



Original Article

The Charlson Comorbidity Index and Health-Related Quality of Life in a Group of Patients with Heart Failure: A Cross-Sectional Study in a Cameroonian Urban Setting

Évaluation des Comorbidités par l'Indice de Charlson et Qualité de Vie d'un Groupe de Patients Atteints d'Insuffisance Cardiaque : Une Étude Transversale en Milieu Urbain Camerounais

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ABSTRACT

Introduction. Heart failure (HF), which affects roughly 2% of the global population, is a significant public health concern often exacerbated by comorbidities. Our study aimed to assess the influence of comorbidities on the health-related quality of life (HR-QoL) of patients with HF. **Materials and Methods.** Over three months, we conducted a cross-sectional study at four public hospitals in Yaoundé, Cameroon, involving consenting HF patients over 18 recruited either in the outpatient cardiology unit or during hospitalization. We evaluated their sociodemographic data, clinical and paraclinical characteristics, prognosis (using the Charlson Comorbidity Score), and quality of life (using the Minnesota Living with Heart Failure questionnaire). Data were collected from direct interviews and/or from patients' records. Multivariate linear regression was used to identify factors associated with the HR-QoL. **Results.** Among 86 patients included, the average age was 62 years, with heart failure evolving for a median of 3.5 years. Hypertension and ischemia were common HF causes, and over half of the patients were in NYHA stage II. The average quality of life score was 30.06, with 53.5% reporting a good quality of life. Poorer quality of life was significantly associated with advanced NYHA stages, valvular HF, and Chronic kidney disease (CKD). A significant correlation was found between poorer quality of life and the Charlson comorbidity index. **Conclusion.** HR-QoL is moderately affected in HF patients, and is correlated with Charlson comorbidity index, valvular etiology of HF and CKD. An integrated and holistic treatment approach is imperative to enhance the quality of life for these patients.

RÉSUMÉ

Introduction. L'insuffisance cardiaque (IC), touche environ 2 % de la population mondiale, est un problème de santé publique important, souvent exacerbé par des comorbidités. Notre étude visait à évaluer l'influence des comorbidités sur la qualité de vie liée à la santé des patients atteints d'IC. **Patients et Méthodes.** Pendant trois mois, nous avons mené une étude transversale dans quatre hôpitaux publics de Yaoundé, au Cameroun, sur les patients atteints d'IC chronique stables, âgés de plus de 18 ans et consentants. Nous avons évalué leurs données sociodémographiques, leurs caractéristiques cliniques et paracliniques, leur pronostic (Score de comorbidité de Charlson) et leur qualité de vie (Questionnaire « Minnesota Living with Heart Failure »). Les données ont été recueillies lors d'entretiens directs et/ou à partir des dossiers des patients. Une régression linéaire multivariée a été utilisée pour identifier les facteurs associés à la qualité de vie des patients. **Résultats.** Parmi les 86 patients inclus, l'âge moyen était de 62 ans. La durée moyenne de l'IC était d'environ 3,5 ans. L'hypertension et l'ischémie étaient des causes fréquentes d'IC, et plus de la moitié des patients étaient au stade II de la NYHA. Le score moyen de qualité de vie était de 30,06 et 53,5 % des patients avaient une bonne qualité de vie. Une mauvaise qualité de vie était significativement associée aux stades NYHA avancés, à l'étiologie valvulaire et à la maladie rénale chronique. Une corrélation significative a été trouvée entre la mauvaise qualité de vie et l'indice de comorbidité de Charlson. **Conclusion.** La qualité de vie est modérément affectée chez les patients atteints d'IC et est corrélée à l'indice de comorbidité de Charlson, à l'étiologie valvulaire et à la maladie rénale chronique. Une approche thérapeutique intégrée et holistique est impérative pour améliorer la qualité de vie de ces patients.

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Mots-clés : Qualité de vie, Score de Charlson, Insuffisance cardiaque, Yaoundé-Cameroun

Keywords: Quality of life, Charlson score, Heart failure, Yaoundé-Cameroon

Article history

Submitted: 28 February 2024

Revisions requested: 28 April 2024

Accepted: 4 May 2024

Published: 15 May 2024

HIGHLIGHT'S OF THE STUDY

What is known about the subject

Comorbidities worsen the vital prognosis and quality of life of patients with heart failure, leading an increasingly complex HF management.

