REPUBLIQUE DU CAMEROUN

Paix – Travail – Patrie

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MINISTERE DE L'ENSEIGNEMENT SUPERIEUR

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L'UNIVERSITE DE YAOUNDE I

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FACULTE DE MEDECINE ET DES SCIENCES BIOMEDICALES

REPUBLIC OF CAMEROON

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THE UNIVERSITY OF YAOUNDE I

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FACULTY OF MEDECINE AND BIOMEDICAL SCIENCES

DEPARTEMENT OF INTERNAL MEDECINE AND SPECIALITIES

Trial of Therapeutic Group Education Program for Patients with Stable Chronic Heart Failure at Yaounde

Research Proposal presented and defended in partial fulfilment for the award of an *MD degree in General Medicine by*

BITA BITA STEVE P.

Matricule: 17M079

Supervisor

Pr NGANOU-GNINDJIO Chris Nadège

Associate Professor In Cardiology

Co-supervisor

Dr MAIMOUNA MAHAMAT

Senior Lecturer In Nephrology

Dr NDOBO Valerie

Senior Lecturer In Cardiology

Academic year 2023-2024

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Jury of defense:

President of the Jury

Pr OWONO ETOUNDI Paul

Jury rapporteur:

Pr NGANOU-GNINDJIO Chris Nadège

Members of Jury:

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Managerial staff:

Supervisor

Pr NGANOU-GNINDJIO Chris Nadège

Associate Professor In Cardiology

Co-supervisor

Dr MAIMOUNA MAHAMAT

Senior Lecturer In Nephrology

Dr NDOBO Valerie

Senior Lecturer In Cardiology

Academic year 2023-2024

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DEDICATION

To my grandmothers

Mrs Bassom borned MENGUE BITA JULIENNE

And

MAMA PASSA SARAH PHILOMENE

ACKNOWLEDGEMENTS

We give thanks to God Almighty for His eternal love and grace. Without Him, we are nothing. I hereby express my sincere gratitude to:

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- All those who accepted to participate on this study, for trusting us about your health.

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259	ABA'A Marthe Dereine	ASL	Drug Analysis
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261	MINYEM NGOMBI Aude Périne épouse AFUH	ASL	Pharmaceutical Regulations

KEY:

HOD: Head Of Department

P: Professor

AP : Associate Professor

SL : Senior Lecturer

L : Lecturer

ASL: Assistante Lecturer

THE PHYSICIAN'S OATH

[Declaration of Geneva adopted by the Geneva Assembly of the World Medical Association in Geneva, Switzerland, September 1948 and amended by the 22nd World Medical Assembly, Sydney, Australia (August 1968)]

On admission to the medical profession:

I will solemnly pledge myself to consecrate my life to the service of humanity

I will give my teachers the respect and gratitude which is their due

I will practice my profession with conscience and dignity

The health of my patients will be my first consideration

I will respect secrets confided in me, even after the patient has died

I will maintain by all the means in my power the honour and noble traditions of the medical profession

My colleagues will be my brothers

I will not permit considerations of religion, nationality, race, party politics or social standing to intervene between my duty and my patient

I will maintain the utmost respect for human life from the time of conception, even under threat I will not use my medical knowledge contrary to the laws of humanity

I make these promises solemnly, freely and upon my honour.

ABSTRACT

Introduction: Heart failure (HF) remains a major public health issue in Sub-Saharan Africa and Cameroon in particular, as it is the first cause of admission at the cardiology unit. Also, studies reveal that, the high onset of decompensation episodes coupled to a high readmission rate following discharge from hospital and the high death rate. Some factors associated to these outcomes were poor knowledge on the disease, poor self-care and poor adherence to treatment. In order to reverse these tendencies, new treatment options require the involvement of patients and caregivers in the active management of their conditions. As such, therapeutic education of patients has now become an important part in the management of individuals with chronic heart failure as it ensures the transfer of appropriate information from health care professionals to patients and their families.

Objective: evaluate the short term effect of a therapeutic group education program.

Methodology: we carried out a one arm pre-test post-test non-randomized clinical trial with an intervention of 6 weeks, enrolling patients who had stable chronic heart failure at the out-patient unit of the Yaoundé central Hospital and the Biyem-Assi District Hospital, from February 14 2024 to April 5 2024. After an initial evaluation, at enrollment, a 6-week period intervention study was carried out consisting of weekly education of patients on heart failure with final evaluation done on the last week. We evaluated the knowledge of the participants, self-care behavior and the quality of life. The threshold for statistical significance was set at 0.05.

Results: We analyze data obtained from 17 participants. The participants had a mean age of 66.65 ± 8,65 years and the sex ratio was 0.89. Most of the participants had received the diagnosis of heart failure for less than 6 months (29.4%) or between 61 and 120 months (29.4%) with the most encountered etiology of heart failure was hypertensive heart disease (58.8%). Most of the participants (70.5%) do not practice regular weight measurements, with 10 /17 participants (58.8%) having heart failure with reduced ejection fraction (HFrEF). After final evaluation, we obtained a statistically significant difference ($p<0.004$) between the mean knowledge score before and after the intervention with an improvement of 3.35 times the initial vale. Likewise, the difference between mean score for the self-care level before and after the evaluation was statistically significant ($p<0.006$) with an improvement of 3.13 times of its initial value. In the same line, we had a highly statistically significant difference ($p<0.001$) between the mean score of quality of life before and after evaluation with a decrease of 4.07 times of its initial value.

Conclusion: Therapeutic education improves the knowledge, self-care behavior and quality of life of individuals with stable chronic heart failure.

Key words: chronic heart failure**,** therapeutic education, knowledge, self-care behavior, quality of life. Yaoundé-Cameroun

RESUME

Introduction : L'insuffisance cardiaque (IC) reste un problème de santé publique majeur en Afrique subsaharienne et au Cameroun en particulier, car elle est la première cause d'hospitalisation dans les services de cardiologie. En outre, des études révèlent que l'apparition d'épisodes de décompensation, couplée à un taux élevé de réadmission après la sortie d'hospitalisation et un taux de mortalité élevé. Certains facteurs associés à ces observations étaient un mauvais niveau de connaissance sur la maladie, un niveau d'auto-soins faible et une mauvaise observance au traitement. Afin d'inverser ces tendances, les nouvelles options de traitement nécessitent l'implication des patients et de leur famille dans la gestion active de leur pathologie. A cet effets, l'éducation thérapeutique des patients est aujourd'hui devenue un élément incontournable dans la prise en charge des personnes atteintes d'insuffisance cardiaque chronique car elle assure le transfert d'informations appropriées des professionnels de santé aux patients et à leurs familles.

Objectifs : Evalué l'effet à court terme d'un programme d'éducation thérapeutique pour patients insuffisant cardiaque résidant dans la ville de Yaoundé

Méthodologie : Nous avons réalisé une étude interventionnelle avant-après à un bras. Nous avons recruté des patients avec insuffisance cardiaque chronique stable dans les services de consultations externes de cardiologie de L'hôpital Central De Yaoundé et de L'HD The Biyem-Assi du 14 Février 2024 au 5 Avril 2024. Apres l'évaluation initiale des participants au moment du recrutement, un programme d'éducation thérapeutique a été réalisé pour une durée de 06 semaine dans l'enceinte de l'hôpital central de Yaoundé avec une évaluation finale à la dernière semaine du programme. Nous avons évalué la connaissance des participants, le niveau d'auto-soins et la qualité de vie. Le seuil de significativité a été fixé à 0,05.

Résultats : Nous avons analysé les données de 17 participants. La moyenne d'Age était de 66.65 ± 8,65 ans et le sex-ratio étais de 0.89. La durée médiane de découverte de l'insuffisance cardiaque était de moins de 6 mois et entre 61 et 120 mois avec comme étiologie la plus représentée l'hypertension artérielle. La plupart des participants ne pratiquais part régulièrement l'automesure du poids, 10 participants sur les 17 avaient une fraction d'éjection réduite. Après l'évaluation finale, nous avons obtenu une différence significative ($p<0.004$) entre la moyenne des scores sur la connaissance de l'insuffisance cardiaque avant et après le programme d'éducation avec une amélioration de 3.35 fois le score initial. Aussi, la différence de la moyenne des scores sur le niveau d'auto soins était aussi significative ($p<0.006$) avec une amélioration de 3.13 fois la moyenne initiale. De même, nous avons eu une différence très significative ($p<0.001$) entre la moyenne des scores de la qualité de vie avant et après l'intervention avec une diminution de 4.07 fois la moyenne initiale traduisant une nette amélioration.

Conclusion : l'éducation thérapeutique améliore la connaissance, l'auto-soins et la qualité de vie des patients avec insuffisance cardiaque stable.

Mots clés : éducation thérapeutique, programme d'éducation thérapeutique, connaissances, auto-soins, qualité de vie

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LIST OF ABBREVIATIONS

ACC: American College of Cardiology

AHA: American Heart Association

ANP: Atrial natriuretic Peptide

BNP: Brain natriuretic peptide

CHF: Congestive Heart Failure

EDV: End Diastolic Volume

SV: Stroke Volume

TPR: Total Peripheral Resistance

EF: Ejection Fraction

MAP: Mean Arterial Pressure

ESC: European Society of Cardiology

EScBHF: European self-care Behaviour Heart Failure Scale

HAS: Highest Health Autority

HCP: Health Care Provider

HF: Heart Failure

HFrEF: Heart Failure with Reduced Ejection Fraction

HFpEF: Heart Failure With Preserved Ejection Fraction

HFmEF: Heart Failure With Midly Reduced Ejection Fraction

PHQ: Physical Health Questionnaire

MLHF: Minnesota Living with Heart Failure

PTE: Patient Therapeutic Education

RAAS: Renine Angiotensine Aldosterone System

YCH: Yaoundé Central Hospital

HDB: Biyem-assi District Hospital

HRQoL: Heart Related Quality of Life

QoL: Quality of Life

Chapter 1 : INTRODUCTION

1 INTRODUCTION

According to the European Society of Cardiology(ESC), heart failure(HF) is a clinical syndrome consisting of symptoms that may be accompanied by signs due to a structural and/or functional abnormality of the heart that results in elevated intra-cardiac pressures and/or inadequate cardiac output at rest and/or during exercise[1]. Heart failure is a global affection concerning at least 64.34 million people (8.52 per 1,000 inhabitants) worldwide, accounting for 9.91 million years lost due to disability (YLDs), 346.17 billion US $ expenditure[2] and the global prevalence is estimated to be 1–2% of the general adult population[3].In Europe, the 2019 European Society of Cardiology (ESC) Heart Failure Association (HFA) ATLAS reported a HF prevalence estimated at 17 per 1,000 people ranging from ≤12 in Spain and Greece to over >30 per 1000 persons in Lithuania and Germany[4,5]. To date, there are no population-based studies estimating prevalence and incidence in northern and sub-Saharan Africa[6]. In Cameroon, a study carried out by Kuate et al. in 2021 at the in-patient cardiologic unit in two public health facilities in Yaoundé showed a hospital prevalence of 40,8% and a mortality rate of 16.4% [7].

