutritional Educational Program, Sulaimani Cardiac Hospital

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1. INTRODUCTION

Heart failure (HF) has developed into a global pandemic, affecting about 64 million humans and costing $346.17 billion [1]. Chronic heart failure (CHF) is a complex clinical condition that represents the final evolution of all

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cardiac ischemic disease. It has a tremendous economic impact on the public healthcare system, with an incidence of approximately 5.8 million in the United States alone, costing $39 billion/year [2], and is steadily increasing in prevalence. The prognosis among individuals diagnosed with HF remains dismal, and there are few dietary interventions that have proved an improvement in clinical outcomes, as seen by the scarcity of evidence-based nutrition recommendations from major HF guidelines. Nutrition management for HF has traditionally centered on a balanced diet, salt, and fluid restriction, but in recent years, overall dietary patterns, as well as particular micro- and macronutrients, have attracted researchers' interest [3].

Nutrition in cardiovascular care focuses on reducing hypertension and diabetes in HF patients. Food not only expresses personal ideals but also provides enjoyment and support [4].

Behavioral and lifestyle modifications are critical for avoiding cardiovascular illnesses, including HF. Dietary patterns that protect against HF have recently received attention, such as the Dietary Approaches to Stop Hypertension (DASH) diet, which emphasizes fruits, vegetables, whole grains, and lean meats while restricting sugar, saturated, and trans fats [5].

The DASH diet lowers the probability of coronary artery disease and stroke by decreasing low-density lipoprotein cholesterol and saturated fat [6]. It, along with the Mediterranean and low-carbohydrate diets, is advised for controlling chronic illnesses such as diabetes and hypertension [7].

Changing diet in individuals with various chronic diseases might be difficult due to inconsistent findings about salt and fluid consumption [8], processed meats rich in salt may raise the risk of heart disease by raising blood pressure [9]. Proteins like arginine contained in the DASH diet can help lower blood pressure [10]. Patients with chronic disease may intake excessive amount of meat instead of more nutritious meals such as fruits and vegetables [11]. However, nutritional recommendations seek to lower hypertension, lipidemia, and obesity while also including non-pharmacological methods to HF care, such as low-sodium diets [12]. The DASH diet has been found to reduce blood pressure in people with hypertension, which is a major risk factor for HF [13]. Eggs, while high in cholesterol, provide high-quality protein and other nutrients at a reasonable cost, prompting controversy about their association with cardiovascular disease (CVD) [14], [15]. Incorporating plant-based proteins, seafood, and less processed diets can help reduce CVD risk. Excess sodium consumption should be limited to (2,000 mg) per day for HF patients, since it might increase fluid retention and exacerbate the condition [16].

Whole grains, such as brown rice, which are high in vital nutrients and fiber, have been related to lower inflammation and improved glucose management, but white rice, which has a higher glycemic index, may raise the risk of Type 2 diabetes [17]. The Canada's food guide recommends a balanced meal containing vegetables, protein, and whole grains to promote weight control and general health [18].

Patients with HF should check their weight on a regular basis since variations might indicate fluid imbalances and an increased risk of hospitalization [19]. Sudden weight fluctuations require medical care [20]. Dietitians propose that patients monitor their food and fluid consumption to better understand how their diet affects salt and fluid retention [21].

Nursing interventions make a big difference in patient outcomes. Nurses are in charge of executing initiatives targeted at disease prevention, health promotion, and patient care. Implementing nurse interventions is critical for improving patient outcomes and providing superior patient-centered care [22].

Individuals with HF require a balanced diet due to diuretic-induced electrolyte, vitamin, and micronutrient imbalances [23]. Nutritional standards highlight the need for dietary diversity for optimal health since eating a diverse range of foods helps avoid chronic illnesses [24]. However, increasing dietary diversity has been associated with an increased risk of adverse events and poorer clinical outcomes for hospitalized HF patients [25]. According to research, concentrating on nutritional treatment with nursing care can enhance food consumption in hospitalized HF patients [26]. Therefore, the purpose of this study was to investigate the impact of an educational program on nutritional status among patients with HF at Sulaimani Cardiac Hospital.

2. PATIENTS AND METHODS

2.1 Design of the Study

A quantitative approach (quasi-experimental study) was utilized to evaluate the efficacy of a nursing teaching program on the nutritional status of HF patients at Sulaimani Cardiac Hospital in Sulaimani City. The investigation was conducted between August 2nd, 2021, and February 8th, 2024.

2.2. Administrative Approval

The study protocol was approved by the College of Nursing-University of Sulaimani, and an official agreement letter from the College of Nursing-University of Sulaimani was sent to the Directorate of Health (Sulaimani Cardiac Hospital) to facilitate and ensure cooperation during the implementation of the Nursing education program.

2.3. Study Setting

This study was done at the Coronary Care Unit at Cardiac Hospital, which considered as the top hospitals for managing heart illness.

