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Effect of Therapeutic Education on Adherence and Quality of Life in Heart Failure

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Abstract

Background: Heart failure is associated with poor treatment adherence and impaired quality of life. Therapeutic patient education (TPE) has demonstrated benefits in Western countries but remains poorly evaluated in sub-Saharan Africa. **Objective:** To assess the effect of a structured therapeutic education program on treatment adherence and quality of life in patients with chronic heart failure at the University Hospital of Brazzaville. **Methods:** This was a prospective cohort study conducted from February to August 2020. Patients hospitalized for chronic heart failure were assigned to an educated group (n = 51) receiving a structured five-session therapeutic patient education program or to a non-educated control group (n = 87) receiving usual care. Outcomes were assessed at three months using the Girerd adherence test, the Minnesota Living with Heart Failure Questionnaire (MLHFQ), and the DERIC knowledge questionnaire. **Results:** At three-month follow-up, good adherence was observed in 65.3% of educated patients versus 16.9% of controls ($p < 0.001$). Mean Girerd score was 0.6 ± 0.9 in the educated group versus 3.2 ± 2.3 in controls ($p < 0.001$). Good quality of life was achieved in 83.7% of educated patients versus 40.3% of controls ($p < 0.001$). Mean Minnesota score was 12.3 ± 15.1 versus 50.1 ± 30.2, respectively ($p < 0.001$). Sufficient knowledge of heart failure was found in 69.4% of educated patients versus 13.9% of controls ($p < 0.001$). Rehospitalization rate was 7.8% in the educated group versus 22.9% in controls ($p = 0.02$). Mortality was 3.9% versus 19.5% respectively ($p = 0.01$). **Conclusion:** Therapeutic patient education was associated with significant improvements in treatment adherence, quality of life, disease knowledge, and short-term clinical outcomes in patients with heart failure in a sub-Saharan African setting.

Keywords

Therapeutic Education, Heart Failure, Adherence, Quality of Life, Brazzaville, Sub-Saharan Africa

1. Introduction

Heart failure is a chronic and progressive condition associated with high morbidity, frequent hospitalizations and impaired quality of life [1]. Despite therapeutic advances, long-term management remains challenging and largely depends on patients' adherence to treatment and lifestyle recommendations [2]. Poor adherence to medication and inadequate implementation of hygienic and dietary measures are common and contribute to disease progression and poor outcomes [3].

Therapeutic education of patients has been defined by the World Health Organization as a structured and continuous process aimed at enabling patients to acquire and maintain the skills necessary to manage their chronic disease [4]. In heart failure, therapeutic education is recommended as an integral part of patient care and focuses on improving knowledge of the disease, treatment adherence, self-care behaviors and quality of life [5] [6]. European and American guidelines assign therapeutic education a class I, level A recommendation, positioning it at the same level as pharmacological therapies [5] [6].

Evidence of efficacy from North American and European studies demonstrates that multidisciplinary therapeutic education reduces rehospitalizations by 20% - 30% and significantly improves quality of life [7]-[9]. More than 30% of rehospitalizations are potentially avoidable, being related to treatment discontinuation or dietary non-compliance [10].

In sub-Saharan Africa, and particularly in Congo-Brazzaville, therapeutic education is not yet systematically integrated into the management of patients with heart failure, and data evaluating its impact remain limited [11]. At the University Hospital of Brazzaville, a recent study reported a hospital frequency of heart failure of 56.2% among cardiology admissions [12]. In this context, hypertension has become a major cause of heart failure following the epidemiological transition [13].

The present study was conducted to assess the effect of therapeutic education on treatment adherence and quality of life in patients with chronic heart failure followed at the University Hospital of Brazzaville.

2. Patients and Methods

2.1. Study Design and Setting

We conducted a prospective cohort study over a six-month period, from February 15 to August 28, 2020, in the Department of Cardiology and Internal Medicine of the University Hospital of Brazzaville (CHU-B), Republic of Congo.

This tertiary referral center has a total capacity of 44 beds, including 40 con-

ventional hospitalization beds and 4 beds in a cardiac intensive care unit. The department is equipped with standard cardiovascular diagnostic facilities, including transthoracic echocardiography, electrocardiography, exercise testing, and Holter monitoring.

2.2. Study Population

The study population consisted of patients aged 15 years and older who were hospitalized for chronic heart failure and followed regularly at the outpatient cardiology clinic of CHU-B. Only patients who provided written informed consent were eligible for inclusion.

Patients were included if they had a known or newly diagnosed heart failure and were hospitalized in the cardiology department during the study period. Patients were excluded if they did not regularly attend the therapeutic patient education (TPE) sessions, died before the first educational session, had documented cognitive impairment, experienced clinical relapse during the educational program, or declined participation.