Chronic heart failure is characterized by slow progression of symptoms that include: breathlessness with exertion, shortness of breath (even when lying down), fatigue, tiredness or weakness, sleep problems and swollen legs or ankles[8]. In addition to experiencing severe physical restrictions and rapid and unexpected decompensations, people with CHF have to deal with complex treatment regimens, strict self-care behaviors and lifestyle changes that have a significant impact in their daily lives[8]. All of these, decreases the opportunities they have to participate in social life, leading them to experience a deterioration of social interaction and loneliness, social isolation and lack of social support to be able to cope with their daily activities[8].

Beyond the availability of new, sophisticated therapies both medical and non-medical, the WHO recommends systematically the application of patient education program with an emphasis on self-care in the management of chronic diseases at it has proven its efficacy in reducing hospitalizations and even, as demonstrated in recent publications, all causes of mortality[9]. Therapeutic patient education (TPE) has been described for more than 30 years and numerous studies have demonstrated its efficiency based on very diverse outcome changes. These programs have been shown to alter health behaviors positively as the patients actively takes part in their disease management, and thus improve biological, psychological, and quality of life outcomes

for many chronic disorders[10]. In 2011, Brunie et al. carried out a 09 months study on twenty four patients hospitalized in a cardiologic unit to evaluate the efficiency of a patient therapeutic education program. They showed very encouraging results regarding the acquisition of skills by patients (94%), the improvement in patient knowledge associated with an increase in confidence, their satisfaction with the program (80%) and their ability to change habits (75%), self-assessment of the changes in the lifestyle of patients shows an evolution in their daily quality of life[11].

In the aim to contribute to the implementation of these programs in our context, for a better management of patients with CHF, we proposed to undertake a therapeutic education program for patients with stable chronic heart failure living in Yaounde.

1.1 Justification

Heart failure remains a real public health issue in sub-Saharan African region and Cameroon in particular. It remains the first cause of hospitalization into cardiology unit[12]. Its prevalence has continued to increase in the country despite the improvement in the therapeutic 'regimen. This is shown by the prevalence in 2014, 2015 and 2021 of 30%, 33.3% and 40.8% respectively [13] [7]. It becomes therefore necessary to introduce new therapeutic options like patient therapeutic education as recommended by the WHO in the management of chronic conditions.

Low therapeutic education has been associated to low treatment adherence and poor prognosis. This has been confirmed by a study of Nganou et al. in 2021 which revealed that only 9.1% of patients with chronic HF where adherent to their treatment with 40.6% of the patients pointing forgetfulness as the main reason [14]. Also, the limited time available during outpatient consultation associated to a high rate of disinformation about heart failure from non-medical source in our environment, it becomes therefore necessary for patients to engage in therapeutic education. Although some studies have proven the beneficial effect of therapeutic education in wellbeing of patients with hypertension in Cameroon, very few have been done concerning patients with chronic heart failure. We therefore propose to evaluate the effect of a group therapeutic education program for patients with stable chronic heart failure living in Yaoundé.

1.2 Research question

What is the short term effect of a therapeutic education program for patients with chronic stable heart failure living in Yaoundé?

1.3 Research hypothesis

A therapeutic education program has beneficial effects on patients with stable chronic heart failure.

1.4 Research objectives

- **General**: Evaluate the short term effect of a therapeutic education program on patients with stable chronic heart failure.
- **Specific**:
    1. Estimate the knowledge level of patients before and after the program of education.
    2. Assess the self-care behavior before and after the program of education.
    3. Appreciate the quality of life before and after the program of education.

Chapter 2 : LITERATURE REVIEW

2 Literature review

2.1 Heart failure

2.1.1 Definition

The European Society of Cardiology(ESC) defines heart failure(HF) as a clinical syndrome consisting of symptoms that may be accompanied by signs due to a structural and/or functional abnormality of the heart that results in elevated intra-cardiac pressures and/or inadequate cardiac output at rest and/or during exercise[15].

Hence, heart failure is not a disease but a syndrome with many possible etiologies and a complex pathogenesis. Chronic HF arises as a consequence of an abnormality in cardiac structure, function, rhythm, or conduction. As such, heart failure may be caused by an abnormality in systolic function, diastolic function or both. Heart failure is a common condition that affects the quality of life, causing fatigue, breathlessness and edema, it is usually associated with a poor prognosis.

2.1.2 Epidemiology

In the world, HF is a major public health issue as it is the leading cause of hospitalization among individuals above 65 years in European union and the united states, affecting nearly 1 in every 100 people aged above 65 years. It contributes to 3 to 7% of all hospital admissions [1] and has a prevalence of 64 million of individuals worldwide and 15 million in EU. The prevalence of HF varies geographically, with the highest prevalence rates of HF being reported from Central Europe, North Africa, and the Middle East, whereas lower rates are reported in Eastern Europe and Southeast Asia. The American Heart Association (AHA) estimated that there were 6.2 million people with HF in the United States between 2013 and 2016[16]. Regardless of the definition used, the prevalence of HF and LV dysfunction increases with age. As an example, the Framingham Heart Study found a prevalence of HF in males of 8 per 1000 at age 50 to 59 years, increasing to 66 per 1000 at ages 80 to 89 years; similar values (8 per 100 and 79 per 1000) were noted in females The prevalence in African-American populations is reported to be 25 percent higher than in White population[16].

In Africa, heart failure remains a health challenge as it is associated with significant rates of hospitalization, morbidity and mortality. Meanwhile there is a paucity of data on heart failure epidemiology, etiology, management and on the sociodemographic characteristics of African patients with heart failure, the prevalence has been evaluated in a few hospital-based studies

conducted in countries of sub-Saharan Africa. In Togo, Pio et al. in 2014, carried out a retrospective cross sectional hospital based study and had a prevalence of 25.6%, with a mean age of 52.2 years(Age range: 18 – 106)[17]. Likewise, In 2016, Ansa et al. in a cross-sectional hospital-based study in Nigeria had a prevalence of 42.5%%, male represented 38.9% of the population with a mean age of 42.5 years(Age range: 47 -65)[18].

In Cameroon, a study conducted by Kingue et al. In 2005 at Yaoundé General Hospital revealed that heart failure is responsible for 5.77% of all hospital admissions, with a prevalence of 30% and an overall mortality of 9.03%, and its prevalence is increasing among the aging population. Also, in 2021 a study carried out for 03 years by Kuaté et al in two reference hospital in Yaoundé, showed a prevalence of 40.8 % and a hospital mortality rate of 16.4 %[19].

2.1.3 Recall

The heart is a hollow muscular structure whose function is to pump blood. Located at the mediastinum in the thoracic cavity, it has a cone shape with the base upward and the apex downward, It is made up of 03 layers: Pericardium (fibrous and serous), myocardium and endocardium. The amount of blood pumped by the heart over a given time period is known as cardiac output, which is in turn the product of HR and stroke volume (SV) and is typically **4–8 L/min**. In addition, other factors such as synergistic ventricular contraction, ventricular wall integrity, and valvular competence all affect CO[20].SV is defined as the amount of blood ejected by the ventricle per heartbeat, and is **usually 1 cc/kg or approximately 60–100 cc**[20]**.**

Stroke volume is regulated by

1. **End diastolic volume(EDV):** Volume of blood in the ventricles at the end of diastole. It is also called **preload**. Stroke volume increases with increase EDV

Preload can be calculated as: preload =(LVEDP×LVEDR)/2*h*, where LVEDP is the left ventricular end-diastolic pressure, LVEDR means left ventricular end diastolic radius and "*h*" represents the left ventricular thickness [6].

2. . **Total peripheral resistance**: Also called **afterload**, it is frictional resistance in arteries and varies inversly with the stroke volume
3. **Myocardial Contractility (Frank-Starling principle)**: It is strenght of ventricular contraction and increases with increase in preload.

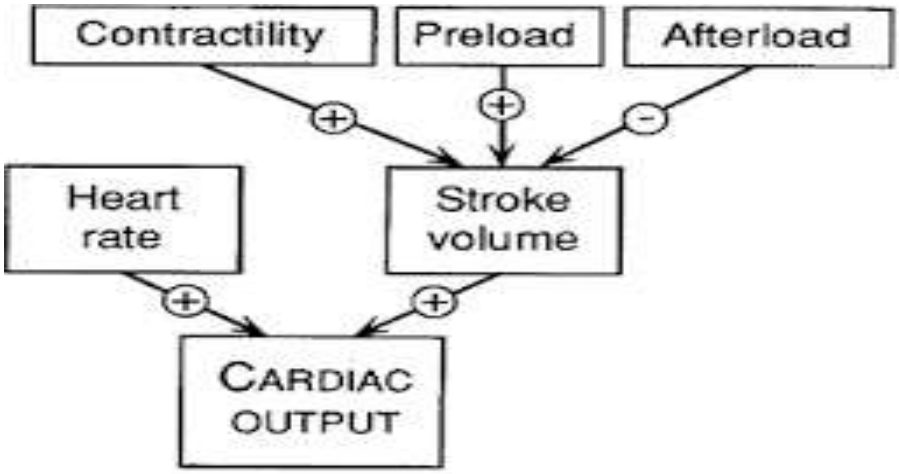

Figure 1: Determinants of cardiac output [21]

From Frank-Starling principle

Normally (top curve), as preload increases, cardiac performance also increases. However, at a certain point, performance plateaus then decline. In heart failure (HF) due to systolic dysfunction (bottom curve), the overall curve shifts downward, reflecting reduced cardiac performance at a given preload, and as preload increases, cardiac performance increases less. With treatment (middle curve), performance is improved, although not normalized[22].