The question addressed in this study

The comorbidities that critically affect the quality of life, in Yaounde

What this study brings ne

1. Poorer quality of life was significantly associated with advanced NYHA stages, valvular heart failure and chronic kidney disease.
2. A significant correlation was found between poorer quality of life and the Charlson comorbidity index

Implications for practice, policy or future research: Charlson comorbidity index must be integrated to improve the quality of life of HF patients. This involves the contributions of the health system and policies to improve financial access to care.

INTRODUCTION

Heart failure (HF) is clinically depicted by the heart's insufficiency to pump adequate blood for the body's needs under normal conditions, typically marked by symptoms such as dyspnea, fatigue, and edema and confirmed by objective cardiac dysfunction [1,2]. With an estimated 26 million people afflicted worldwide, its prevalence is a reflection of both the global burden of cardiovascular diseases and the challenges faced in managing this complex condition [2].

The epidemiological footprint of HF is particularly pronounced in Europe, where the incidence is reported to be around 3 to 5 per 1000 person-years, escalating with age to over 10% in individuals aged 70 and above [2]. Sub-Saharan Africa experiences a disproportionate impact, with HF representing a significant fraction of medical admissions, highlighting the severe strain on healthcare systems [3]. In Cameroon, the figures are stark: Kuate et al. documented a hospital prevalence of 40.8% and a mortality rate of 16.4%, indicating both the pervasiveness and lethality of HF in this setting [4]. Despite strides in treatment that have incrementally improved life expectancy for those living with HF, mortality remains high, particularly in regions like sub-Saharan Africa [3]. This high mortality rate, alongside the quest for improved quality of life for HF patients, has spurred extensive research into mortality determinants. Key factors include the timeliness of diagnosis, the choice of treatment strategies, and the classification of HF, with reduced ejection fraction posing a graver prognosis [5,6]. The complexity of HF management is compounded by the prevalence of comorbidities in the ageing HF population. With a significant portion suffering from various non-cardiac conditions such as diabetes, renal impairment, and obesity, the management landscape of HF has become increasingly intricate [7]. This necessitates a multidisciplinary approach, advocated by authorities like the American Heart Association, to comprehensively

manage these comorbidities and mitigate their impact on the patient's quality of life and survival. Predictive tools, like the Charlson Comorbidity score and the Minnesota Living with Heart Failure Questionnaire, have been developed to navigate the challenging terrain of HF management, underscoring the need for robust indices that can predict clinical outcomes and inform therapeutic strategies [8,9]. The current study is precipitated by the crucial need to assess the prevalence and impact of comorbidities on the quality of life of patients with HF in Cameroon. As HF represents a leading cause of cardiovascular-related in-hospital mortality in Africa, understanding the interplay of these comorbidities is vital. This work endeavors to identify which comorbidities critically affect quality of life, thereby illuminating the path to better patient-centered care in HF management

METHODS

Study design and population

We conducted a cross-sectional study from February 2023 to April 2023 in the cardiology departments of four major hospitals in Yaoundé, namely the Yaoundé Central Hospital, the Yaoundé General Hospital, The Yaoundé University Teaching Hospital and the Efoulan District Hospital. These institutions are recognized as the city's primary public facilities providing cardiological services. Eligible participants were adults over the age of 18 who either visited the outpatient units or were hospitalized for chronic heart failure management and provided informed consent. We used a consecutive and exhaustive sampling method. Heart failure was diagnosed based on symptoms and/or signs caused by a structural and/or functional cardiac abnormality with objective evidence of pulmonary or systemic congestion [10].

Data collection and management

Socioeconomic data were acquired through direct interviews with the study participants at inclusion. History and general characteristics of heart failure were retracted from patients' medical records. The Minnesota Living with Heart Failure Questionnaire was employed to evaluate the Health-Related Quality of Life (HR-QoL). Following the original authors' guidelines, we used the overall score as the primary HR-QoL metric rather than the domain-specific scores. An overall score below 24 indicated high HR-QoL, ranging from 24 to 45, suggested moderate HR-QoL, and scores above 45 depicted low HR-QoL [9].