2.4. The Study Sample

A non-probability purposive sampling was used as a method for selecting samples in this study. Patients who were admitted to the Cardiac Hospital were diagnosed with HF by the cardiologists and were invited to participate in the study. Two hundred patients participated in this study. The participants were divided into two groups (100) recruited for the interventional and (100) for the control group. However, after implementing the nursing educational program, the intervention group decreased to (94) patients and the control group to (90) patients due to mortalities.

2.5. Inclusion and Exclusion Criteria

The study included adults aged (20) years and older diagnosed with HF with reduced ejection fraction, approved by a cardiologist team at least 3 months prior. Moreover, the patients had a right to refuse or withdraw from the study in any time they want. Exclusion criteria encompassed severe mental health issues, end-stage liver or renal failure, pregnant women, asthma, or chronic obstructive pulmonary disease, due to potential health impediments during the study period.

2.6. Instruments of the Study

The study tool was composed of three parts that represent demographic data of patients with HF such as (age, gender, marital status, educational level, residential area, and economic state). The second part deals with some clinical data such as (number of times admitted to hospital, body mass index, waist-hip ratio (WHR), and lipid profile, serum electrolyte, and, renal function test). Third part is previous medical history such as (Diabetes Mellitus, hypertension, and dyslipidemia).

2.7. Pilot Study

It was conducted with (20) patients from the initial study sample during the period of January (15th 2022) and then they excluded from the study sample.

2.8. Reliability of the Study Sample

The reliability was determined by the Cronbach Alpha Correlation Coefficient and Stability (test-retest) approach, producing a strong association (r = 0.85).

2.9. Approaches of Data Collection

All patients diagnosed with HF and admitted to the Cardiac Hospital in Sulaimani City were included in this study sample. Data were collected through face-to-face interviews with the patients for their information. The data collection period spanned from March 26th, 2022. Completing the questionnaire about HF took approximately 15 min. Two hundred patients participated with HF for both intervention and control groups. The researchers measured patient's blood pressure, body weight, body high, and recorded their investigations such as lipid profiles, serum electrolyte, and renal function test before and after the nursing educational program.

2.10. Statistical Analysis of the Study Sample

Version (26) of the Statistical Package of the Social Science (SPSS) was used to code and organize the data into computer files. (The inferential data analysis, frequency and percentage computation Chi-square, and independent t-test) were used to process the data.

3. RESULTS

Table 1 demonstrated that the total number of HF patients was 200, their mean age (±standard deviation) was 68.3 ± 11.2 years and the age range was between 38 and 100 years. No significant differences were detected in the age distribution or the mean age of the two study groups (P = 0.23 and 0.11 respectively). More than half of the intervention and control group (72% and 69%), respectively, were males. Half of intervention and control group (52%, 50%), respectively, were widower, and they live alone or with their children. While others were married and live with their wives or their husbands, the proportion of illiterate patients was higher in the control group than the intervention group (65% and 59%), respectively, while the proportion of secondary school and college graduates was higher in the intervention than the control group (14%, 7%). In the control group, housewife was slightly more than interventional group (25%, 29%). Almost all of the patients of the intervention group (95%) were living in urban areas compared to (87%) of patients of the control group. More than half of both group's incomes were insufficient (63%, 68%). This table showed that there were no significant differences between both groups in all

TABLE 1: Participants' sociodemographic and clinical characteristics (the own numbers are percentages)

Variables	Interventional group F (%) *n*=100		Control group F (%) *n*=100	Total	*P*-value
Age (years)	38–50	10	3	13	0.11*
	51–64	26	20	46	
	65–80	52	65	117	
	81–100	12	12	24	
	Mean±standard deviation	67.3±11.5	69.2±10.8	68.3±11.2	0.23**
Gender	Male	72	69	141	0.64*
	Female	28	31	59	
Educational level	Illiterate	59	65	124	0.62*
	Primary school	20	21	41	
	Secondary school	14	10	24	
	Institute and College	7	4	11	
Marital status	With husband	48	50	98	0.78 *
	Widower	52	50	102	
Occupation	Housewife	25	29	54	0.78*
	Retired	22	20	42	
	self-employee	21	21	42	
	Jobless	21	20	41	
	Governmental employee	7	7	14	
	Non-governmental employee	4	3	7	
Residency	Urban	95	87	182	0.048*
	Rural	5	13	18	
Living with	Alone	33	33	66	0.90*
	Son, daughter	19	17	36	
	Husband/wife	48	50	98	
Economic status	Insufficient	63	68	131	0.46*
	Barely sufficient	29	28	57	
	Sufficient	8	4	12	

*Performed by Chi-square test, **performed by independent t test

items of socio-demographic and clinical data at *P* value more than 0.05 except residential area.

Table 2 demonstrated the consumption status of various food items such as red meat, milk and dairy products, white rice, fruit, and drinking coffee that showed significant differences before and after the educational program between the two groups. In addition, the consumption status of fish and seafood, bread, nuts and seeds, fizzy drink, butter, cream and margarine, hydrogenated fat, lard, and skin also showed significant differences after the nursing educational program ($P \leq 0.001$).