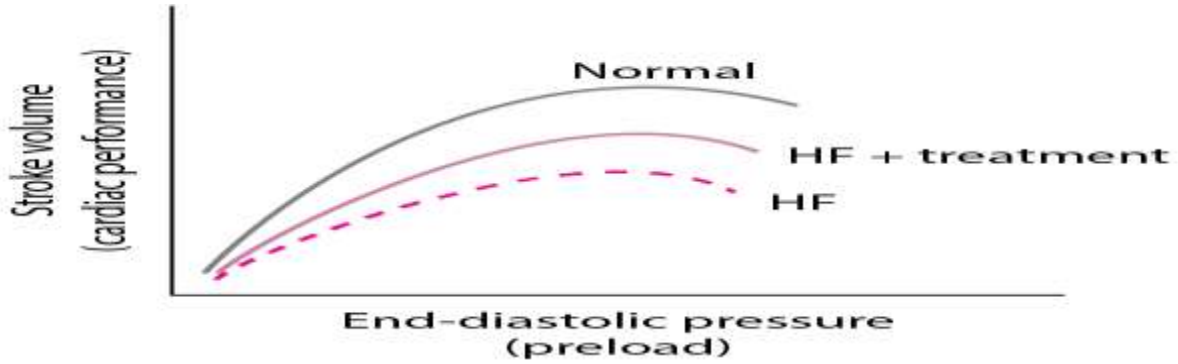

Figure 2:Frank-starling principle[22]

2.1.4 CLASSIFICATION OF HEART FAILURE

A. **According to the side of the heart involved**: Left sided, right sided or biventricular
B. **According to the output dysfunction**: Low and high output
C. **According to the time of onset**: Acute and chronic
D. **Acccording to the ejection fraction**: HFpEF, HFmEF and HFrEF
E. **According to New York Heart Association**: class I,II,III,IV and V
F. **According to ACC/AHA**: stage A,B,C and D

Table I: Classification of heart failure based on ejection fraction[23]

Classification	Left ventricular ejection fraction(LVEF)
HF with reduced ejection fraction(HFrEF)	≤ 40%
HF with midly reduced ejection fraction(HFmEF)	41 to 49%
HF with preserved ejection fraction(HFpEF)	≥ 50%
HF with improved ejection fraction(HFimEF)	≤ 40% at baseline, a ≥ 10-point increase from baseline and a second measurement of > 40%

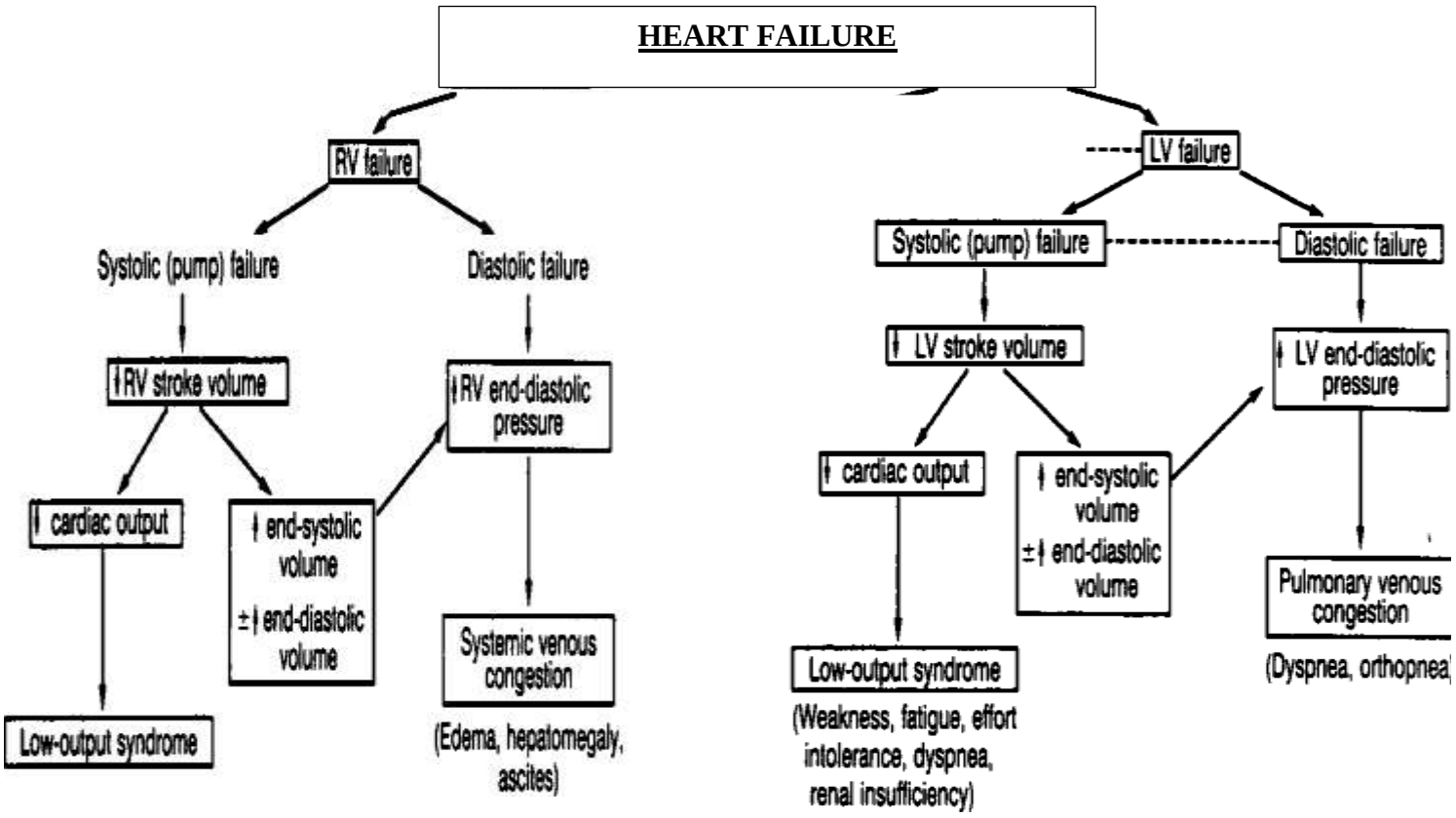

Figure 3: Pathophysiology of right ventricular(RV) and left ventricular(LV) heart failure[24]

2.1.5 Pathophysiology

In heart failure, the heart may not provide tissues with adequate blood for metabolic needs, and cardiac-related elevation of pulmonary or systemic venous pressures may result in organ congestion.

Heart failure may be viewed as a progressive disorder that is

- Firstly, it is initiated by direct action on the heart after an index event leading to an inadequate Cardiac output.
- Secondly it is also a systemic response attempting to compensate for the inadequacy[25].

A. INDEX EVENT

Although one seldom has an opportunity to observe the very beginnings of the heart failure syndrome (except for acute myocardial infarction [MI]), it has been proven that patients often go through a period of latent or even asymptomatic LV dysfunction before the development of overt signs and symptoms[26]. Hence, we can presume that in many cases there is a preceding index event which may have an abrupt onset, as in the case of a myocardial infarction, it may have a gradual or insidious onset, as in the case of hemodynamic pressure or volume overloading, or it may be hereditary, as in the case of many of the genetic cardiomyopathies[25].This index event either damages the heart muscle, with a resultant loss of functioning cardiac myocytes, or alternatively disrupts the ability of the myocardium to generate force, thereby preventing the heart from contracting normally[25], leading to a decrease in cardiac output. Regardless of the nature of the inciting event, the feature that is common to each of these index events is that they all, in some manner, produce a decline in pumping capacity of the heart. In most instances, patients will remain asymptomatic or minimally symptomatic following the initial decline in pumping capacity of the heart, or will develop symptoms only after the dysfunction has been present for some time[25]. In developed countries, left ventricular dysfunction accounts for the majority of cases of HF and results mainly from myocardial infarction (systolic dysfunction), hypertension (diastolic and systolic dysfunction), or in many cases both[9]. Thus, when viewed within this conceptual framework, left ventricular (LV) dysfunction is necessary but not sufficient for the development of the syndrome of heart failure[25].

If cardiac output falls, either the heart rate or stroke volume must change in order to maintain perfusion. If stroke volume cannot be maintained, then heart rate must increase to maintain cardiac output. However, the pathophysiology behind chronic HF includes not only a structural abnormality; it also includes the systemic response to poor perfusion with the activation of the compensatory mechanisms.

B. COMPENSATORY MECHANISM

Heart failure begins after an index event produces an initial decline in pumping capacity of the heart. Following this initial decline in pumping capacity of the heart, a variety of compensatory mechanisms are activated, including **the neuro-hormonal(**or **neuro-humoral) system, cardiac remodeling** and **vascular changes**[25]**.**In the short-term, these systems are able to restore cardiovascular function to a normal homeostatic range with the result that the patient remains asymptomatic. However, with time, the sustained activation of these systems can lead to secondary end-organ damage within the ventricle, with worsening LV remodeling and subsequent cardiac decompensation. As a result of worsening LV remodeling and cardiac decompensation, patients undergo the transition from asymptomatic to symptomatic heart failure. These compensatory mechanisms are discussed below:

i. The neuro-hormonal system

The first activated system in response to impaired cardiac function is the neuro-hormonal system, which includes **the sympathetic nervous system, the RAAS** and **vasoactive peptides.** In heart failure, the pressure-baroreceptors are activated in the carotid sinus, aortic arch, and in the left ventricle. The afferent signals modify the central cardio-regulatory centers to increase the circulating blood volume. Sympathetic and humoral efferent mechanisms are stimulated, and the antidiuretic hormone arginine vasopressin is released from the posterior pituitary gland. Sympathetic activation of peripheral organs, for example, kidney, vasculature, skeletal muscles, or the heart itself results in perfusion redistribution[25].

- **The activation of the sympathetic system**

This implies activation of systemic and cardiac sympathetic nervous system which are the fastest adaptive response mechanism in heart failure. The sympathetic nervous system is activated by pressure-sensitive (baro- receptors). Under physiological circumstances, “high-pressure” baroreceptors in the carotid sinus and aortic arch, and “low-pressure” baroreceptors, located in the walls of major veins and in the right atrium of the heart, are the main inhibitors of the sympathetic nervous system. In contrast, the peripheral chemoreceptors activate the sympathetic nervous system. The cooperation of these two systems results in low sympathetic activity and high heart rate variability, according to the actual needs[25]. In heart failure, this precisely controlled balance shifts that is, the baroreceptor inhibition decreases and excitatory impulses increase. The decrease in MAP seen in HF leads to a stimulation of the sympathetic nervous

system (SNS) and release of catecholamines (norepinephrine and epinephrine).This stimulation has direct effects on the heart (increased HR and contractility) and on the peripheral vasculature (vasoconstriction) which increase SV and TPR, respectively, increasing MAP[20]. The effects of the sympathetic nervous system are mediated through three adrenergic receptors: β1, β2, and α1. In the peripheral vasculature, activation of the β1 and α1 receptors leads to activation of the renin–angiotensin–aldosterone system (RAAS) which causes vasoconstriction, sodium retention, and thirst, also augmenting MAP[20]. The sympathetic activation has some negative effects as well as the release of catecholamines can potentiate different arrhythmias and may aggravate myocardial ischemia. Furthermore, plasma epinephrines are also well-known directly toxic to cardiac myocytes and induce their hypertrophy and apoptosis as well.

Table II: Biological effects of activated cardiac adrenergic receptors[27]

Adrenergic receptors	Beneficial effect	Harmful effect
α1c	Positive inotropy	Myocyte damage Proarrhythmic vasoconstriction
β1	Positive inotropy Positive chronotropy Vasodilation(epicardial) Positive lusitropy	Myocyte damage, apoptosis Fetal gene induction proarrhythmic
β2	Positive inotropy Positive chronotropy Vasodilation(small vessel) Antiapoptic Positive lusitropy	Proarrhythmic Fibroblast hyperplasia

- **Renin-angiotensin-aldosterone system(RAAS) activation**

The activation of this system is thought to occur as a consequence of reduced renal perfusion, increased proximal sodium reabsorption and thereby, decreased distal tubular sodium delivery to the macula densa. Increased renal sympathetic tone via ß – adrenegic stimulation of renin release also contributes to this effect[6].Increase activity of this system and stimulation of antidiuretic hormone through a central action of angiotensin II leads to volume and salt retention that is thought to be beneficial for augmentation of cardiac performance, from the principle of Frank-Starling. Also, angiotensin II is a powerful vasoconstrictor which leads to increase afterload. In addition, angiotensin II has important effects on cardiac myocytes (it promotes hypertrophy, myocyte apoptosis, and causes structural and biochemical alterations in the extracellular matrix) and may contribute to the endothelial dysfunction that is observed in chronic heart failure.