The Charlson comorbidity index was calculated using data collected in patient records and direct interview responses. The index comprises 17 medical conditions, each weighted based on their respective prognostic implications. These conditions encompass age, myocardial infarction, congestive heart failure, peripheral vascular disease, cerebrovascular accident or transient ischemic attack, dementia, chronic obstructive pulmonary disease, connective tissue disease, peptic ulcer disease, liver disease, diabetes, hemiplegia, moderate to severe chronic kidney disease (CKD), solid tumor, leukemia, lymphoma, and AIDS [11].

A new and revised classification of HF according to left

ventricular ejection fraction (LVEF) proposed by Bozkurt et al. was used: LVEF \leq 40% was categorized as heart failure with reduced ejection fraction (HFrEF); LVEF between 41% and 49% was classified as heart failure with mid-range ejection fraction (HFmrEF); and LVEF \geq 50% was defined as heart failure with preserved ejection fraction (HFpEF) [10].

Statistical analysis

Quantitative data were described using the mean \pm standard deviation or median with interquartile ranges, depending on whether distributions were normal or skewed. Qualitative data were summarized as frequencies and percentages. The normality of continuous variables' distributions was assessed using the Kolmogorov–Smirnov test and visual aids such as histograms and normal Q-Q plots. Given that the distribution of the HR-QoL scores was normal, group comparisons for categorical variables were conducted using the Student's t-test for binary categories and Analysis of Variance (ANOVA) for multinomial variables. The association between HR-QoL scores and continuous variables was determined using Pearson's or Spearman's correlation coefficients after the linearity of the relationship was visually inspected using scatter plots. A linear multiple regression model was employed to adjust for potential confounders, designating the HR-QoL score as the dependent variable and incorporating all variables significantly associated with the outcome as covariates. A p-value of less than 0.05 was set as the threshold for statistical significance. Data analysis was performed using IBM SPSS Statistics for Windows, Version 26.0, released in 2019 by IBM Corp., Armonk, NY.

Ethical consideration

Ethical approval for this study was obtained from the Institutional Research and Ethics Committee of the Faculty of Medicine and Biomedical Sciences (Reference No.: 0453/Uy1/FMSB/VDRC/DAASR/CD). Administrative permissions were also secured from the administrations of the participating hospitals. All participants were fully informed about the objectives and procedures of the study and provided written informed consent before inclusion. Data collection and handling were conducted strictly to the ethical principles outlined in the Helsinki Declaration for medical research involving human subjects [12].

RESULTS

Characteristics of study participants

During the study period, 86 patients were included in the study with a mean age of 62.6 ± 14.2 years (range: 25 – 95 years). Female represented 52.3% while married patients were 55.8%. More than 60% of participants were retired or unable to perform a professional activity. The median level of income was 90,000 (IQR: 63,750 - 122,500) F CFA ranging from 40,000 FCFA to 650,000 FCFA, with about 5% of participants having health insurance. Sedentary lifestyle, overweight or obesity and hypertension were the most common cardiovascular risk factors in 68.6%, 55.8% and 46.5% of participants. Table I

Table I. Socioeconomic characteristics and cardiovascular risk factors of study participants

Variables	N = 86
Age groups (years)	
[25-35[6 (7.0)
[35-45[4 (4.7)
[45-55[11 (12.8)
[55-65[21 (24.4)
\geq 65	44 (51.2)
Gender (Male)	41 (57.7)
Marital status	
Married	48 (55.8)
Widow	23 (26.7)
Single	12 (14.0)
Divorced	3 (3.5)
Occupation	
Retired or Invalid	53 (61.6)
Private sector	16 (18.6)
Informal sector	11 (12.8)
Public sector	6 (7.0)
Level of income (CFA Francs)	
< 41875*	3 (3.5)
41875-100000	45 (52.3)
100000-150000	8 (9.3)
150000-200000	9 (10.5)
\geq 200000	5 (5.8)
Insured patients	5 (5.8)
Cardiovascular risk factors	
Sedentary	59 (68.6)
Overweight or Obesity	48 (55.8)
Hypertension	40 (46.5)
Alcohol	24 (27.9)
Smoking	18 (20.9)
Dyslipidemia	12 (14)

41875CFA Francs represent Guaranteed Inter professional Minimum Wage in Cameroon provides more details on the characteristics of study participants.