Table 3 showed that before implementing the nutritional educational program, there were no significant differences observed between the intervention and control groups in laboratory investigations except high-density lipoprotein (HDL) and random blood (RB) glucose levels at ($P \leq 0.001$). However, the results after the educational program showed a significant difference between both groups in cholesterol, HDL, hemoglobin A1c, and RB Glucose levels ($P \leq 0.001$).

Table 4 documented that (48%, 57%) of intervention and control groups had a past medical history of Diabetes Miletus (DM), and (73% and 82%) of them had hypertension, respectively. (59% and 63%) of intervention and control groups had dyslipidemia, respectively.

The electrolyte results of the participants are presented in Table 5. Before the educational program, there were no significant differences in serum creatinine, serum sodium, serum potassium, and serum chloride between the control and intervention groups. However, post-educational program results indicated significant differences in serum creatinine, serum sodium, serum potassium, and serum chloride between the intervention and control groups ($P \leq 0.001$).

Table 6 indicated that there was no significant difference was observed in body mass index (BMI) before and after the educational program between the two groups; however, there was an improvement in decreasing the BMI.

Table 7 indicated that those male patients that falling within the normal range for WHR were (29.2% and 40.6%) in the intervention and control groups, respectively. Conversely, (70.8% and 59.4%) of individuals in both groups had WHR values in the abnormal range. Notably, there were no

TABLE 2: Comparisons between both groups related to dietary pattern before and after the nursing educational program

Variables	Interventional group F (%)	Control group F (%)	*P*-value
Red meat			
Pre-test			
Does not eat	0 (0)	0 (0)	0.003
1–3/day	17 (17.0)	12 (12.0)	
1–3/week	45 (45.0)	63 (63.0)	
1–3/month	38 (38.0)	25 (25.0)	
Post-test			
1–3/day	10 (10.6)	12 (13.3)	0.046
1–3/week	60 (63.8)	49 (54.4)	
1–3/month	24 (25.5)	29 (32.2)	
Fish and Seafood			
Pre-test			
Does not eat	37 (37.0)	50 (50.0)	0.251
1–2/day	0 (0)	0 (0)	
1–2/week	15 (15.0)	3 (3.0)	
1–2/month	48 (48.0)	47 (47.0)	
Post-test			
Does not eat	7 (7.4)	46 (51.1)	0.0001
1–2/day	0	0	
1–2/week	54 (57.4)	1 (1.1)	
1–2/month	33 (35.1)	43 (47.8)	
Chicken and poultry			
Pre-test			
Does not eat	0 (0)	7 (7.0)	0.059
1–3/day	11 (11.0)	4 (4.0)	
1–3/week	77 (77.0)	83 (83.0)	
1–3/month	12 (12.0)	6 (6.0)	
Post-test			
Does not eat	0	6 (6.7)	0.002
1–3/day	10 (10.6)	0	
1–3/month	6 (6.4)	13 (14.4)	
1–3 times/week	78 (83.0)	71 (78.9)	
Egg			
Pre-test			
Does not eat	19 (19.0)	9 (9.0)	0.298
1–3 times/day	14 (14.0)	26 (26.0)	
1–3 times/week	53 (53.0)	56 (56.0)	
1–3 times/month	14 (14.0)	9 (9.0)	
Post-test			
Does not eat	0	7 (7.8)	0.097
1–3/day	16 (17.0)	15 (16.7)	
1–3/week	59 (62.8)	46 (51.1)	
1–3/month	19 (20.2)	22 (24.4)	
Milk and dairy			
Pre-test			
Does not eat	20 (20.0)	15 (15.0)	0.000
1–3/day	46 (46.0)	2 (2.0)	
1–3/week	14 (14.0)	61 (61.0)	
1–3 times/month	20 (20.0)	22 (22.0)	
Post-test			
Does not eat	0	15 (16.7)	0.132
1–3/day	40 (42.6)	2 (2.2)	
1–3/month	10 (10.6)	34 (37.8)	
1–3 times/week	44 (46.8)	39 (43.3)	
Bread			
Pre-test			
Does not eat	0	0 (0)	1.000
1–3/day	86 (86.0)	86 (86.0)	
1–3/week	14 (14.0)	14 (14.0)	
1–3/month	0	0 (0)	
Post-test			
Does not eat	0	0	0.000
1–3/day	18 (19.1)	78 (86.7)	
1–3/week	34 (36.2)	12 (13.3)	
1–3 times/month	42 (44.7)	0	
Cake, biscuit, and pastry			
Pre-test			
1–3/day	10 (10.0)	14 (14.0)	0.001
1–2/week	65 (65.0)	62 (62.0)	
1–3 times/month	6 (6.0)	7 (7.0)	
Does not eat	19 (19.0)	17 (17.0)	
Post-test			
1–3/day	0	13 (14.4)	0.000
1–2/week	33 (35.1)	55 (61.1)	
1–3/month	21 (22.3)	7 (7.8)	
Does not eat	40 (42.6)	15 (16.7)	
Processed rice			
Pre-test			
Does not eat	0	3 (3.0)	0.023
1–2/day	56 (56.0)	45 (45.0)	
1–3/week	44 (44.0)	51 (51.0)	
1–3/month	0	1 (1.0)	
Post-test			
Does not eat	0	3 (3.3)	0.015
1–2/day	18 (19.1)	36 (40.0)	
1–3/week	56 (59.6)	50 (55.6)	
1–3/month	20 (21.3)	1 (1.1)	
Nuts, seeds			
Pre-test			
Does not eat	24 (24.0)	29 (29.0)	0.470
1–3/day	13 (13.0)	8 (8.0)	
1–3/month	7 (7.0)	7 (7.0)	
1–3/week	56 (56.0)	56 (56.0)	
Post-test			
Does not eat	0	26 (28.9)	0.000
1–3/day	22 (23.4)	8 (8.9)	
1–3/week	61 (64.9)	49 (54.4)	
1–3/month	11 (11.7)	7 (7.8)	
Fresh vegetables (cucumber)			
Pre-test			
Does not eat	12 (12.0)	13 (13.0)	0.808
1–3/day	31 (31.0)	23 (23.0)	
1–3/week	55 (55.0)	59 (59.0)	
1–3/month	2 (2.0)	5 (5.0)	
Post-test			
Does not eat	0	12 (13.3)	0.789
1–3/day	59 (62.8)	19 (21.1)	
1–3/week	35 (37.2)	54 (60.0)	
1–3/month	0	5 (5.6)	