2.3. Patient Allocation

At hospital discharge, eligible patients were allocated into two groups in a 1:2 ratio (educated vs. non-educated), based on feasibility and patient availability to participate in the therapeutic education program. Patients who agreed and were able to attend the structured therapeutic education sessions were assigned to the educated group, while the remaining patients received usual care and constituted the control group. The educated group consisted of 51 patients who benefited from a structured therapeutic education program, while the control group included 87 patients who received usual care without formalized therapeutic education.

2.4. Therapeutic Education Intervention

2.4.1. Educational Diagnosis

Before discharge, each patient in the educated group underwent an individual educational diagnostic interview. This interview aimed to assess the patient's level of knowledge about heart failure, beliefs regarding the disease and its treatment, social and family environment, and personal expectations. Based on this assessment, an educational contract was established through a negotiated agreement defining the competencies to be acquired during the program.

2.4.2. Educational Sessions

The therapeutic education program consisted of five collective, interactive sessions delivered over five consecutive weeks, at a rate of one session per week. Two additional weeks were allowed to accommodate missed sessions, resulting in a total program duration of seven weeks. Each session lasted between one and two hours and was conducted in the morning (10:00 - 12:00). Sessions were organized in small groups of approximately ten patients, each accompanied by a support

person.

The multidisciplinary education team included cardiologists, cardiology residents, nurses, social workers, and nutritionists.

The educational content was structured as follows:

1) basic concepts of heart failure, including definition, clinical manifestations, warning signs, etiologies, and factors of decompensation;

2) dietary recommendations, food pyramid principles, and prevention of malnutrition;

3) physical activity and effort management;

4) pharmacological treatment of heart failure;

5) water and salt intake management.

After completion of the sessions, patients received telephone follow-up for a period of three months.

Compared with usual care, the educational intervention involved substantially more frequent contact with the healthcare team. Educated patients attended five weekly group sessions (1 - 2 hours each) and received weekly telephone follow-up for three months (approximately 12 brief calls), whereas control patients received only brief discharge counseling (15 - 30 minutes) without systematic follow-up contacts. This difference in contact frequency is inherent to therapeutic education programs and reflects real-world implementation.

All patients in both groups received optimized pharmacological therapy during the index hospitalization before study enrollment, including guideline-recommended medications titrated to target or maximally tolerated doses. Baseline medication regimens were comparable between groups (all $p > 0.05$). During the education program, therapeutic adjustments were not performed during collective sessions. Individual medical consultations were arranged when needed, and any medication changes were documented. Control group patients had similar access to medical consultation if required.

2.4.3. Control Group

Patients in the control group received usual care, including standard medical management and routine discharge advice, but did not participate in any structured therapeutic education sessions.

2.5. Data Collection and Variables

Data were collected using standardized questionnaires at baseline (during hospitalization) and at three-month follow-up. Sociodemographic data included age, sex, occupation, level of education, marital status, and monthly income. Clinical variables comprised cardiovascular risk factors (hypertension, diabetes, smoking, alcohol consumption, and obesity), blood pressure, heart rate, body weight, presence of edema, NYHA functional class, heart failure etiology and type (left, right, or global), and left ventricular ejection fraction (LVEF). Therapeutic variables included adherence to hygienic-dietary measures and prescribed heart failure medications.

2.6. Assessment Tools

Medication adherence was assessed using the Girerd adherence test, a six-item questionnaire with dichotomous (yes/no) responses. A score of 0 indicated good adherence, a score of 1 - 2 reflected minor adherence difficulties, and a score of 3 or more indicated poor adherence.

Quality of life was evaluated using the Minnesota Living with Heart Failure Questionnaire (MLHFQ), a 21-item instrument assessing physical, emotional, and social dimensions over the previous four weeks. Total scores range from 0 to 105, with higher scores indicating poorer quality of life. For analysis, a score ≤30 was considered indicative of good quality of life, while scores >30 reflected impaired quality of life.

Patient knowledge of heart failure was assessed using the DERIC questionnaire (Rapid Educational Diagnosis in Heart Failure), which explores five domains related to diagnosis, treatment, hygienic-dietary measures, recognition of warning signs, and interest in therapeutic education. Total scores range from 0 to 20, with scores ≥17 indicating sufficient knowledge, ≤9 poor knowledge, and intermediate scores reflecting partial knowledge.

2.7. Outcome Measures

The primary outcomes were treatment adherence, assessed by the Girerd test, and quality of life, assessed by the MLHFQ. Secondary outcomes included patient knowledge of heart failure, rehospitalization for heart failure, all-cause mortality, changes in clinical parameters (NYHA class, blood pressure, heart rate, edema, and body weight), and dietary compliance.