Description of Heart Failure and Charlson Comorbidities Index

The median duration of heart failure was 3.5 years (IQR: 2 – 5; Range: 0.5 – 20). Hypertension (30.2%) and ischemic heart disease (22.1%) emerged as the leading causes. The pharmacological management predominantly included loop diuretics (94.2%), beta-blockers (67.4%), angiotensin-converting enzyme (ACE) inhibitors (59.3%), and antiplatelet agents (53.5%). The average ventricular ejection fraction was $39.13 \pm 14.18\%$ (Range: 15 – 78). The New York Heart Association (NYHA) functional classification indicated that most patients were in stage II (60.5%).

Charlson comorbidities in this population were diabetes mellitus (16.3%), chronic kidney disease (10.5%) and stroke (9.3%). Moreover, the mean Charlson comorbidity score was 3.96 ± 1.96 , ranging from 1 to 8. See Table II for more details.

Table II. General characteristics of heart failure and Charlson comorbidity index

Variables	N = 86
Etiology of heart failure	
Hypertension	26 (30.2)
Ischemic	19 (22.1)
Idiopathic	9 (10.5)
Valvulopathy	9 (10.5)
Toxic	7 (8.1)
Post-Rheumatic fever	3 (3.5)
Peripartum cardiomyopathy	3 (3.5)
Arrhythmia	2 (2.3)
Others	8 (9.3)
Pharmacological treatment of heart failure	
Loop diuretics	81 (94.2)
Beta-blockers	58 (67.4)
Converting enzyme inhibitors	51 (59.3)
Antiplatelet aggregators	46 (53.5)
Mineralocorticoids receptor antagonists	31 (36.0)
Statins	22 (25.6)
Digitalis	19 (22.1)
Ivabradine	2 (2.3)
Number of decompensation in last 12 months	
0	60 (69.8)
1	24 (27.9)
2	2 (2.3)
Type of heart failure	
HFrEF	48 (55.8)
HFmrEF	24 (27.9)
HFpEF	14 (16.3)
NYHA classification	
Stage II	52 (60.5)
Stage III	30 (34.9)
Stage IV	4 (4.7)
Charlson comorbidities	
Diabetes mellitus	14 (16.3)
Chronic kidney disease	9 (10.5)
Cerebrovascular accident	8 (9.3)
Myocardial infarction	5 (5.8)
Peptic ulcer disease	5 (5.8)
Peripheral vascular disease	4 (4.7)
Solid tumor	4 (4.7)
Dementia	3 (3.5)
Liver disease	3 (3.5)
Hemiplegia	2 (2.3)
Chronic obstructive pulmonary disease	1 (1.2)
Charlson comorbidity index	
1	11 (12.8)
2	9 (10.5)
3	15 (17.4)
4	20 (23.3)
5	15 (17.4)
6	8 (9.3)
> 6	8 (9.3)

HFrEF: heart failure with reduced ejection fraction;
 HFmrEF: Heart failure with midrange ejection fraction;
 HFpEF: heart failure with preserved ejection fraction.
 NYHA: New York Heart Association.

Health-related quality of life and its determinants

The average health-related quality of life (HRQoL) score among participants was 30.06 (±17.13), ranging from 7 to 75. The assessment of HRQoL categorized 53.5% of patients as having a good level, 25.6% moderate, and 20.9% poor. Older participants (age ≥ 65 years) experienced significantly worse quality of life (p = 0.031) compared to those under 65. Other factors negatively impacting HRQoL were valvular etiology (p = 0.035), heart failure with reduced ejection fraction (HFrEF) (p = 0.029), and overweight/obesity (p < 0.001). Both the Charlson comorbidity index (r = 0.589; p < 0.001) and the NYHA classification (r = 0.759; p < 0.001) demonstrated significant positive linear correlations with HRQoL scores, indicating that higher scores on these indices were associated with poorer HRQoL.