(*Contd*...)

(*Contd*...)

TABLE 2: (*Continued*)

Variables	Interventional group F (%)	Control group F (%)	*P*-value
Fruit			
Pre-test			
Does not eat	10 (10.0)	9 (9.0)	0.000
1–3/day	57 (57.0)	66 (66.0)	
1–3/week	33 (33.0)	24 (24.0)	
1–3/month	0	1 (1.0)	
Post-test			
Does not eat	0	8 (8.9)	0.006
1–3/day	70 (74.5)	58 (64.4)	
1–3/week	24 (25.5)	23 (25.6)	
1–3/month	0	1 (1.1)	
Fried food			
Pre-test			
Does not eat	0 (0)	6 (6.0)	0.005
1–3/day	33 (33.0)	14 (14.0)	
1–3/week	54 (54.0)	22 (22.0)	
1–3/month	13 (13.0)	58 (58.0)	
Post-test			
Does not eat	41 (43.6)	19 (21.1)	0.001
1–3/day	0	6 (6.7)	
1–3/month	33 (35.1)	12 (13.3)	
1–3/week	20 (21.3)	53 (58.9)	
Lard and skin			
Pre-test			
Does not eat	8 (45.0)	2 (2.0)	0.632
1–3/day	3 (3.0)	13 (11.0)	
1–3/week	45 (45.0)	44 (44.0)	
1–3/month	45 (45)	41 (41.0)	
Post-test			
Does not eat	49 (52.1)	13 (14.4)	0.003
1–3/day	0	2 (2.2)	
1–3/week	24 (25.5)	32 (35.6)	
1–3/month	21 (22.3)	43 (47.8)	
Butter, cream, margarine			
Pre-test			
Does not eat	6 (6.0)	3 (3.0)	0.817
1–3/day	25 (25.0)	26 (26.0)	
1–3/week	52 (52.0)	59 (59.0)	
1–3/month	17 (17.0)	12 (12.0)	
Post-test			
Does not eat	35 (37.2)	26 (28.4)	0.000
1–3/day	0	3 (3.3)	
1–3/week	31 (33.0)	50 (55.6)	
1–3/month	28 (29.8)	11 (12.2)	
Hydrogenated fat			
Pre-test			
Does not eat	0	4 (4.0)	0.105
1–3/day	72 (72.0)	77 (77.0)	
1–3/week	28 (28.0)	17 (17.0)	
1–3/month	0	2 (2.0)	
Post-test			
Does not eat	0	4 (4.4)	0.037
1–3/day	36 (38.3)	70 (77.8)	
1–3/week	58 (61.7)	14 (15.6)	
1–3/month	0	2 (2.2)	
1–3/week	58 (61.7)	14 (15.6)	

(*Contd*...)