2.8. Operational Definitions

Socioeconomic level was defined according to the Congolese civil servant minimum salary (90,000 FCFA) and categorized as low (<90,000 FCFA), medium (90,000 - 200,000 FCFA), or high (>200,000 FCFA). Clinical thresholds for blood pressure, heart rate, obesity, smoking status, alcohol consumption, diabetes, and rehospitalization were defined according to standard criteria.

2.9. Statistical Analysis

Data were entered using Epi Info version 3.5.4 and analyzed with R software version 3.6. Microsoft Excel was used for data formatting and graphical representation. Qualitative variables were expressed as frequencies and percentages, and quantitative variables as means ± standard deviation with ranges. Group comparisons were performed using the chi-square test for categorical variables and Student's t-test for continuous variables. A two-sided p-value < 0.05 was considered statistically significant.

Given the limited sample size and sparse data structure, reliable multivariable adjustment could not be performed. The low events-per-variable ratio precluded stable estimation, and exploratory models yielded unstable coefficients with wide

confidence intervals, although they suggested a persistent protective effect of the intervention after adjustment for age. Consequently, the primary analyses were based on unadjusted comparisons, and potential confounding factors—including age, socioeconomic level, and education level—were addressed in the interpretation of the findings and discussed as study limitations.

2.10. Ethical Considerations

The study protocol was approved by the institutional ethics committee of CHU-Brazzaville. All participants provided written informed consent prior to inclusion, and confidentiality of patient data was strictly maintained throughout the study.

3. Results

3.1. Study Flow

A total of 192 patients were initially recruited (70 in the educated group, 122 in the control group). Among them, 62 patients participated in TPE sessions. Finally, 138 patients completed the 3-month evaluation: 51 in the educated group and 87 in the non-educated group.

A total of 192 patients were initially recruited and allocated to the educated group (n = 70) or control group (n = 122). In the educated group, 19 were excluded: 3 died before the first session, 8 did not attend sufficient sessions (<3/5), 4 experienced clinical decompensation, 2 withdrew consent, and 2 were lost to follow-up. Final educated group: 51 patients (retention 72.9%). In the control group, 35 were excluded: 17 died (included in mortality analysis) and 18 were lost. Final control group: 87 patients who completed evaluation (retention 71.3% or 85.2% including deceased). Overall, 138 patients completed 3-month evaluation (retention 71.9%). Loss to follow-up was partly attributable to the COVID-19 pandemic (February-August 2020).

3.2. Baseline Characteristics

3.2.1. Sociodemographic Characteristics

Sex and Age: The educated group included 30 women (58.8%) with a sex ratio (F/M) of 1.4. The non-educated group included 47 women (54%) with a sex ratio of 1.2.

Mean age was 52.4 ± 12.9 years in the educated group versus 59.5 ± 16.5 years in the control group (p = 0.01). The age group 55 - 64 years was predominant in both groups (Table 1). The age distribution differed significantly between groups (p = 0.01) (Table 1). The educated group had a younger age profile, with 35.3% (95% CI 22.4% - 50.0%) aged 55 - 64 years as the largest category, whereas the control group showed a higher proportion of elderly patients, with 24.1% (95% CI 15.7% - 34.5%) aged ≥75 years and 18.4% (95% CI 11.0% - 28.1%) aged 65 - 74 years. No patients aged 15 - 24 years were present in the educated group (95% CI 0.0% - 6.8%), while 3.5% (95% CI 0.7% - 9.8%) of controls were in this age range. This baseline age difference represents a potential confounding factor in outcome comparisons.

Table 1. Distribution of patients by age group.

Age Group	Educated Group n (%)	Control Group n (%)	p
15 - 24 years	0 (0.0) [0.0 - 6.8]*	3 (3.5) [0.7 - 9.8]*	
25 - 34 years	5 (9.8) [3.3 - 21.4]*	4 (4.6) [1.3 - 11.4]*	
35 - 44 years	9 (17.7) [8.4 - 30.9]*	6 (6.9) [2.6 - 14.4]*	
45 - 54 years	12 (23.5) [12.8 - 37.5]*	16 (18.4) [11.0 - 28.1]*	
55 - 64 years	18 (35.3) [22.4 - 50.0]*	21 (24.1) [15.7 - 34.5]*	
65 - 74 years	3 (5.9) [1.2 - 16.2]*	16 (18.4) [11.0 - 28.1]*	
≥75 years	4 (7.8) [2.2 - 18.9]*	21 (24.1) [15.7 - 34.5]*	**0.01**

*95% Confidence Interval (Wilson score method).

Occupation and Education: Unemployment was present in 33.3% of the educated group versus 62.1% of controls (p = 0.01). Secondary education level was most common: 78.4% in the educated group and 55.2% in controls (p = 0.03) (Table 2).

Table 2. Distribution by socio-economic characteristics occupation and education level.