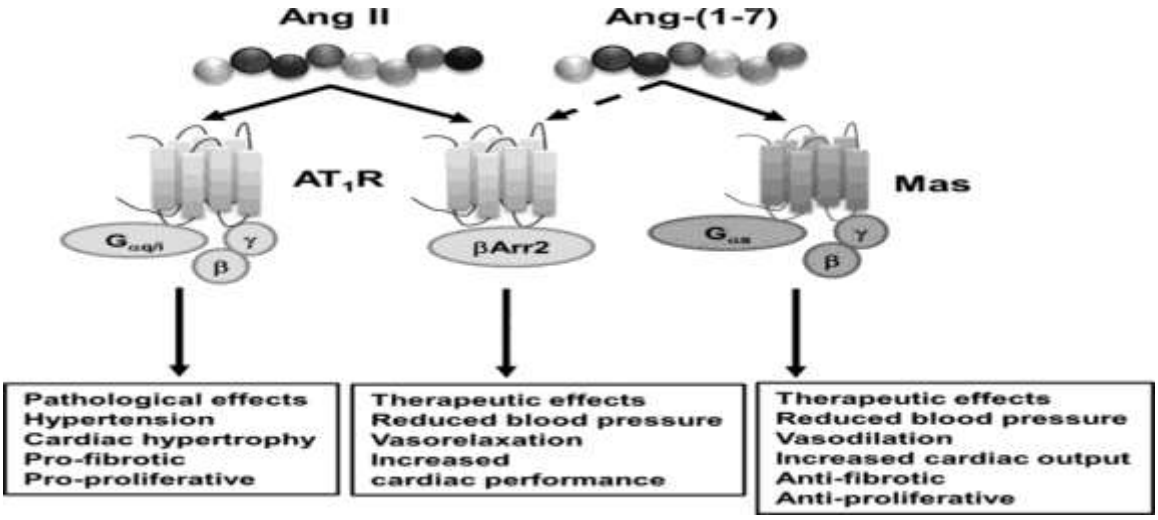

Figure 4: Mechanism of action of Angiotensin II[28]

There are other neurohormonal mechanisms at work in HF. The first includes the natriuretic peptides atrial natriuretic peptide (ANP), brain natriuretic peptide (BNP), and c-type natriuretic peptide (CNP) which serve to counteract the vasoconstricting effects of the other neurohormonal systems previously discussed [6]. ANP and BNP are found in the atria and ventricles, respectively, and are released following atrial or ventricular stretch. CNP is found predominantly in the central nervous system. These hormones act directly on blood vessels to cause vasodilation. Additionally, BNP (brain natriuretic peptide) inhibits the RAAS and the adrenergic activation. As important members of the compensatory mechanisms in heart failure, the concentration of

natriuretic peptides has both diagnostic and prognostic relevance [6]. Plasma ANP (atrial natriuretic peptide) levels rise in the early phase of the development of heart failure, therefore, they have been used as marker for the diagnosis of asymptomatic left ventricular dysfunction..

- **Endothelium-derived vasoactive substances**

They are produced by the vascular endothelium and act locally to promote vasodilation (nitric oxide, bradykinin, and prostacyclin) or vasoconstriction (endothelin I). Cytokine production also increases in HF and include tumor necrosis factor α, interleukin 1α, interleukin 6, and interferon α. These small molecules are negative inotropes and decrease contractility, and elevated levels are associated with worse clinical outcomes.

ii. **Cardiac remodelling**

The term *remodeling* is used to summarize the structural and subsequent functional changes in the heart after injury. It implies alterations in heart dimensions, mass, and shape in response to a specific cardiac event[6] . Remodeling can be divided into physiologic/pathologic or adaptive/maladaptive. Physiologic remodeling is called “athlete’s heart”, when the remodeling occurs after physiological stimuli. It is clearly different from pathologic remodeling. The molecular mechanisms are unclear but might involve IGF signaling. Pathological remodeling develops if the underlying cause is a pathological process, for example, cardiac injury, pressure, or volume overload. Independently of the underlying pathologic cause, cardiac remodeling has a common molecular, biochemical, mechanical pathway, and involves all cells and components of the entire heart: cardiomyocytes, fibroblasts, endothelium, and the interstitium. There are several modifying factors that have an effect on cardiac remodeling, such as activation of the neuro-humoral system, blood pressure, or the hemodynamic changes in heart chambers. Cardiac remodeling is divided into 02: Macroscopic(macrostructural) and microscopic(cellular) remodeling. Macroscopic remodeling involves ventricular hypertrophy and dilation due to cardiomyocyte reorganization and elongation, increased ventricle wall tension, and impaired subendocardial perfusion. Microscopic changes on the other hand involve cardiomyocyte hypertrophy, myocyte apoptosis and necrosis, fibroblast proliferation, accumulation of proinflammatory mediators, and extracellular matrix reorganization characterized by fibrosis induction.

iii. **Vascular changes[6]**

These are the series of changes occuring during HF aiming to increase vascular tone leading to perfusion redistribution. These changes include: Constriction of arteriolar vessels, increased systemic vascular resistance, increased venous pressure and decreased venous compliance[6].

2.1.6 Summary of pathophysiology of heart failure

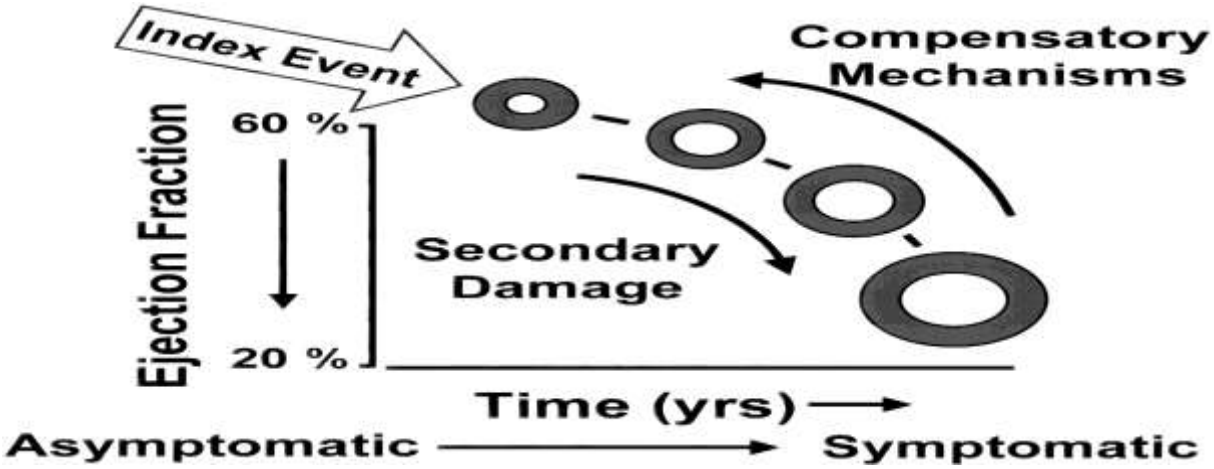

Figure 5: summary of Pathophysiology of heart failure[25]

Table III: compensatory mechanism in heart failure[27]

Localization	compensated	Decompensated
Cardiac	Frank-Starling mechanism Ventricular hypertrophy Tachycardia	Reduced EF Ventricular dilation Arrhythmias
Vascular	Increased vascular tone Perfusion redistribution	Vasoconstriction Peripheral hypoperfusion
Hormonal	RAAS Vasopressin (ADH) Circulating cathecolamines Natriuretic peptides	Hypertension, vasoconstriction Volume overload Tachycardia Hyponatremia
Autonomic	Increased sympathetic adrenergic activity Reduced vagal tone	Tachycardia Tachycardia

2.1.7 Signs and Symptoms

The signs and symptoms of HF are the result of the clinical sequelae of inadequate CO and lack of efficient venous return. These are signs and symptoms are dependent on the type of ventricular dysfunction encounterd. As such, clinically there are symptoms of left ventricular dysfunction, right ventricular dysfunction or both.

Table IV: signs and symptoms of heart failure [8]

	Left-sided heart failure	Right-sided heart failure
Symptoms	Due mainly to diastolic dysfunction: -dyspnea -cardiac asthma -pulmonary edema -hemoptysis Due mainly to systolic dysfunction: -fatigue -decreased physical and mental performance -Cheyne-Stokes respiration -nocturia	Distended neck veins - peripheral edema - lower extremity edema - edema of hand dorsum - eyelids - anasarca nausea, vomiting Upper abdominal pain nocturia
Signs	Signs of pulmonary congestion:	Signs of venous congestion:
	- moist rales - wheezing - abdominal sputum cytology Fourth heart sound (presystolic gallop) Third heart sound (protodiastolic gallop) Cold extremities oliguria	- increased central venous pressure - positive hepato-jugular reflux - congestive hepatomegaly, cardiac cirrhosis Ascites Proteinuria Fourth heart sound
Findings in left-sided and right-sided heart failure	Tachypnea Tachycardia Peripheral exhaustion cyanosis Pleural effusion cachexia	

2.1.8 Diagnosis

The diagnosis of heart failure is generally made based on the Framingham criteria, which involve manifested symptoms and clinical signs of the patient.
The diagnosis requires at least 2 major criteria, or 1 major criterion with at least two minor criteria. Two or more minor criteria are only accepted as diagnosis if they cannot be due to different organ failure like chronic lung disease [chronic obstructive pulmonary disease (COPD)], liver cirrhosis or nephrotic syndrome.

Table V: Framingham diagnostic criteria of heart failure[29]

Major symptoms	**Minor symptoms**
1. Paroxysmal Nocturnal Dyspnea(PND) or orthopnea	1. Bilateral ankle edema
2. Neck vein distension(JVD)	2. Nocturnal cough
3. Rales	3. Dyspnea or ordinary exertion
4. Radiographic cardiomegaly	4. Hepatomegaly
5. Acute pulmonary edema	5. Pleural effusion
6. S3 gallop	6. A decreased in vital capacity by 1/3 the maximal value recorded
7. Increased central venous pressure(> H_2O at RA)	7. Tachycardia(> 120 BPM)
8. Circulation time of 25 seconds	8. *NOT utilized in this analysis as not documented in routine clinical practice
9. Hepato-jugular reflux(HJR)	
10. Weight loss of 4.5 kg in 5 days in response to treatment	

The clinical severity of heart failure is graded according to the New York Heart Association (NYHA) functional classification based on the clinical symptoms and physical activity of the patient.