TABLE 2: (*Continued*)

Variables	Interventional group F (%)	Control group F (%)	*P*-value
Fizzy drink			
Pre-test			
1–3/day	23 (23.0)	17 (17.0)	0.982
1–2/week	29 (29.0)	33 (33)	
1–3/month	14 (14.0)	11 (11.0)	
Does not eat	34 (34.0)	39 (39.0)	
Post-test			
1–3/day	0	15 (16.7)	0.018
1–2/week	28 (29.8)	33 (36.7)	
1–3/month	13 (13.8)	11 (12.2)	
Does not eat	53 (56.4)	31 (34.4)	
Cups of tea			
Pre-test			
>5 cups/day	56 (56.0)	48 (48.0)	0.207
1–2 cups/day	21 (21.0)	28 (28.0)	
3–5 cups/day	23 (23.0)	22 (22.0)	
Does not drink	0	2 (2.0)	
Post-test			
>5 cups/day	23 (24.5)	19 (21.1)	0.054
1–2 cups/day	53 (56.4)	2 (2.2)	
3–5 cups/day	18 (19.1)	69 (76.7)	
Does not drink	0	0	
With or without sugar?			
Pre-test			
With sugar	84 (84.0)	90 (90.0)	0.845
Without sugar	16 (16.0)	8 (8.0)	
Post-test			
With sugar	62 (66.0)	88 (88.9)	0.032
Without sugar	32 (34.0)	8 (8.9)	
Coffee frequently			
Pre-test			
>3 cups/day	0	6 (6.0)	0.050
Does not drink	90 (90.0)	88 (88.0)	
1 cup/day	10 (10.0)	6 (6.0)	
Post-test			
>3 cups/day	0	6 (6.7)	0.0347
Does not drink	83 (88.3)	6 (6.7)	
1 cup/day	11 (11.7)	78 (86.7)	
With or without sugar?			
Pre-test			
With sugar	4 (4.0)	3 (3.0)	0.105
Without sugar	6 (6.0)	9 (9.0)	
Post-test			
With sugar	3 (3.2)	3 (3.3)	0.000
Without sugar	8 (8.5)	9 (10.0)	

*Performed by independent *t* test

statistically significant differences between the two groups, with a *P*-value of (0.180) before the educational program.

Following the educational program, there was a notable shift in WHR values. The percentage of individuals within the normal range increased from intervention group to (54.4%) but decreased from the control group to (38.1%). Meanwhile, the percentage of individuals with abnormal WHR values

TABLE 3: Comparisons between both groups regarding laboratory investigation before and after the nursing educational program

Variable	Interventional group F (%)	Control group F (%)	*P*-value*
Cholesterol (mg/dL)			
Pre-test			
High (≥240)	50 (50)	53 (53)	0.671
Borderline high (200–239)	22 (22)	17 (17)	
Normal (<200)	28 (28)	30 (30)	
Post-test			
High (≥240)	31 (33)	50 (55.6)	0.001
Borderline high (200–239)	36 (38.3)	14 (15.6)	
Normal (<200)	27 (28.7)	26 (28.8)	
Low-density lipoprotein (mg/dL)			
Pre-test			
High (≥160)	42 (42)	35 (35)	0.549
Borderline high (130–159)	40 (40)	47 (47)	
Normal (<130)	18 (18)	18 (18)	
Post-test			
High (≥160)	27 (28.7)	31 (34.4)	0.697
Borderline high (130–159)	48 (51.1)	43 (47.8)	
Normal (<130)	19 (20.2)	16 (17.8)	
High-density lipoprotein (mg/dL)			
Pre-test			
Low (<40)	61 (61)	76 (76%)	0.03
High (>60)	0	0	
Normal (40–60)	39 (39)	24 (24)	
Post-test			
Low (<40)	35 (37.2)	68 (75.6)	0.001
High (>60)	0	0	
Normal (40–60)	59 (62.8)	22 (24.4)	
TG (mg/dL)			
Pre-test			
Very high (≥500)	0	0	0.354
High (200–499)	53 (53)	46 (46)	
Borderline high (150–199)	35 (35)	35 (35)	
Normal (<150)	12 (12)	19 (19)	
Post-test			
Very high (≥500)	0	0	0.055
High (200–499)	30 (31.9)	41 (45.6)	
Borderline high (150–199)	51 (54.3)	33 (36.7)	
Normal (<150)	13 (13.8)	16 (17.8)	
Random blood glucose (mg/dL)			
Pre-test			
>125	49 (49)	66 (66)	0.02
<70	0	0	
70–125	51 (51)	34 (34)	
Post-test			
>125	15 (16)	49 (54.4)	0.001
<70	0	0	
70–125	79 (84)	41 (45.6)	
Hemoglobin A1c (%)			
Pre-test			
<7	7 (14.6)	12 (21.1)	0.391
≥7	41 (85.4)	45 (78.9)	
Post-test			
<7	30 (71.4)	9 (18.8)	0.001
≥7	12 (28.6)	39 (81.2)	

*Performed by Chi-square test

TABLE 4: Participant's previous medical history for other disease

Past medical history	Interventional group F (%) *n*=100	Control group F (%) *n*=100	Total	*P*-value
Diabetes mellitus	No			
	52	43	95	0.20*
	Yes			
	48 (48)	57	105	
Hypertension	No			
	27	18	45	0.13*
	Yes			
	73	82	155	
Dyslipidemia	No			
	41	37	78	0.56*
	Yes			
	59	63	122	

*Performed by Chi-square test

decreased to (45.6%) from the intervention group but from control group increased to (61.9%). Despite these changes, there were no significant differences between the intervention and control groups, as indicated by a *P*-value of 0.086. However, when comparing the pre- and post-program values within the intervention group, a significant difference emerged with a *P*-value of (0.001). This contrasted with the control group, there were no significant difference observed, as reflected by a *P*-value of (0.521).