Variable	Educated Group n (%)	Control Group n (%)	p
Employment Status			**0.01**
Unemployed	17 (33.3) [21.0 - 47.9]*	54 (62.1) [51.0 - 72.2]*	
Private sector	5 (9.8) [3.3 - 21.4]*	9 (10.3) [5.0 - 18.8]*	
Civil servant	10 (19.6) [10.0 - 33.2]*	10 (11.5) [5.7 - 20.2]*	
Informal sector	19 (37.3) [24.1 - 52.0]*	14 (16.1) [9.2 - 25.6]*	
Education Level			**0.03**
None	1 (2.0) [0.1 - 10.4]*	5 (5.8) [1.9 - 12.9]*	
Primary	2 (3.9) [0.5 - 13.5]*	14 (16.1) [9.2 - 25.6]*	
Secondary	40 (78.4) [64.7 - 88.7]*	48 (55.2) [44.1 - 65.9]*	
Higher	8 (15.7) [7.0 - 28.6]*	20 (23.0) [14.8 - 33.1]*	
Socioeconomic Level			**<0.001**
Low	22 (43.1) [29.3 - 57.8]*	59 (67.8) [57.0 - 77.3]*	
Medium	29 (56.9) [42.2 - 70.7]*	25 (28.7) [19.6 - 39.4]*	
High	0 (0.0) [0.0 - 6.8]*	3 (3.5) [0.7 - 9.8]*	

*95% Confidence Interval (Wilson score method).

Significant socioeconomic disparities were observed between groups (Table 2). Unemployment was markedly higher in the control group (62.1%, 95% CI 51.0% - 72.2%) compared to the educated group (33.3%, 95% CI 21.0% - 47.9%, p = 0.01). Education level also differed significantly (p = 0.03), with the educated group showing a higher proportion of secondary education (78.4%, 95% CI 64.7% - 88.7%) versus controls (55.2%, 95% CI 44.1% - 65.9%). The most pronounced difference was observed in socioeconomic level (p < 0.001), with 67.8% (95% CI 57.0% - 77.3%) of controls classified as low socioeconomic status compared to 43.1% (95% CI 29.3% - 57.8%) of the educated group. Conversely, a medium socioeconomic level was more prevalent in the educated group (56.9%, 95% CI 42.2% - 70.7%) than in controls (28.7%, 95% CI 19.6% - 39.4%). No educated patients had high socioeconomic level (95% CI 0.0% - 6.8%), while 3.5% (95% CI 0.7% - 9.8%) of controls did.

Socioeconomic Level: Low socioeconomic level was found in 43.1% of educated patients versus 67.8% of controls (p < 0.001). Most patients were single: 41.2% in the educated group and 51.7% in controls (p = 0.09).

3.2.2. Cardiovascular Risk Factors

Comparison of cardiovascular risk factors between educated and control groups at study enrollment is summurised in Table 3.

Table 3. Cardiovascular risk factors at baseline.

Risk Factor	Educated Group n (%)	Control Group n (%)	p
Hypertension	23 (45.1) [32.3 - 58.6]*	28 (32.2) [23.3 - 42.6]*	0.13
Obesity	7 (13.7) [6.8 - 25.7]*	9 (10.3) [5.5 - 18.5]*	0.55
Diabetes	4 (7.8) [3.1 - 18.5]*	18 (20.7) [13.5 - 30.4]*	0.06
Dyslipidemia	5 (9.8) [4.3 - 21.0]*	11 (12.6) [7.2 - 21.2]*	0.62
Alcoholism	3 (5.9) [2.0 - 15.9]*	1 (1.1) [0.2 - 6.2]*	0.14

*95% Confidence Interval (Wilson score method).

3.2.3. Etiologies

Dilated cardiomyopathy of undetermined cause was the main etiology in both groups, followed by hypertensive heart disease.

3.2.4. Clinical Characteristics

Blood pressure and heart rate: Normal blood pressure was found in 94.1% of educated patients and 86.2% of controls (p = 0.08). Normal heart rate was present in 96% and 98.9% respectively (p = 0.10).

Mean initial weight: 64.4 ± 10.5 kg in the educated group versus 65.3 ± 11.9 kg in controls.

NYHA class and edema: All patients were in NYHA class I at inclusion. No patient had lower limb edema at baseline.

Type of heart failure: Global heart failure predominated: 90.2% in the educated group and 89.7% in controls (p = 0.11).

3.2.5. Echocardiographic Characteristics

Reduced LVEF was found in 82.3% of educated patients and 82.8% of controls. Intermediate LVEF was present in 17.7% and 9.2% respectively. Preserved LVEF was found in 8.1% of controls only (p = 0.05).

3.2.6. Treatment

Non-pharmacological treatment: All patients in both groups received hygienic-dietary counseling.