Following multivariate analysis, factors independently related to poor quality of life included valvular etiology (p = 0.016) and chronic kidney disease (p < 0.001). The NYHA classification (p < 0.001) and the *Charlson comorbidity index* (p = 0.006) also remained significant independent risk factors for poor quality of life. Additional insights into these relationships are provided in Table IV.

Table IV. Linear regression model of quality of life score including covariates significantly associated with the outcome

Variables	Beta	Confidence interval		p value
		lower limit	upper limit	
Age ≥ 65 years	-1.479	-5.752	2.794	0.493
Overweight/obesity	1.947	-2.004	5.899	0.329
HFrEF	-1.868	-5.486	1.750	0.307
Valvular etiology	7.887	1.497	14.277	0.016
Peripheral vascular disease	7.512	-1.639	16.663	0.106
cerebrovascular accident	-1.514	-9.295	6.268	0.699
Hemiplegia	11.625	-2.179	25.429	0.098
Chronic kidney disease	16.112	9.534	22.690	< 0.001
Solid tumor	8.970	-0.418	18.357	0.061
Charlson comorbidity index	1.998	0.584	3.413	0.006
NYHA classification	15.925	12.263	19.588	0.000

Table III. Factors associated with the quality of life

Variables	QoL Mean score ± SD	p value
Age groups (years)		0.031
≥ 65	33.52 ± 17.36	
<65	26.43 ± 16.31	
Gender		0.194
Male	27.12 ± 15.406	
Female	32.73 ± 18.33	
Marital status		0.411
Married	28.02 ± 15.41	
Not married	32.63 ± 17.23	
Level in incomes		0.083
< 100000	33.04 ± 18.301	
≥ 100000	26.29 ± 14.93	

Table III. Factors associated with the quality of life

Variables	QoL Mean score ± SD	p value
Etiologies of heart failure		
Ischemic	31.16 ± 16.61	0.658
Hypertension	29.04 ± 16.49	0.933
Valvulopathy	42.22 ± 18.34	0.035
Idiopathic	25.67 ± 16.50	0.330
Others etiology	27.26 ± 17.31	0.266
Type of heart failure		
HFrEF	26.69 ± 16.142	0.029
HFmrEF	36.96 ± 19.36	0.056
HFpEF	29.79 ± 13.583	0.535
Cardiovascular risk factors		
Sedentary behavior	31.97 ± 16.35	0.053
Hypertension	31.88 ± 17.41	0.225
Diabetes	30.71 ± 17.60	0.888
Overweight/obesity	36.25 ± 17.90	< 0.001
Dyslipidemia	32.0 ± 14.99	0.383
Tobacco	27.0 ± 16.98	0.269
Alcohol	29.13 ± 16.93	0.721
Charlson comorbidities		
Myocardial infarction	36.8 ± 19.68	0.462
Peripheral vascular disease	51.5 ± 8.35	0.009
Cerebrovascular accident	49.63 ± 20.38	0.004
Dementia	36.33 ± 11.55	0.415
Peptic ulcer disease	26.20 ± 3.56	0.796
Liver disease	35.33 ± 34.79	0.947
Hemiplegia	72.0 ± 4.24	0.001
Chronic kidney disease	52.89 ± 10.41	< 0.001
Solid tumor	49.50 ± 20.81	0.049

QoL: Quality of life HFrEF: heart failure with reduced ejection fraction; HFmrEF: Heart failure with midrange ejection fraction; HFpEF: heart failure with preserved ejection fraction.

DISCUSSION

Health-related quality of life (HR-QoL) is a critical measure in the management and therapeutic outcomes for patients with heart failure (HF). As the population ages and the expectancy of life improves due to advancements in medical treatments, it becomes increasingly important to focus on the quality of life for those living with HF, including the impact of coexisting comorbidities on their well-being. In our study, the average HR-QoL score for patients with HF, as assessed by the Minnesota Living with Heart Failure Questionnaire, was 30.06 ± 17.13 , denoting a moderate quality of life. Our findings align closely with those reported by Yayehd et al. in Togo, who observed an average score of 37.2 ± 22.3 [13]. This underscores that HR-QoL is substantially compromised in our context and necessitates targeted attention during patient care. The need for bolstered, comprehensive, and interdisciplinary approaches to management—including the integration of mental health professionals—becomes clear in the quest to enhance HR-QoL for these patients. We identified a statistically significant association between diminished HR-QoL and several variables, such as NYHA classification ($\beta=15.9$; 95% CI, 12.3–19.6, $p < 0.001$), valvular etiology of HF ($\beta=7.9$; CI, 1.5–14.3, $p=0.016$), chronic kidney disease ($\beta=16.1$; CI, 9.5–22.7, $p < 0.001$), and the Charlson comorbidity index ($\beta=2.0$; CI,