The same table illustrates the WHR findings for the female gender in both intervention and control groups. Initially, (57.1% and 35.4%) of females in the intervention and control groups, respectively, had a normal WHR, while (42.9% and 64.6%) had an abnormal WHR, with no significant differences between the two groups ($P = 0.214$). Following the educational program, there was a noteworthy shift in WHR values among patients in the intervention group. The percentage of females within the normal range increased to (88.5%) in intervention group, and (51.9%) in the control group. Conversely, the percentage of females with abnormal WHR values decreased to (11.5%) and (48.1%) in the intervention and control groups, respectively. Importantly, a significant difference between the two groups emerged ($P = 0.004$) after the implementation of the dietary educational program.

Table 8 compares hospital admission frequencies between an interventional group and a control group over the last 12 weeks, both before (pre-test) and after (post-test) an intervention. It presents the number and percentage of participants in each category, including "Zero," "1 time," "2 times," and "≥3 times," along with the corresponding p-values for group differences. Key findings include:

TABLE 5: Comparisons between both groups related to electrolyte before and after the nursing educational program

Variable	Interventional group F (%)	Control group F (%)	P-value
Urea (mg/dL)			
Pre-test			
>45	20 (20)	26 (26)	0.001
<15	0	12 (12)	
15–45	80 (80)	62 (62)	
Post-test			
>45	22 (23.4)	37 (41.1)	0.012
<15	0	0	
15–45	72 (76.6)	53 (58.9)	
S. Creatinine (mg/dL)			
Pre-test			
>1.2	35 (35)	35 (35)	1
<0.2	0	1 (1)	
0.2–1.2	65 (65)	64 (64)	
Post-test			
>1.2	22 (23.4)	44 (48.8)	0.001
<0.2	0	5 (5.6)	
0.2–1.2	72 (76.6)	41 (45.6)	
S. Na (mmol/dL)			
Pre-test			
>145	0	0	0.735
<135	21 (21)	24 (24)	
135–145	79 (79)	76 (76)	
Post-test			
>145	0	0	0.001
<135	8 (8.5)	30 (33.3)	
135–145	86 (91.5)	60 (66.7)	
S. K^+ (mmol/dL)			
Pre-test			
>5	23 (23)	24 (24)	1
<3.5	0	0	
3.5–5	77 (77)	76 (76)	
Post-test			
>5	10 (10.6)	28 (31.1)	0.001
<3.5	10 (10.6)	1 (1.1)	
3.5–5	74 (78.8)	61 (67.8)	
S. Cl^-(mmol/dL)			
Pre-test			
>106	0	0	1
<98	0	0	
98–106	100 (100)	100 (100)	
Post-test			
>106	0	0	0.001
<98	12 (12.8)	0	
98–106	82 (87.2)	90 (100)	

*Performed by Chi-square test

TABLE 6: Comparisons between both groups concerning body mass index before and after the nursing educational program

Variable	Interventional group F (%)	Control group F (%)	Total F (%)	*P*-value*
Body mass index kg/m^2				
Pre-test				
18.5–24.9	5 (5)	7 (7)	12 (12)	0.908
25–29.9	24 (24)	26 (26)	50 (50)	
30–34.9	48 (48)	46 (46)	94 (94)	
35–39	23 (23)	21 (21)	44 (44)	
Post-test				
18.5–24.9	14 (14.9)	5 (5.6)	15 (8.1)	0.344
25–29.9	28 (29.8)	27 (30)	53 (28.9)	
30–34.9	38 (40.4)	48 (53.3)	92 (50)	
35–39	14 (14.9)	10 (11.1)	24 (13)	

*Performed by Chi-square test

TABLE 7: Comparisons between both groups related to waist and hip circumference before and after the nursing educational program

Variables	Interventional group F (%)	Control group F (%)	Total F (%)	*P*-value
Male WHR (0.90 cm or less) F (%)				
Pretest	21 (29.2)	28 (40.6)	49 (34.8)	0.180
0.90 or lower	51 (70.8)	41 (59.4)	92 (65.2)	
0.91and more	72 (72)	69 (69)	141 (100)	
Total				
Post-test	37 (54.4)	24 (38.1)	61 (46.6)	0.086
0.90 or lower	31 (45.6)	39 (61.9)	70 (53.4)	
0.91 and more	68 (68)	63 (63)	131 (100)	
Total				
P-value	0.001	0.521		
Female WHR (0.85 cm or less) F (%)				
Pretest	16 (57.1)	11 (35.4)	27 (45.6)	0.214
0.85 or lower	12 (42.9)	20 (64.6)	32 (54.2)	
0.86 or higher	28 (28)	31 (31)	59 (100)	
Total				
Post-test	23 (88.5)	14 (51.9)	37 (69.9)	0.004
0.85 or lower	3 (11.5)	13 (48.1)	16 (30.1)	
0.86 or higher	26 (26)	27 (27)	53 (100)	
Total				
P-value	0.006	0.789		

WHR: Waist-to-hip ratio
*Performed by independent t test

- Pre-test: No significant difference between groups in admission frequencies ($P = 0.555$).
- Post-test: A trend toward reduced admissions in the interventional group, though not statistically significant ($P = 0.059$).