Heart failure medications: The most commonly used drugs were diuretics (100% in educated group, 98.9% in controls), ACE inhibitors (66.7% vs 71.3%), beta-blockers (64.7% vs 60.9%), and ARBs (33.3% vs 23.0%). No significant differences were observed between groups (all p > 0.05).

Adjuvant treatment: Amlodipine was used in 33.3% of educated patients and 20.7% of controls (p = 0.10). Statins were prescribed in 23.5% versus 35.6% respectively (p = 0.14).

3.3. Three-Month Follow-Up Outcomes

3.3.1. Clinical Outcomes

At 3-month follow-up, the educated group demonstrated significantly better clinical outcomes across all measured endpoints (Table 4). Mortality was markedly lower among educated patients (3.9%, 95% CI 1.1% - 13.2%) than in controls (19.5%, 95% CI 12.5% - 29.0%), corresponding to a risk ratio of 0.20 (95% CI 0.05 - 0.83; p = 0.01), representing an 80% relative risk reduction.

Table 4. Clinical outcomes.

Outcome	Educated n/N (%)	Control n/N (%)	RR [95% CI]	p
Mortality	2/51 (3.9) [1.1 - 13.2]*	17/87 (19.5) [12.5 - 29.0]*	0.20 [0.05 - 0.83]	**0.01**
Rehospitalization	4/51 (7.8) [3.1 - 18.4]*	20/87 (22.9) [15.3 - 32.8]*	0.34 [0.12 - 0.94]	**0.02**
Lower limb edema	4/51 (7.8) [3.1 - 18.4]*	23/87 (26.4) [18.3 - 36.5]*	0.30 [0.11 - 0.81]	**0.01**
Dietary non-compliance	4/51 (7.8) [3.1 - 18.4]*	46/87 (53.2) [42.2 - 63.8]*	0.15 [0.05 - 0.39]	**<0.001**

*95% CI for proportions (Wilson score method); RR = Risk Ratio.

Rehospitalization rates were also reduced in the educated group (7.8%, 95% CI 3.1% - 18.4%) compared with controls (22.9%, 95% CI 15.3% - 32.8%; RR = 0.34, 95% CI 0.12 - 0.94; p = 0.02). Similarly, lower limb edema occurred in 7.8% (95% CI 3.1% - 18.4%) of educated patients versus 26.4% (95% CI 18.3% - 36.5%) of controls (RR = 0.30, 95% CI 0.11 - 0.81; p = 0.01).

Dietary compliance was substantially better in the educated group, with non-compliance observed in only 7.8% (95% CI 3.1% - 18.4%) compared with 53.2%

(95% CI 42.2% - 63.8%) in controls (RR = 0.15, 95% CI 0.05 - 0.39; p < 0.001).

Mean weight remained stable in the educated group (64.4 ± 10.2 kg at follow-up vs 64.4 ± 10.5 kg at inclusion; p = 0.74) but increased significantly in the non-educated group (66.8 ± 11.9 kg vs 65.3 ± 11.9 kg; p < 0.001), with no significant between-group difference (p = 0.25).

Progression to NYHA class III-IV was more frequent among non-educated patients (p = 0.03). Abnormal blood pressure values (low or high) and tachycardia were also significantly more common in the non-educated group (p < 0.001 for both), whereas most educated patients maintained normal heart rate.

3.3.2. Patient-Reported Outcomes and Knowledge

Patient-reported outcomes and disease knowledge improved markedly in the educated group (Table 5). The mean Girerd adherence score was significantly lower among educated patients (0.6 ± 0.9; 95% CI 0.4 - 0.8) than in controls (3.2 ± 2.3; 95% CI 2.7 - 3.7; p < 0.001), with 65.3% (95% CI 50.6% - 78.0%) achieving good adherence (score = 0) compared with 16.9% (95% CI 9.8% - 26.4%) of controls.

Quality of life, assessed using the Minnesota Living with Heart Failure Questionnaire, was substantially better in the educated group (mean score 12.3 ± 15.1; 95% CI 8.2 - 16.4) than in controls (50.1 ± 30.2; 95% CI 43.8 - 56.4; p < 0.001), with good quality of life (score ≤ 30) observed in 83.7% (95% CI 70.3% - 92.7%) versus 40.3% (95% CI 29.8% - 51.5%), respectively.

Disease knowledge, measured by the DERIC questionnaire, was also significantly higher among educated patients (mean score 16.6 ± 2.4; 95% CI 15.9 - 17.3) compared with controls (10.5 ± 4.4; 95% CI 9.6 - 11.4; p < 0.001), with sufficient knowledge (score ≥ 17) demonstrated in 69.4% (95% CI 54.6% - 81.7%) versus 13.9% (95% CI 7.5% - 23.0%), respectively.

Table 5. Patient-reported outcomes and knowledge.