Another classification of chronic heart failure was established by the American College of Cardiology (ACC) and the American Heart Association (AHA) to complement the NYHA functional classification. This classification is also based on the clinical signs and symptoms of the patient, thus comprises the concomitant diseases and risk factors as well, to estimate the progression stage and outcome of the disease

Table VI: ACC/NYHA classification of heart failure[30]

ACC/ AHA Heart failure stage	NYHA Functional class
A. At risk for heart failure but without structural heart disease or symptoms	None
B. Structural heart disease but without symptoms	I. Asymptomatic heart failure : no symptoms
C. Structural heart disease with prior or current heart failure symptoms	II. Mild heart failure: symptomatic with moderate exertion III. Moderate heart failure: symptomatic with minimal exertion
D. Refractory heart failure requiring specialized intervention	IV. Severe heart failure: symptomatic at rest

2.1.9 Paraclinical evaluation[31]

All individuals diagnosed with HF should benefit of an initial workup consisting of atleast: an echocardiogram, chest x-ray, an electrocardiogram(ECG) and biological workups. The remaining workups are discussed depending on the case encountered.

- Echocardiogram

This is the most useful workup necessary to confirm the diagnosis of heart failiure. It provides information on heart chamber volumes, diastolic function, wall thickness, valvular function and degree of left ventricular defects; all been indespensable for the diagnosis and management.

- Electrocardiogram(ECG)

An abnormal ECG increases the probability of heart failiure though it has a low specificity. Abnormalities on ECG sometimes provide information on the etiology of heart failiure (for example myocardial infarction), and the results may provide indication on appropriate therapy for patient management.

- Chest radiography

This is mainly done to exclude dyspnea of pulmonary origine eventhough it enable to observe the prescence of signs pulmonary congestion and heart enlargment. Hence, its main intereset is to exclude differential diagnosis and put into evidence pulmonary venous congestion and cardiomegaly.

- Dosage of natriuretic peptide

Plasmatic concentration of natriuretic peptides can be used as a diagnostic tool for heart failure especially when it is chronic when echocardiography is not availaible. Elevated level of natriuretic peptide can be used for initial diagnosis. The upper limit for normal level in chronic heart failure depends on the type of natriuretic peptides; for Brain natriuretic peptider(BNP) it is 35pg/ml and for N-terminal pro-BNP(NT-pro BNP) it is 125pg/ml. Elevated BNP in particular is thought to be one of the first signs of HF and is used to follow the progression of disease.

- Other workups

To evaluate the level of end organ damage, additional workups like creatinemia, BUN and blood electrolytes to measure kidney injury, bilirubinemia, clothing factors and transaminase for liver injury ca help to guide therapeutic management.

2.1.10 Management[31]

- **Treatment goals**

The objectives in management of patients with heart failure are:

a. Ameliorate quality of life
b. Prevent decompensation, reduce rates and length of hospitalization
c. Improve functional capacities
d. Slow disease progression and decrease mortality rates

- General measures

It consist in changing lifestyle behaviors which have an impact in disease progression. These mesures include:

i. **Therapeutic education**
ii. Low salt diet
iii. Restriction in liquid intake
iv. Moderate alcohol consumption

v. Abolition of tobacco consumption
vi. Increase practice of physical activities

- Pharmacological measures

i. Angiotensin converting enzyme(ACE) inhibitor
ii. Angiotensin II receptor blocker(ARB)
iii. beta blockers
iv. mineralocorticoid receptor antagonists
v. diuretics.

- Implantable devices

i. Pacemakers or cardiac stimulators
ii. Cardiac resynchronization
iii. Implantable defibrillators

- Surgical technics

i. Valvular replacement and reconstruction
ii. Aorto-coronarian pontage
iii. Ventricular remodellage technics

2.2 Patient Therapeutic Education

2.2.1 Definition

According to the **WHO** document published in **1998** [32], therapeutic patient education can be viewed as a set of structured activities that consist of "helping the patient and his family to acquire knowledge and competencies they need to manage their life with chronic disease and its treatment, in order to better collaborate with the caregivers, and to improve his quality of life" [32,33] . It is a basic, lasting component of patient management and encourages the patient to assume a certain level of responsibility for his or her own care [34]. Therapeutic patient education is a technique that was developed for the purpose of enabling health care professionals to pass on their knowledge and expertise to patients so that, patients can become partners in their own care [35].

Therapeutic patient education is education managed by health care providers trained in the education of patients and it is designed to enable a patient or a group of patients and families to manage the treatment of their conditions and prevent avoidable complications while maintaining or improving quality of life. Its principal purpose is to produce a therapeutic effect in addition to that of all other interventions (pharmacologic, physical therapy, etc). [32,35].

It consist of organized activities, including psychosocial support, designed to make patients fully aware about their disease and to inform them about care, hospital organization and procedures, and health- and disease-related behaviours. It helps patients and their families understand and deal with the disease and its treatment together, in order to maintain or even improve quality of life.

2.2.2 History of Therapeutic patient education

The history of therapeutic patient education (TPE) has been strongly influenced by evolution of theories and concepts in the fields of medicine, psychology, and pedagogy. TPE has always existed in the form of advices, but actually it was born in 1922 with the first treatment with insulin. It has had three periods. The first period spans half a century from 1920s; pedagogy was vertical, authoritarian and passive. The second period began in 1970s; it was characterized by the development of a humanist, active, constructivist pedagogy. The third period, since the end of the 20th century, is dominated by the skill-based approach and by the management of objectives. This operative approach underestimates the importance of emotional experience of patients[36].

TPE history can be summarize as follows:

1922: TPE was described for the first time in literature by Leona Miller as he addresses to young diabetic patients from socially disadvantaged backgrounds to show that the TPE allows the treatment with insulin to give its full effectiveness, and that economically and culturally disadvantaged populations can learn to treat themselves.

1941: First diabetic education manual by Elliott P. Joslin.

1954: Creation of the association of "liberated diabetics" by Henril Estradet.

1972: Demonstration of the efficiency of therapeutic patient education (TPE) by Leona V. Miller et Jack Goldstein.

1975: Creation of the "diabetes treatment and teaching unit", in Geneva (Switzerland), by Jean-Philippe Assal.

1977: Creation of the Diabetes Education Study Group (DESG)

1988: Creation of the DESG for French language.

1996: according to the WHO "therapeutic patient education aims to help patients acquire or maintain the skills they need to best manage their life with a chronic illness."

1998: Definition of TPE by the World Health Organization (WHO). The WHO recognizes Therapeutic Patient Education (TPE): "TPE should be systematically integrated into the care provided to people suffering from chronic illness. »

2001: In France, the Directorate General of Health organized a working group on PTE.

2002: In France, law on the rights of patients. Ministerial decree calling for national PTE projects for health establishments.

2007: The High Authority for Health (HAS) adopts the skills-based approach developed by the Bobigny school.

2009: PTE makes its entry into the so-called "hospital, patients, health and territory" law (HPST); management of the PTE is entrusted to the Regional Health Agencies (ARS).

2010: decree relating to the conditions of authorization of therapeutic patient education programs.

2.2.3 Types of therapeutic patient education

The initial offer of TPE: This takes place after announcing the diagnosis or, during the course of the disease, if the patient has undergone a period without TPE. An assessment establishes whether the patient has attained his/her educational objectives:

- If yes: regular follow-up TPE (reinforcement) may be offered.
- If not: in-depth TPE (re-introduction) may be offered.

Regular follow-up TPE: This is a form of "continuous TPE" that strengthens and updates the patient's skills; it teaches the patient how to adjust skills. It encourages patients to implement skills and supports them in their life projects. It may be used to develop new skills so that patients can adapt better to their disease and its treatment. Its contents and schedule depend on medical follow-up, the patient's wishes, and the assessment of their skills.

In-depth TPE (or re-introduction of TPE): Required if patients have learning problems, fail to acquire specific skills, or experience a change in their health, living conditions, or status (from childhood to adolescence to adulthood).

Figure 6: Ongoing session of therapeutic education[37]

Some forms of traditional methods of therapeutic education has been carried out in France, with patients at high cardiovascular risk, were the PEGASE project[38] was designed to help doctors and paramedical staff provide TPE for these patients. After the educational diagnosis, specific themes discussed were related to diet, physical activity, treatments and cardiovascular diseases. This project was organized in 6 sessions (4 sessions group and 2 individual sessions). It was evaluated with 256 patients, and improvements were noted on the profile lipid levels and quality of life at 6 months.

Similarly, the I-CARE project[39] still in France was developed to create specific tools for patient TPE in chronic heart failure. The program takes place in individual sessions during therapeutic adaptation consultations or telemedicine follow-up and in four group sessions. This program includes 5 modules: educational diagnosis, knowledge of the disease, diet, physical activity and life activity daily and finally medications. A questionnaire knowledge was distributed before and after the TPE program in 136 centers to evaluate practices among I-CARE users. The results show that the program was generally completed after four ambulatory sessions, each with a total of 6 hours. Almost all centers included in the study (89%) completed the program.

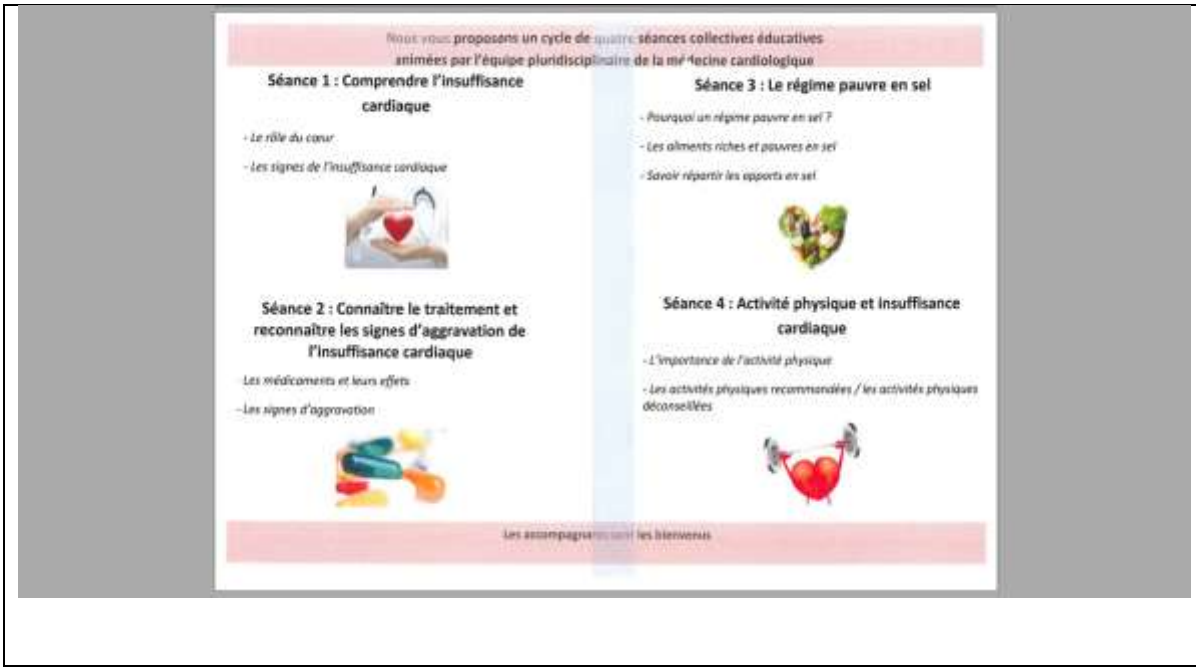

Figure 7: Flyer used in ICARE project for patient therapeutic education[40]

2.2.4 Objectives of therapeutic education for patients with heart failure

The objectives of patient education differ from those of educating students. When educating students, we are attempting to transfer knowledge and skills whereas in patient education we are attempting to facilitate behavior change. Patient education is therefore not just the provision of information, or of an intervention such as counselling or behavioral instruction. Patient acquisition of knowledge is often an essential component of patient education but it is not to be limited to that, but encompasses the use of this knowledge to promote behavioral changes which promote healthy life style.