This suggests a potential effect of the intervention on reducing hospital admissions.

Table 9 demonstrated that before implementing the nursing educational program, there were no significant differences observed in systolic and diastolic blood pressure, between

TABLE 8: Comparisons between both groups regarding numbers of admitting hospital during the past 3 months

Variable	Interventional group F (%)	Control group F (%)	Total F (%)	*P*-value*
How many times were admitted hospital during the last 12 weeks				
Pre-test				
0	9 (9)	10 (10)	19 (19)	0.555
1 time	22 (22)	30 (30)	52 (52)	
2 time	45 (45)	37 (37)	82 (82)	
≥3 times	24 (24)	23 (23)	47 (47)	
Post-test				
0	17 (18.1)	10 (11.1)	27 (13.5)	0.059
1 time	39 (41.5)	27 (30)	66 (33)	
2 time	27 (28.7)	32 (35.6)	59 (29.5)	
≥3 times	11 (11.7)	21 (23.3)	32 (16)	

*Performed by Chi-square test

TABLE 9: Comparisons between both groups related to systolic and diastolic blood pressure before and after the nursing interventional program

Variable	Interventional group F (%)	Control group F (%)	*P*-value*
Systolic blood pressure (mm. Hg)			
Pre-test			
≤100	22 (22)	24 (24)	0.938
≥140	15 (15)	14 (14)	
130–139	20 (20)	17 (17)	
120–129	43 (43)	45 (45)	
Post-test			
≤100	20 (21.3)	23 (25.5)	0.282
≥140	13 (13.8)	18 (20)	
130–139	18 (19.1)	19 (21.1)	
120–129	43 (45.8)	30 (33.4)	
Diastolic blood pressure (mm. Hg)			
Pre-test			
<80	23 (23)	24 (24)	0.175
≥90	2 (2)	9 (9)	
85–89	18 (18)	17 (17)	
80–84	57 (57)	50 (50)	
Post-test			
<80	21 (22.3)	20 (22.2)	0.006
≥90	1 (1.1)	12 (13.4)	
85–89	17 (18.1)	20 (22.2)	
80–84	55 (58.5)	38 (42.2)	

the control and intervention groups. The only significant difference was found in diastolic blood pressure at ($P \leq 0.006$) after dietary educational program.

4. DISCUSSION

Nutritional care of HF clients includes screening for nutritional hazards, providing information, conducting evaluations, designing tailored programs, tracking progress, and keeping ongoing communication with patients [27]. Nurses are essential in supporting HF patients with meals, monitoring intake, and working with dietitians. However, there is minimal research on nursing care quality in this area, and tailored nutritional therapy is frequently constrained in practice [28]. The demographic data from the study indicated that the average age of participants in both groups was (68.3) years. This is consistent with findings by (McMurray *et al*., 2021) [29], who reported that more than half of their cases were aged between 50 and 60. No studies included participants under (60) years old, except for (Mohamed *et al*., 2017) [30], who reported that Egyptians are more prone to cardiac conditions at a younger age. In the current study, younger patients in both groups made up about one-tenth of the total. This rise in cases may be attributed to population aging, dietary changes, and increasingly sedentary lifestyles. In addition, the majority of cases in this study were male, representing nearly three quarters of the participants. This finding is come along with the study of (Awoke *et al*., 2019) [31], who emphasized similar trends. However, it contrasts with the results of (Elmaghraby *et al*., 2023) [32]. HF is more common in rural areas due to insufficient medical education on disease risk factors, clinical symptoms, and treatment options, but this result is contrast with the current outcome because the majority of the present sample were lived in urban region, the researchers returned this outcome to background of that more than half of the HF patients in the current study were illiterate with bad economic state. The study showed a marked improvement in patients' vital signs and BMI after the program, compared to pre-program levels. This is consistent with (Walters *et al.,* 2020) [33], who found that regular physical activity, exercise, a healthy diet, weight management, and avoiding tobacco are key factors for cardiovascular health. Similarly with the study of (Beauchamp *et al.,* 2020) [34] highlighted the importance of health behavior modification and education, aligning with the current study's focus on addressing individual needs in cardiovascular prevention and rehabilitation.