Measure	Educated Group Mean ± SD	Control Group Mean ± SD	p
Girerd Adherence Score (0 - 6)	0.6 ± 0.9 [0.4 - 0.8]†	3.2 ± 2.3 [2.7 - 3.7]†	**<0.001**
Good adherence, n (%)	33 (65.3) [50.6 - 78.0]*	15 (16.9) [9.8 - 26.4]*	**<0.001**
Minnesota LHFQ Score (0 - 105)	12.3 ± 15.1 [8.2 - 16.4]†	50.1 ± 30.2 [43.8 - 56.4]†	**<0.001**
Good quality of life, n (%)	43 (83.7) [70.3 - 92.7]*	35 (40.3) [29.8 - 51.5]*	**<0.001**
DERIC Knowledge Score (0 - 20)	16.6 ± 2.4 [15.9 - 17.3]†	10.5 ± 4.4 [9.6 - 11.4]†	**<0.001**
Sufficient knowledge, n (%)	35 (69.4) [54.6 - 81.7]*	12 (13.9) [7.5 - 23.0]*	**<0.001**

*95% CI for proportions (Wilson score); †95% CI for means (t-distribution) Lower scores indicate better outcomes for Girerd and Minnesota scales; higher scores indicate better knowledge for DERIC.

3.3.3. Cardiovascular Risk Factor Management

Good management of cardiovascular risk factors was observed in 75.5% of educated patients versus 18.1% of controls (p < 0.001) (Table 6).

Table 6. Comparison of cardiovascular risk factor management at 3 months.

Management	Educated Group n (%)	Control Group n (%)	p
Good	37 (75.5)	313 (18.1)	**<0.001**
Poor	12 (24.5)	59 (81.9)	

Knowledge of Heart Failure

Sufficient knowledge of heart failure was found in 69.4% of educated patients versus 13.9% of controls. Poor knowledge was present in 4.1% versus 44.4% respectively ($p < 0.001$).

Mean DERIC score was 16.6 ± 2.4 in the educated group versus 10.5 ± 4.4 in the control group ($p < 0.001$).

3.3.4. Decompensation Factors

Treatment non-adherence was the only decompensation factor identified in the educated group (4 patients, 7.8%). In the non-educated group, decompensation factors included: treatment non-adherence (8 patients, 9.2%), dietary non-compliance (7 patients, 8.0%), and both factors combined (5 patients, 5.7%) ($p = 0.04$).

3.3.5. Complications

No complications were reported in either group at 3-month follow-up.

4. Discussion

4.1. Methodological Considerations

This is the first prospective study evaluating the impact of structured therapeutic patient education on heart failure management in sub-Saharan Africa. The study was conducted at the University Hospital of Brazzaville, the reference center for cardiovascular care in Congo-Brazzaville, allowing recruitment of a representative sample of heart failure patients in this setting.

The prospective cohort design with a control group and the use of validated instruments (Girerd test, Minnesota LHFQ, DERIC questionnaire) strengthen the internal validity of our findings. However, several limitations must be acknowledged. The sample size was modest ($n = 138$) and may limit statistical power for some analyses. The follow-up period was relatively short (3 months), and the impact of the COVID-19 pandemic on patient evaluation cannot be excluded. The absence of formal randomization may have introduced selection bias, although baseline characteristics were generally comparable between groups.

4.2. Therapeutic Education and Treatment Adherence

Our study demonstrates a dramatic improvement in treatment adherence in the educated group, with 65.3% achieving good adherence versus only 16.9% in controls ($p < 0.001$). The mean Girerd score was significantly lower in educated patients (0.6 ± 0.9 vs 3.2 ± 2.3, $p < 0.001$).

These findings are consistent with international literature. In a United States study, Rich *et al.* reported good adherence in 82.5% of educated patients versus 64.2% of controls at 3-month follow-up [7]. The magnitude of improvement observed in our study is even greater, possibly reflecting the particularly low baseline adherence levels in our population, where 62.1% of control patients were unemployed, representing a major barrier to medication procurement and continuity.

The mechanisms underlying improved adherence in educated patients likely include: 1) enhanced understanding of the importance of regular medication intake, 2) increased perception of disease severity following hospitalization, 3) development of strategies to overcome adherence barriers, and 4) empowerment through active participation in educational sessions [14] [15].

The persistence of suboptimal adherence in 34.7% of educated patients suggests that additional interventions may be needed, particularly addressing socioeconomic barriers through social support systems or medication assistance programs.

4.3. Therapeutic Education and Quality of Life

Quality of life improved markedly in the educated group, with 83.7% achieving good quality of life versus 40.3% of controls ($p < 0.001$). The mean Minnesota score demonstrated a four-fold difference between groups (12.3 ± 15.1 vs 50.1 ± 30.2, $p < 0.001$).