The main goals of Patient therapeutic education are:

- acquire and maintain self-care skills (decisions taken by patients in order to modify the effect of disease on their health)
- acquire or mobilize life skills

self-care skills include:

- Relieving symptoms
- Taking into account self-monitoring and self-measurement results.
- Adjusting doses of medicines, initiating self-treatment.
- Accomplishing technical and healthcare procedures.

- Implementing lifestyle changes (e.g. diet, exercise).
- Preventing avoidable complications.
- Facing up to disease-related problems.
- Involving close relatives and friends in disease management, treatment and in any repercussions

Life skills include:

- Managing emotions and controlling stress
- Developing creative reasoning and critical thinking
- Developing communication and interpersonal skills
- Decision-making and problem-solving
- Setting goals and making choices
- Self-examination, self-evaluation, and self-reinforcement

2.2.5 Steps in a program of therapeutic education for patients with heart failure

Therapeutic education is provided in a 4-step process

1. **Making an educational diagnosis**

This is done after clinical diagnosis of chronic heart failure has been made by clinicians and aims to identify patients' needs and expectations, find out with them which skills they must acquire or maintain (and in which order), and estimate their willingness to take up the offer of TPE.

To do this, we:

- Conduct a structured interview to find out what the patient knows, their ideas, explanations, and feeling.
- Examine the patient's psychological reactions to their situation.
- Identify any protective or negative socio-environmental factors (social background, age, and lifestyle), social and cultural characteristics, stressful events, and problems in social integration.
- Find out what patients know about their health and what they expect; and identify any learning difficulties.
- Encourage patient involvement and self-motivation. Establish with the patient the disease management procedures that are best suited to them.

2. Defining an individual tailored TPE program with learning priorities

After the educational diagnosis session, we establish with the patient the skills (**self-care and life skills**) they need to acquire for their life project and treatment goals. Negotiate these skills with them in order to plan an individually tailored program. Explain them clearly to patients and to the healthcare providers implementing TPE and follow-up.

Below is a table of skills and their objectives.

Table VII: Competences and specific objectives of patients in therapeutic education[41]

Competences(skills)	**Specific objectives**
1. Understanding, explaining	Understand the human body, the disease, its pathophysiology, its social/ family repercussions, and the principles underlying treatment
2. Identifying, analyzing and measuring	Identify warning signs of early symptoms; analyse a risk situation or test results; be able to measure blood pressure, heart rate, oxygen saturation etc and record measurments
3. **Coping, deciding**	Know how to cope in a crisis (e.g. dyspnea attack), how to decide in an emergency, etc
4. **Problem solving (daily treatment, disease or life management, prevention)**	Be able to adjust treatment (e.g. diuretic doses), balance diet over a day or week, prevent accidents and exacerbations, setup a health-conducive surroundings and lifestyle (e.g. physical activity, stress management)
5. **Carrying out, doing**	Be able to carry out technical procedures (e.g. self-monitoring of blood pressure, use of diuretics, measuring oxygen saturation), self-examination (e.g. breathing rate, edema, pulse) and emergency procedures

6. **Adapting, adjusting**	Be able to adapt treatment to context (e.g. travel, sport), adjust treatment or diet, and adopt new medical technologies.
7. **Using the resources of the healthcare system, Asserting ones right**	Know where and when to consult, whom to call, how to seek useful information; assert rights (e.g. work, school, insurance policies). Take part in patient associations, etc

3. Planning and providing group and/or individual TPE session

- Select contents of TPE sessions, methods to be used and participative learning techniques (Table1).
- Propose and agree upon a suitable schedule of TPE sessions that takes into account geographical accessibility, availability of healthcare providers, and the patient's needs and preferences.
- Provide sessions which could be either group or individual or both in alternation.
- Group and individual sessions may alternate. This may be planned either in advance or during the program (at the patient's request or healthcare provider's discretion).

Group TPE sessions

Size of group: at least 3 people, not more than 8 to 10 adults

Duration of each session: 45 minutes

Value:

- Patients with similar educational objectives are grouped together.
- Experience and knowledge are shared.
- Added value from patients (shared experience, messages from other healthcare providers, how to solve every day problems).

Individual TPE sessions

Duration of each session: 30 to 45 minutes.

Value:

- Especially suitable for patients with physical, sensory or cognitive disabilities or who find it difficult to be in a group.
- Easier access.
- Better adaptated to the patient's everyday life in some cases.

4. **Conducting an individual TPE assessment:** This is usually done at least at the end of each TPE program or at anytime during the program (at the healthcare provider's discretion or the patient's request).

   The aim is to:

   - Emphasize the changes made by the patient (e.g. acquisition of skills, everyday experience of the illness, self-determination, capacity to act).
   - Update the educational diagnosis.
   - Share information and organize exchanges among the professionals involved in patient's management.
   - Offer a revised TPE program based on follow-up and the patient's wishes.

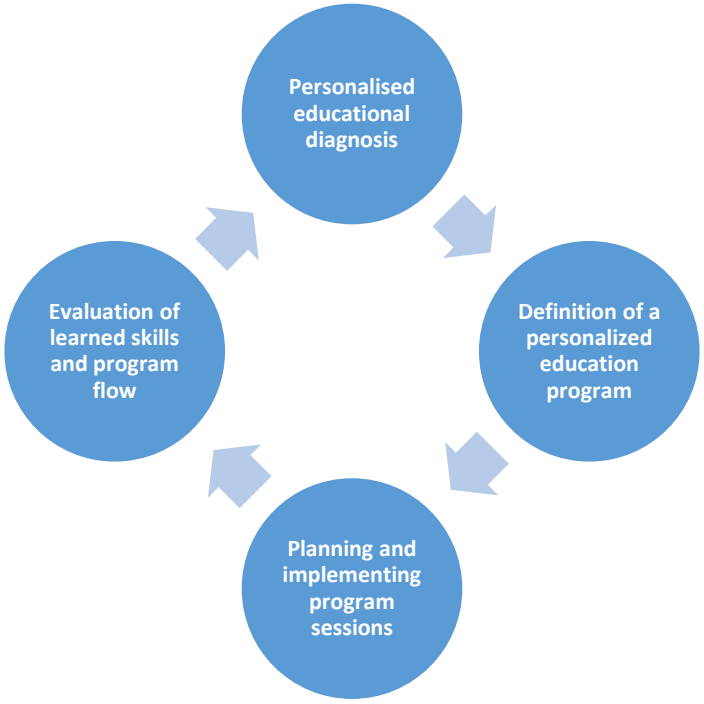

Figure 8: Flow chart showing steps involve in a program of therapeutic education[42]

2.2.6 Quality criteria for a program of therapeutic patient education

A high quality PTE should be:

- Patient-centered ("holistic", share decision-making, take account of patient preferences).
- Evidence-based (practice guidelines, relevant scientific literature, expert consensus) and supplemented by feedback from patients and their close relatives with regard to content and educational resources.
- A component of treatment and management.
- Concerned with the patient's everyday life (social, psychological and environmental factors).
- A continuing process adjusted to disease course and patient lifestyle (part of long term management).
- Taught by health care providers trained in TPE and in educational methods, who are part of a team coordinating actions.
- Based on an educational assessment of the patient's needs and environment (educational diagnosis) and on the learning priorities identified by the patient and healthcare providers.
- Developed jointly with the patient, with the involvement of the patient's relatives whenever possible.
- Adjusted to the patient's educational and cultural background, in line with their preferences, their approach to learning, and how fast they learn.
- Well-defined (activities and contents), scheduled, and conducted using different educational methods.
- Be multi-professional, interdisciplinary, and inter-sectorial, and implemented within a network.
- Include an individual assessment of the TPE program and its implementation.

2.2.7 Importance of therapeutic education in self-care of patients with CHF

Self-care, is conceptually defined as a deliberate, decision-making process of sustaining health through symptom monitoring, treatment seeking and evaluating the effects of treatment[43]. Patient-centered self-care education is an educational approach that employs meaningful, targeted education tailored to an individual patient's needs, preferences, and values. Patient-centered

educational approaches may empower patients with heart failure to be successful in self-care management and improve outcomes[44].

Effective self-care is vital for successful management of HF to avoid repeated hospital readmissions, but patients struggle with discerning changes in symptoms, medication adherence and prescribed diets[45]. Evidence suggests that interventions(TPE) that is suited to individuals can build skills, self-efficacy and are effective in increasing engagement in self-care)[46].

Efficient self-care in HF is associated with decreased myocardial stress and reduced re-hospitalizations rates, however, the number of individuals performing effective self-care is low[47]. In addition, self-care behaviors such as daily weight monitoring, symptom monitoring and adherence to a low sodium diet are not consistently performed among patients with HF[43]. Symptom monitoring can be difficult in the presence of two or more comorbidities and can be further confounded by the normal physical changes associated with aging. As a result, older individuals are particularly susceptible to having problems with symptom monitoring and, need the most support to help them monitor and recognize changes in their symptoms, making therapeutic education essential in the process of patient self-care.

The Middle-Range Theory of Self-care of Chronic Illness[43] differentiates three modes of patient empowerment:

- **Self-care maintenance:** is defined as those behaviors used by patients with a chronic illness to maintain physical and emotional stability. These behaviors could be related to lifestyle (eg, smoking cessation, preparing healthy food, coping with stress) or the medical regimen (eg, taking medication as prescribed). These activities may be imposed by others (eg, health care professionals or family members) and then agreed on by the patient or solely chosen by the patient to meet his or her own goals.
- **Self-care monitoring:** refers to the process of observing oneself for changes in signs and symptoms (For example, many people monitor their weight regularly to follow gains and losses).
- **Self-care management:** involves an evaluation of changes in physical and emotional signs and symptoms to determine if action is needed. For example, shortness of breath due to asthma may require use of a bronchodilator but shortness of breath due to heart failure may require taking an extra diuretic.