Adopting healthy habits is essential for both preventing and managing CVDs. The current research identified hypertension as the most prevalent condition associated with HF, as nearly three-quarters of the intervention group and the majority of the control group had a history of hypertension. In addition, over half of both groups experienced DM and dyslipidemia, respectively. This finding is consistent with (Anker *et al.,* 2021; Bachmann *et al.,* 2021) [35], [36], who identified hypertension and diabetes mellitus as primary risk factors for HF. Concerning edema, both in the feet and abdominal bloating – which

contributes to overweight – over half of the patients exhibited ankle edema, and all cases experienced abdominal bloating. This study revealed that nearly half of both groups were obese before the educational program. However, post-program, the intervention group showed a slight reduction in obesity rates compared to the control group. The study of (Cleland *et al.,* 2021) [37] found that half of their study participants had edema, which is a marker of clinical HF. Edema, caused by fluid retention often due to excessive fluid intake, frequently signals worsening cardiac function. The study of (Koikai and Khan, 2023) [38] described their educational program as covering topics such as HF, complications related to seeking treatment, dry weight monitoring, signs of fluid overload, and the benefits of self-care and nutrition. They employed a teach-back approach to ensure comprehension. The interventional group in their study showed lower rates of cardiac deaths compared to the control group, which aligns with our findings. Before the last (12) weeks of the nursing educational program, nearly half of the intervention group and less than half of the control group had been hospitalized twice. However, the frequency of hospital admissions decreased more significantly in the intervention group compared to the control group. This outcome is consistent with the study of (Tsutsui *et al.,* 2019) [39], who observed a reduction in hospital readmissions following an educational program. Conversely, the study of (Halliday *et al.,* 2019) [40] did not find statistically significant results regarding rehospitalization rates but noted that the educational intervention reduced the risk of readmission after 12 months. This discrepancy may be due to the high standard of care already provided by the hospitals involved in these studies, even without an educational program. The study of (Cui *et al.,* 2019) [41] conducted a randomized controlled trial on a nurse-led structured education program aimed at improving self-management skills and reducing hospital readmissions among patients with HF. The intervention group in their study showed lower readmission rates compared to the control group. In addition, a study of (Mizukawa *et al.,* 2019) [42] demonstrated the feasibility and benefits of self-management and collaborative management techniques, suggesting that further investigation with a larger sample is warranted. This discrepancy may be due to the high standard of care already provided by the hospitals involved in these studies, even without an educational program. Regarding WHR for males and females in the current study, nearly three-quarters of males in the intervention group and more than half in the control group had abnormal WHR levels. Before the nursing educational program, there were no statistically significant differences between the two groups (P = 0.180). However, after the program, the intervention group showed a significant improvement in WHR levels compared to the control group, with a significant difference noted in the intervention group (P = 0.001). For females, more than half of those in the intervention group and nearly half in the control group had abnormal WHR levels before the educational program. There were no significant differences in WHR levels between the two groups before the program (P = 0.214). However, after the program, there was a significant change in WHR levels between the groups, with notable improvements in the intervention group (P = 0.004 and P = 0.006). The researcher noted that participants had long histories of unhealthy eating, multiple health issues, various treatments, and high-stress levels. Despite these challenges, the results of the study were considered valid, particularly given the short duration (only 3 months) of the nursing dietary educational program. This outcome contrasts with the study of (Ballin, 2023) [43] who stated that altering abdominal or visceral fat within a short intervention period is unlikely, especially for patients with CVD who are physically inactive and follow an unhealthy diet. Despite this, the current study found that the nursing educational program led to significant improvements in various aspects related to quality of life (QoL), such as dietary patterns, in the intervention group compared to the control group. This finding is consistent with studies by (Akbari *et al*., 2019; Stavrianopoulos, 2016; Liou *et al*., 2015; Al-Hchaim and Hamza,2012; Harris, 2012; Ali *et al*., 2019; and Świątoniowska-Lonc *et al*., 2020) [44], [45], [46], [47], [48], [49] and [50], all of which reported that improvements were predominantly observed in the intervention group compared to the control group after their respective programs. Furthermore, the study by (Kakabra and Abdulsahib, 2021) [51] in China and (Lainscak *et al.,* 2011) [52] in Sulaimani City aligns with recent findings because their program was associated with improvements in dietary practices, monitoring recommendations, and social support and the nutritional regimen significantly influences dietary habits and effectively regulates blood pressure in the participants. Most notably, it led to a reduction in the readmission rate within the first (12) months post-discharge. Patients with HF encounter difficulties in self-care due to personal, illness-related, and support-related factors. Healthcare professionals can influence this understanding to develop personalized education programs, offer psychological support, and provide financial assistance. These measures aim to enhance self-care and improve treatment outcomes for HF patients (Cui *et al.,* 2019) [41].

5. CONCLUSION

The intervention group experienced more significant improvements in nutritional status than the control

group. The (12-week) educational program resulted in better eating habits, lower hypertension, reduced diabetes and lipids levels, decreased body weight and hospital readmissions, and greater awareness of healthier food choices. These outcomes indicate that similar programs can enhance QoL, improve dietary habits, and potentially lower mortality rates among participants compared to those in the control group.

This educational programs are recommended to be available in every coronary care unit enhance the knowledge of nurses concerning health education related to healthy nutrition and the consequences of a healthy diet on heart failure disease patients.

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