This substantial improvement aligns with findings from Kasper *et al.*, who demonstrated better quality of life in the intervention group over 6 months of follow-up [16]. Several mechanisms may explain this improvement: 1) better symptom control through improved adherence, 2) reduced anxiety related to disease understanding, 3) enhanced self-efficacy in managing daily activities, and 4) empowerment enabling patients to resume social and professional activities within their capacities [17].

The magnitude of quality of life improvement in our study exceeds that reported in many Western studies, potentially reflecting the particularly low baseline quality of life in our population and the substantial unmet educational needs that the intervention addressed.

4.4. Therapeutic Education and Clinical Outcomes

4.4.1. Rehospitalization

The rehospitalization rate was significantly lower in the educated group (7.8% vs 22.9%, $p = 0.02$), representing a 66% relative risk reduction. This finding is comparable to Rich *et al.*, who reported 38.6% rehospitalization in controls versus 16.9% in educated patients at 3 months [7], and Krumholz *et al.*, who found 68.2% versus 40.9% rehospitalization rates at 11 months [18].

Analysis of decompensation factors revealed that treatment non-adherence was the sole factor in the educated group (7.8%), while the control group experienced multiple factors including non-adherence (9.2%), dietary non-compliance (8.0%), and combined factors (5.7%). This demonstrates that therapeutic education par-

ticularly addresses modifiable behavioral factors that precipitate decompensation.

The mechanisms of rehospitalization reduction likely include: 1) improved medication adherence optimizing hemodynamic status, 2) better adherence to sodium and fluid restriction preventing volume overload, 3) early recognition of warning signs prompting timely medical consultation, and 4) enhanced self-monitoring through daily weight measurements [19] [20].

4.4.2. Mortality

Mortality at 3 months was markedly lower in the educated group (3.9% vs 19.5%; $p = 0.01$), corresponding to an 80% relative risk reduction. This finding is consistent with Rich *et al.*, who reported 3-month mortality rates of 9.2% in the intervention group versus 12.1% in controls.

Several mechanisms may explain this reduction, including: 1) prevention of acute decompensation through improved adherence and self-care; 2) earlier medical consultation in response to warning signs; 3) better adherence to evidence-based pharmacological therapy; and 4) improved control of cardiovascular risk factors.

The relatively high mortality observed in the control group (19.5% at 3 months) may reflect the clinical and social vulnerability of this population, characterized by older age (mean 59.5 years; 42.5% aged ≥ 65 years), probable multimorbidity, absence of structured follow-up, and a high prevalence of low socioeconomic status (67.8%), which may limit access to healthcare and medications.

However, this mortality difference should be interpreted with caution given the significant baseline imbalances between groups. Control patients were older (59.5 vs 52.4 years; $p = 0.01$), more frequently unemployed (62.1% vs 33.3%; $p = 0.01$), and more likely to have low socioeconomic status (67.8% vs 43.1%; $p < 0.001$)—all established predictors of poor prognosis in heart failure. Advanced age is associated with greater comorbidity burden, reduced physiological reserve, and increased risk of adverse outcomes, while socioeconomic disadvantage may impair medication adherence, dietary compliance, and access to regular medical care.

Consequently, although therapeutic education was associated with a substantial reduction in mortality, the observed magnitude of effect likely reflects both the benefit of the intervention and the greater baseline vulnerability of the control group, rather than the intervention alone.

4.4.3. Other Clinical Parameters

Educated patients showed better control of multiple clinical parameters at 3 months: fewer patients developed edema (7.8% vs 26.4%, $p = 0.01$), maintained normal heart rate more frequently ($p < 0.001$), and had better blood pressure control ($p < 0.001$). These improvements likely reflect better adherence to diuretic therapy, sodium restriction, and antihypertensive medications.

Dietary compliance was markedly better in educated patients (92.2% vs 46.8%, $p < 0.001$), demonstrating the effectiveness of nutritional education sessions. This is particularly important given that dietary non-compliance is a major precipitant

of heart failure decompensation [10].

4.5. Therapeutic Education and Knowledge

Sufficient knowledge of heart failure was achieved in 69.4% of educated patients versus only 13.9% of controls ($p < 0.001$). The mean DERIC score was 16.6 ± 2.4 in the educated group versus 10.5 ± 4.4 in controls ($p < 0.001$).

This dramatic improvement in knowledge is consistent with Björk-Linné *et al.*, who reported higher knowledge scores in the intervention group (mean 17.2 vs 14.3 points on a 28-point scale) [21]. Enhanced knowledge represents a crucial intermediate outcome linking therapeutic education to improved clinical outcomes through a causal pathway: education → knowledge → appropriate behaviors (adherence, self-monitoring, help-seeking) → better outcomes [22].