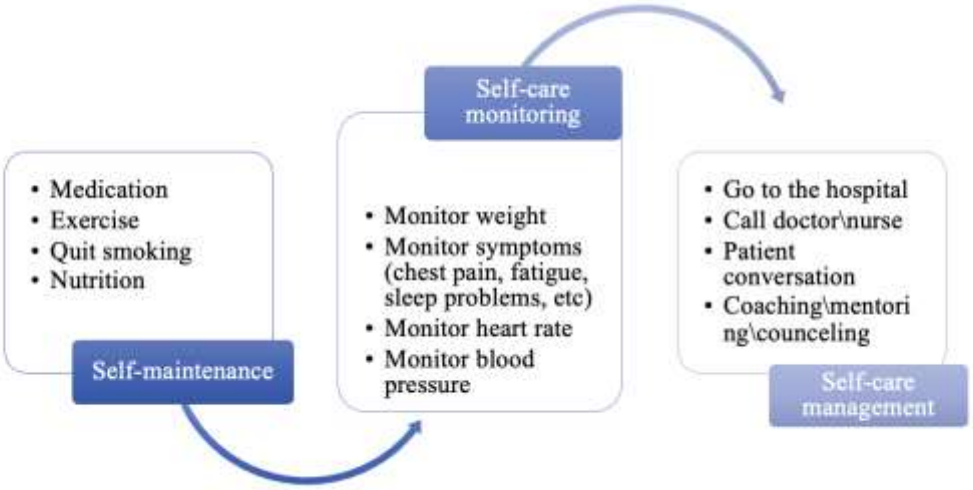

Figure 9: Application of The Middle-Range Theory of Self-care of Chronic Illness into patient education within a complex cardiologic condition[43]

2.2.8 Current state of literature on the research question

In sub-Saharan Africa, communicable diseases such as malaria, tuberculosis, and HIV have long been among the most prominent contributors to disease burden. However, like most low-income and middle-income countries across the globe, countries in sub-Saharan Africa are undergoing a rapid epidemiological transition characterized by a shift from disease-burden profiles dominated by communicable diseases and childhood illnesses to profiles featuring an increasing predominance of chronic, non-communicable diseases (NCDs) [48]. As such, research indicates growing burdens of NCDs such as cardiovascular disease including heart failure in numerous countries in sub-Saharan Africa[49]. Differently from acute conditions, whose control largely depends on the physician, chronic diseases require the patients' compliance and their active involvement in the management of their daily life, due to a transfer of medical competencies [50]. **The concepts of patient's empowerment, patient–physician partnership and therapeutic alliance** all referring to patient therapeutic education, are more and more frequently discussed in the medical literature as directly linked to this new attribution of roles and responsibilities within the frame of chronic diseases[50]. Therapeutic education has been recognized by the WHO as a major component of treatment and long term follow up of many chronic diseases[32,51].It is a well-defined branch of health education with a patient-centered approach aimed at patient empowerment[52]. It allows not only to increase patients' knowledge and skills on the disease, but also on their treatment, in order to maintain and improve life quality[52], increase therapeutic compliance, and decrease complication[53].

Table VIII: Some studies on therapeutic education of patients with heart failure and their results

Country	Year	Author	Title	Journal	Method	Results
USA	2016	Isabella Cajita et al.	Health Literacy and Heart Failure: A Systematic Review	Journal of cardiovascular nursing	A systematic search of the following databases was conducted, PubMed, CINAHL Plus, Embase, PsycINFO, and Scopus,	An average of 39% of the study participants found to have low health literacy. Adequate health literacy was consistently

					using relevant keywords and clear inclusion and exclusion criteria	correlated with higher HF knowledge and higher salt knowledge.
Cameroon	2018	CN Nganou-Gnindjio et al.	Evaluation de l'observance thérapeutique chez les patients suivis pour insuffisance cardiaque chronique en milieu urbain Camerounais: étude observationnelle	The journal of medicine and biomedical sciences	A cross-sectional study carried out over a period of 8 months in 03 public health facilities in Yaoundé. With a sample of 175 participants	Overall treatment compliance was 9.1%, adherence to medication was 36%, adherence to low sodium diet was 28.6%. forgetting was the reason of non-compliance in 71 % of participants. Higher education was a risk factor for poor drug adherence and poor knowledge about HF. Been widowed, doubled the risk of non-compliance to a low sodium diet. Disease duration of between 11 to 20 years was a risk factor of poor compliance to a low sodium diet

Taiwan	2015	Huey-ling Liou et al.	The effects of a self-care program on patients with heart failure	Journal of the Chinese medical association	A quasi-experimental design was used to investigate the effectiveness of a self-care program in HF patients. The patients were allocated to either the control group (usual care, n=75) or the experimental group (self-care program, n=56). The extent of patient knowledge on CHF was tested at both pre- and post-education stages. Self-care HF index(SCHFI), NYHA, hospital readmission and mortality were assessed	The experimental group had a significantly higher mean score in knowledge of CHF during post education testing than the control group. Self-care maintenance, self-care management and self-confidence significantly improved after the education program was completed. The NYHA functional class in the in the experimentation group showed a significant improvement after the self-care program compared to the control group. However, there was no significant difference in hospital readmission or mortality rate

						between the two groups
Ethopia	2021	Getenet Dessie et al.	Effect of a self-care educational intervention to improve self-care adherence among patients with chronic heart failure: a clustered randomized control trial in Northwest Ethopia	BMC cardiovascular disorders	A two-arm parallel, clustered-randomized control trial to assess a self-care education intervention's effectiveness on patient self-care scores with a sample size of 114 participants in each group	Self-care adherence score were balanced at baseline. After the intervention, patients in the intervention group(n=88) had a higher adherence scores than those in the control group(n=98). This difference was statistically significant and increased with each round of education
Senegal	2023	Mamadou Barry et al.	Therapeutic education of heart failure: prospective study in the cardiology department of Delal Jamm national hospital center in Dakar	World journal of cardiovascular diseases	a single-centered, interventional, non-randomized, before-and-after type study	he recorded that patients with good compliance increased from 75% to 90.63%, and patients with a low level of compliance (90.6%) decreased to 34.4%, An increase in the number of patients who had an attitude adapted to not

						exceeding the recommended amount of salt (6 before TPE and 22 after TPE), as well as in the number of patients who had an attitude adapted to physical activity (12 before TPE and 16 after TPE). There was also an increase in the number of patients who were confident about the outcome of their disease (12 before TPE and 16 after TPE), and a decrease in those who were hopeless (8 before TPE and 5 after TPE), an improvement in the quality of life score (45.03 before TPE and 15.78 after TPE)
China	2017	Qiong wang et al.	Effectiveness of the PRECEDE-based education	BMC Cardiovascular disorders	Experimental study	He recorded that, the scores for the

			intervention on quality of life in elderly patients with CHF			predisposing, reinforcing, and enabling factors increased significantly, and the mean total scores in EHFScBS-9, PHQ-9, and MLHFQ decreased significantly in the intervention group. In addition, these scores significantly differed from those of the control group. Furthermore, the MLHFQ score significantly correlated with the EHFScBS-9 and PHQ-9 scores

Chapter 3 : METHODOLOGY

3 METHODOLOGY

3.1 Study design

Our study was a one group pretest-posttest interventional study

3.2 Study site

we conducted our study in the cardiology unit of the Yaoundé Central Hospital and Biyem-assi district Hospital with patients selected from the out-patient unit of these health facilities:

- **The Yaoundé Central Hospital(YCH):**

It is a second category hospital in the health pyramid. It is located in the Center region, Mfoundi division, second district of Yaoundé, street 2.008. behind the CENAME and not far from the Messa's presbyterian church. We found there, several services such as the cardiology unit which takes care of cardiovascular pathologies. It includes a hospitalization and an outpatient ward where we recruited patients. The medical team within the cardiology unit is made up of cardiologists, a major, nurses and residents.

- **The Biyem-assi District Hospital:**

It is a fourth category hospital in the health pyramid. It is located in the center region, Mfoundi division, sixth district of Yaoundé. We found there several services such as that of internal medicine which is divided into several outpatient units and 01 hospitalization unit. We recruited patients at the out-patient cardiology unit. The medical team consisted of cardiologist, internist, dermatologist, endocrinologist, a major and nurses.

3.3 Duration and period

The study had a duration of 09 months beginning from October 1st 2023 to June 31st 2024.

The enrollment of participants took place for 02 months from February 14 2024 to April 5 2024

3.4 Target population

Individuals with stable chronic heart failure and who meet the Framingham HF diagnostic criteria of HF regardless of etiology, severity (ejection fraction) and resident in the city of Yaoundé.

3.5 Selection criteria

3.5.1 Inclusion criteria

Were included in the study any patient:

- ✓ Aged 21 years or older as of the date of enrollment and
- ✓ Diagnosed of chronic heart failure as defined regardless of the ejection fraction, based on echocardiogram exam done during the last 12 months preceding enrollment.
- ✓ Be stable.
- ✓ Be treated with at least one heart failure medication.

3.5.2 Exclusion criteria

Were excluded from the study any patient:

- ✓ Not able to take care of self (eat, dress, walk, bath, take medications, or use the toilet independently).
- ✓ Loss to follow-up or decided to quit the study.
- ✓ Absent from more than 02 educative sessions.
- ✓ Having advanced chronic kidney disease (glomerular filtration rate <30 ml/min/1.73 m^2).
- ✓ Having active cancer.

3.6 Sample size determination

We executed a non-probabilistic, consecutive and non-exhaustive sampling.

3.7 Judgment criteria

i. Principal judgment criteria:

Variation in score for quality of life: it shall consist of the difference between the mean score at the MNLHFQ in the pretest and that of the posttest intervention.

ii. Secondary judgment criteria:

- Knowledge on HF: it shall consist of the difference between the mean score at the Dutch's HF knowledge questionnaire in the pretest and that of the posttest intervention.
- Self-care behavior: it shall consist of the difference between the mean score obtained at 12-item EHFSCB questionnaire in the pretest and that of the posttest intervention.

3.8 Procedures

Description of the intervention

After obtaining the different administrative authorizations and ethical clearance, we proceeded with enrollments of participants from our study population. Our study was scheduled as follows:

- **Firstly,** eligible patients were selected during cardiology out-patient consultation using their consultation booklets.
- **Secondly,** individuals fulfilling inclusion criteria were approached for appropriate explanation on the aim and modalities of the study and a quick entertainment on the different topics of the educative sessions was done. Then, a written consent form was submitted to each participant for approval and signature. The consent form was available in both French and English languages.
- **Thirdly,** initial evaluation was performed immediately after filling of the consent form for:

– Socio-demographic parameters (name, age, sex, marital status, educational level, occupation)

– History of heart failure: duration since diagnosis, comorbidities (Alcohol, tobacco, hypertension, dyslipidemia, obesity), this was obtained from consultation booklet and prior para-clinical investigations.

– Health management: advice received on drugs, alcohol, physical activity and diet.

– Clinical and anthropometric parameters: weight, blood pressure, heart rate, height, body mass index and abdominal circumference.

– Workups: left ventricular ejection fraction.