0.6–3.4, $p=0.006$). This association is similar to findings by Fotos et al., who also found NYHA classification and chronic kidney disease among the determinants linked with HR-QoL [14]. HF's adverse impact on patient's functional abilities is well-documented, and as the disease progresses, symptoms tend to become more severe and frequent, further deteriorating HR-QoL. The progression of NYHA stages—from I, denoting no physical limitations, to IV, where symptoms are present even at rest—illustrates the increasing severity of the condition and its correlation with lower HR-QoL, as reflected in our study population that predominantly comprised patients in NYHA stage II.

Additionally, the Charlson comorbidity index's positive association with poor HR-QoL suggests that the burden of comorbid conditions can significantly affect patients' life quality. Among the comorbidities, chronic kidney disease (CKD) was particularly impactful on HR-QoL in patients with HF. While HF and CKD may arise from distinct pathological processes, they can precipitate one another in the cardio renal syndrome (types 2 and 4). HF can lead to CKD through reduced renal perfusion, causing ischemia and activation of the renin-angiotensin-aldosterone system, resulting in fluid retention and worsening HF. Conversely, CKD can instigate fluid overload, stimulate the sympathetic nervous system, and lead to cardiac remodeling due to increased preload and afterload [15]. Thus, this forms a harmful feedback loop that impairs HR-QoL.

Our study did not find a significant relationship between HR-QoL and demographic factors such as age and sex nor with other comorbidities included in the Charlson index ($p > 0.05$). This is consistent with the findings of Sadat et al., who also did not report an association between HR-QoL and sex ($\chi^2=1.70$, $df=4$; $p=0.79$) or age group (ANOVA, $F=0.74$; $p=0.57$) [16]. However, a meta-analysis by Comin-Colet et al. emphasized that a substantial proportion of non-cardiovascular comorbidities, including anemia or iron deficiency (21.5%), mental and behavioral disorders (20.4%), diabetes mellitus (20.4%), and respiratory diseases (14.0%), were associated with reduced HR-QoL in patients with HF [17]. The heterogeneity across studies notwithstanding, it was evident that non-cardiovascular comorbidities adversely affect HR-QoL in CHF patients, highlighting the necessity for more comparative research in our setting to gauge these factors' influence accurately. Limitations of this study include the recruitment of hospitalized patients who may have difficulty accurately recalling their HR-QoL before decompensation, as hospitalization is inherently a transitional period characterized by poorer quality of life and elevated NYHA status. Additionally, this observational study lacks a comparative analysis between HF patients and individuals with other chronic conditions or the general population. Moreover, we did not assess patient adherence to pharmacological and non-pharmacological treatment, which can significantly influence HR-QoL outcomes.

CONCLUSION

The average HR-QoL score observed among heart failure (HF) patients was 30.06 ± 17.13 , indicating a moderate overall quality of life within this group. A significant negative correlation was evident between the Charlson comorbidity index and quality of life, suggesting that a higher burden of comorbid conditions is linked to decreased life quality. Additional factors contributing to a lower quality of life included the presence of valvular heart disease etiology, the progression of chronic kidney disease, and elevated levels of NYHA classification. The findings highlight the considerable impact of these variables on the HR-QoL for patients with HF in the studied context, underscoring the need for meticulous and tailored management strategies. An integrated and holistic treatment approach is imperative, reinforcing global and interdisciplinary care interventions emphasizing the inclusion of mental health professionals to enhance the quality of life for these patients.

COMPETING INTERESTS

Les auteurs déclarent n'avoir aucun conflit d'intérêt.

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