The educational intervention successfully addressed knowledge deficits across all five domains evaluated by the DERIC questionnaire: diagnosis understanding, medication knowledge, hygienic-dietary measures, warning sign recognition, and motivation for self-care. This comprehensive approach is essential, as isolated knowledge improvement without behavioral skill development has limited clinical impact [23].

Although increased contact may have contributed through enhanced surveillance and support, the substantial gain in disease knowledge indicates an independent effect of the educational intervention.

4.6. Contextual Considerations in Sub-Saharan Africa

This study demonstrates that structured therapeutic education is feasible and highly effective in sub-Saharan Africa despite resource constraints. Several contextual factors merit discussion:

Feasibility: The program was implemented using existing hospital infrastructure and staff, with minimal additional resources. The group-based format enhanced efficiency and fostered peer support. Translation into local languages addressed literacy barriers.

Cultural adaptation: Involvement of family members in education sessions reflected the importance of family support systems in African societies. The participatory, interactive teaching methods respected adult learning principles and cultural communication styles.

Socioeconomic barriers: The high unemployment rate (62.1% in controls) and low socioeconomic level (67.8% with low level) represent major barriers to optimal heart failure management. Despite intensive education, some patients may be unable to purchase medications or implement dietary recommendations. This underscores the need for complementary social support interventions and advocacy for medication assistance programs.

Healthcare system factors: The lack of systematic therapeutic education programs and limited availability of specialized heart failure clinics in most African settings means that patients typically receive minimal education during brief hos-

pital stays. This study demonstrates that relatively brief but structured education can yield substantial benefits and should be integrated into routine care.

4.7. Comparison with International Guidelines

European Society of Cardiology and American Heart Association guidelines assign therapeutic education a class I, level A recommendation in heart failure management [5] [6]. Our findings provide evidence supporting the applicability of these recommendations in resource-limited African settings and suggest that therapeutic education may have even greater relative impact where baseline knowledge and adherence are particularly low.

The multidisciplinary team approach employed in our study, involving cardiologists, nurses, dietitians, and social workers, aligns with guideline recommendations [5] [6]. The focus on self-care behaviors, warning sign recognition, medication adherence, and lifestyle modifications reflects evidence-based educational priorities [24].

4.8. Study Limitations

This study has several limitations. The relatively small sample size and short follow-up duration may limit the assessment of long-term effects and reduce statistical power for subgroup analyses. The non-randomized, single-center design introduces potential selection bias and restricts generalizability, particularly to primary care or rural settings.

Loss to follow-up—partly related to the COVID-19 pandemic—and the absence of blinding may also have introduced attrition and measurement bias, especially for subjective outcomes such as quality of life. In addition, the multifaceted nature of the intervention precludes identification of the most influential components.

Substantial baseline imbalances in age and socioeconomic status between groups represent major confounding factors that may partly explain the observed differences in clinical outcomes, particularly mortality. Because of the non-randomized design and limited sample size, adequate statistical adjustment for these confounders was not feasible, thereby limiting causal inference.

Unequal contact intensity between groups may have generated attention bias; however, separating this effect from the educational intervention itself is methodologically difficult and of limited relevance in real-world implementation.

Despite these limitations, the consistency of findings across multiple outcomes and their concordance with international literature support the overall validity of the results.

5. Conclusions

This study demonstrates that structured therapeutic patient education significantly improves treatment adherence, quality of life, disease knowledge, and clinical outcomes in patients with chronic heart failure in the sub-Saharan African context. At 3-month follow-up, educated patients showed substantially better ad-

herence (65.3% vs 16.9% with good adherence), quality of life (mean Minnesota score 12.3 vs 50.1), knowledge (mean DERIC score 16.6 vs 10.5), and experienced fewer rehospitalizations (7.8% vs 22.9%) and deaths (3.9% vs 19.5%) compared to controls.

These findings demonstrate that therapeutic education is both feasible and highly effective in resource-limited settings and should be systematically integrated into heart failure management. The magnitude of benefits observed suggests that therapeutic education may have even greater relative impact in contexts where baseline knowledge, adherence, and quality of life are particularly compromised.

Healthcare providers, hospital administrators, and health policymakers should prioritize the development and implementation of therapeutic education programs. Training of multidisciplinary teams, establishment of dedicated education units, and allocation of resources for sustained programs are essential steps. National health strategies for cardiovascular disease management should incorporate therapeutic education as a core component, with the same priority accorded to pharmacological therapies.

All patients with chronic heart failure should have access to structured therapeutic education as an integral part of their comprehensive care. This represents a cost-effective intervention with the potential to substantially reduce the burden of heart failure through improved patient empowerment, self-care behaviors, and clinical outcomes. The success of therapeutic education in this study provides a model that can be adapted and replicated across other African settings and extended to other chronic diseases requiring long-term patient engagement.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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