– HF Knowledge using the Dutch Heart Failure Knowledge Scale: consists of 15 multiple-choice items concerning HF in general (4 items), HF treatment (6 items on diet, fluid restriction and activity) and symptoms with symptom recognition (5 items). It is a self-administered questionnaire and for each item, patients can choose from three options, with one of the options being the correct answer. The scale has a minimum score of 0 (no knowledge) and a maximum score of 15 points (optimal knowledge)[54]. Interpretation was as follows **Poor<50%, 50%≤ Average < 75% and Good ≥75%.**

– Self-care behavior using the European Self-care Behavior Scale: a self-report scale comprising 12 items rated on a 5-point scale between 0 (none of the time) and 5 (All of the time), was published in 2003. The scale is considered easy to administer and practical to use and has been found to measure change in behavior over time[55]. Interpretation was as follows; **Excellent behavior if ≥ 75%, 60%≤ Good behavior <75%**, **Poor behavior< 60%.**

- Quality of life using the Minnesota Living With Heart Failure questionnaire: it is a self-administered disease-specific questionnaire for patients with HF, comprising of 21-items rated on six-point Likert scales, representing different degrees of impact of HF on Heart Related Quality of Life (HRQoL), from 0 (none) to 5 (very much). It provides a total score (range 0–105, from best to worst HRQoL), as well as scores for two dimensions, physical (8 items, range 0–40) and emotional (5 items, range 0–25). The other eight items (of the total of 21) are only considered for the calculation of the total score[56]. We estimated that a score of **less than 24** on the MLHFQ represents **a good QoL**, **24≤ moderate QoL< 45** , and a score **greater than 45** represents **a poor QoL**[57].

Fourthly: sessions of therapeutic education was organized at the cardiology unit of the YCH and was practiced by the principal investigator under the supervision of cardiologists (Pr Nganou-Gnindjio and Dr Ndobo) and a nutritionist for a duration of 6 weeks (February 22 to May 2/2024). Participants were organized into 02 groups according to their availability with each group receiving one day of teaching in a week for the duration of the entire intervention, each group had the required number of participants recommended by the highest authority of health of France which is a maximum of 10 adults and lasted each 01 hours. The teaching lesson was scheduled as follows:

Number of individuals per group, group1: 10 and group 2: 7

Teaching timetable: group 1 on Saturday at 10:30 a.m.

group 2 on Wednesday at 3pm

Chapter 1: Knowledge on heart failure

- **Knowledge**: definition of heart failure, functioning of a healthy and a sick heart, causes of heart failure and symptoms of heart failure
- **Skills**: regular measurement using measurement instruments, monitoring of lower limb edema, track signs of breathing difficulties and evaluate my level of fatigue
- **Attitudes**: who to call in case of worsening symptoms

Chapter 2: Drugs for heart failure

- **Knowledge**: drugs specific for heart failure and their effects, know drugs adverse effects
- **Skills**: take regularly my treatment, know when and how to take my drugs

- **Attitudes**: think of drug renewal, be use to reading instruction leaflets for drugs side effects

Chapter 3: diet restrictions in heart failure

- **Knowledge**: why a low salt diet, identifying food rich and poor in salt.
- **Skills**: cooking without salt, which food type to privilege
- **Attitudes**: How to adapt daily salt intake?

Chapter 4: physical activities and hobbies

- **Knowledge**: importance of physical activity, recommended and non-recommended activities
- **Skills**: create period for rest and relaxation during the day, practice a physical activity at least 03 times per week

Figure 10: on-going session of therapeutic education at the Yaoundé Central Hospital

The fifth part: evaluations shall be scheduled at week 6 after beginning the intervention. It shall consist of:

- Knowledge on the disease using the Dutch's HF knowledge scale[54]
- Self-care behavior using the European Self-care Behavior scale[55]
- Quality of life using the Minnesota Living With Heart Failure[56]

3.9 SUMMARY OF THE PROCEDURE

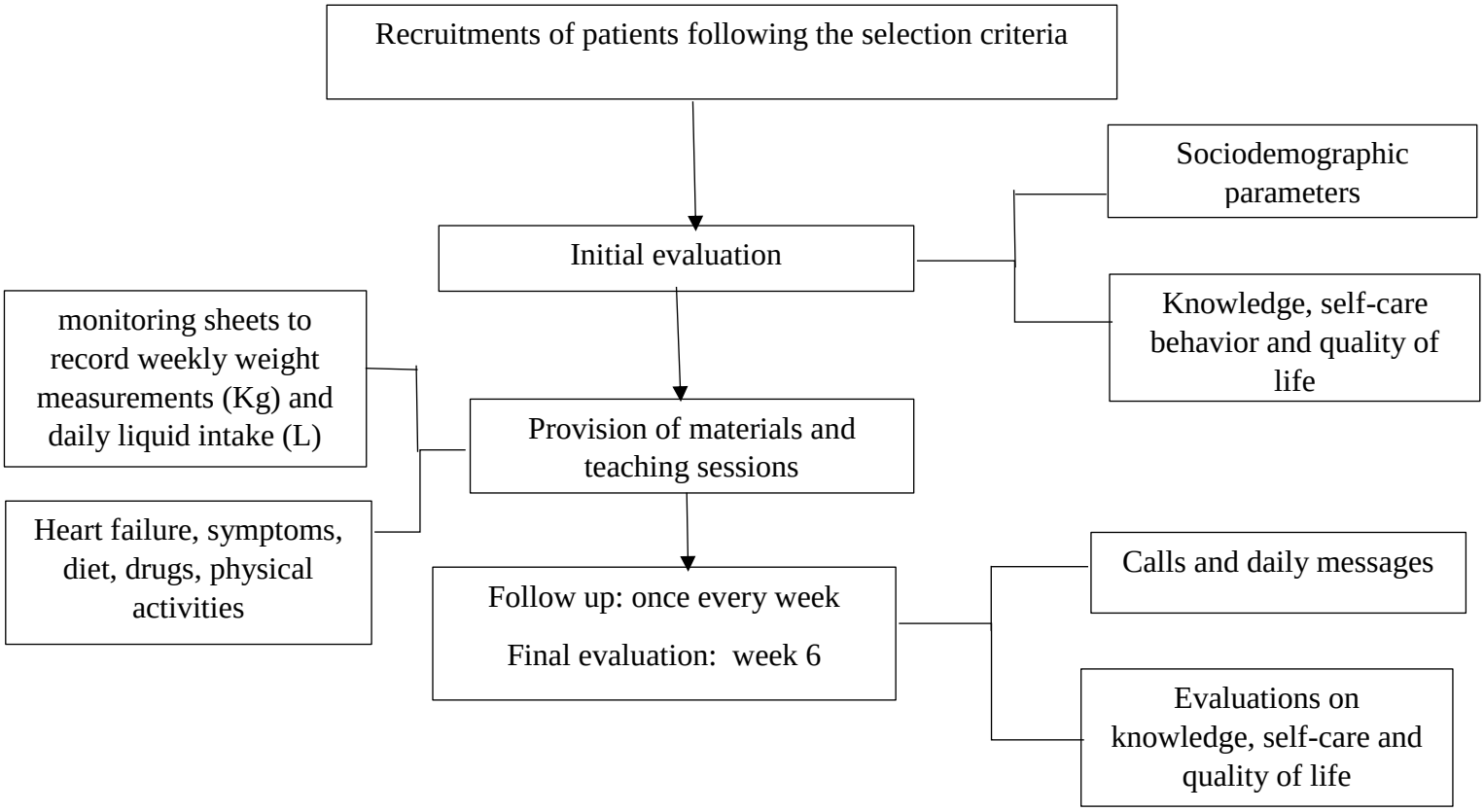

Figure 11: procedure undergone to carry out the intervention

3.10 Operational definition of terms

Chronic heart failure: The European Society of Cardiology(ESC) defined heart failure(HF) as a clinical syndrome consisting of symptoms that may be accompanied by signs due to a structural and/or functional abnormality of the heart that results in elevated intra-cardiac pressures and/or inadequate cardiac output at rest and/or during exercise[1].

Stable chronic heart failure: means no or mild symptoms and signs that have not changed recently for at least one month or since the last ambulatory visit according to clinical practice[58,59].

Therapeutic education: this is the training provided by health care providers trained in the education to patients, and consist of "helping the patient and his family to acquire knowledge and competencies they need to manage their life with chronic disease and its treatment, in order to better collaborate with the caregivers, and to improve his quality of life[32].

Knowledge: these are facts, information and skills acquired through experience or education.

Self-care: The practice of taking an active role in protecting one's own well-being and happiness, in particular during period of stress.

Quality of life: The standard of health, comfort and happiness experienced by an individual or group.

3.11 Data analysis

3.11.1 List of variables

- **Qualitative variables:** sex, comorbidities, etiology of heart failure, use of traditional remedies, advice received on drugs, advice received on rapid increase in weight or breathing difficulties, advice received on physical activity, age interval.
- **Quantitative variables**: weight, blood pressure, pulse, height, Body mass index, ejection fraction, age, knowledge score, self-care behavior score, quality of life score, professional activity, educational level, marital status.

3.11.2 Analysis of data

Data analysis was done using the software SPSS 23.

3.11.3 Statistical test

Comparison of means before and after the intervention was done using the STUDENT TEST.

3.11.4 presentation of results

The results shall be presented using tables and figures with comments for explanation.

3.12 Material for data management

- For history taking, we inspired our self from the STEPS questionnaire proposed by the WHO to device our questionnaire on patient identification, mode of life (daily physical activity)
- Questionnaires on Knowledge, self-care behavior and quality of life where obtained from standard questionnaires
- Consultation booklet
- Electronic blood pressure machine
- Meter rule
- A laptop
- A video projector
- Monitoring files

3.13 HUMAN RESOURCES

- Myself (investigator)
- Supervisor and Co-supervisor
- A Cardiologist
- A Dietician
- A Statistician

3.14 ETHICAL CONSIDERATIONS

We made sure that our research project respected the fundamental principles of medical research as stated by the Helsinki declaration of 1964 revised in October 2013. Research authorizations were obtained from the administration of the Yaoundé Central Hospital(YCH) Nº 059/24 and the Biyem-assi District Hospital (HDB) Nº 330. Ethical clearance was obtained from the Centre Regional Ethics Committee for Human and Health Research Nº 0104, ethical committee of the Faculty of Medicine and Biomedical Sciences of Yaoundé 1 Nº 0736. Participants were informed of the purpose, benefits and risks of the study. The informed consent form was made available and participants were informed of their freedom to participate and withdraw from the study without it affecting the care they receive.

Chapter 4: RESULTS

4 RESULTS

Recruitment of participants

The recruitment of participants took place in 02 public health facilities of the city of Yaounde, from February 14 2024 to APRIL 5 2024; notably in the out-patient cardiologic unit of the Yaoundé Central Hospital (YCH) and the Biyemassi District Hospital (HDB). A total of 200 participants were approached for the intervention. The figure below describes the process of recruitment:

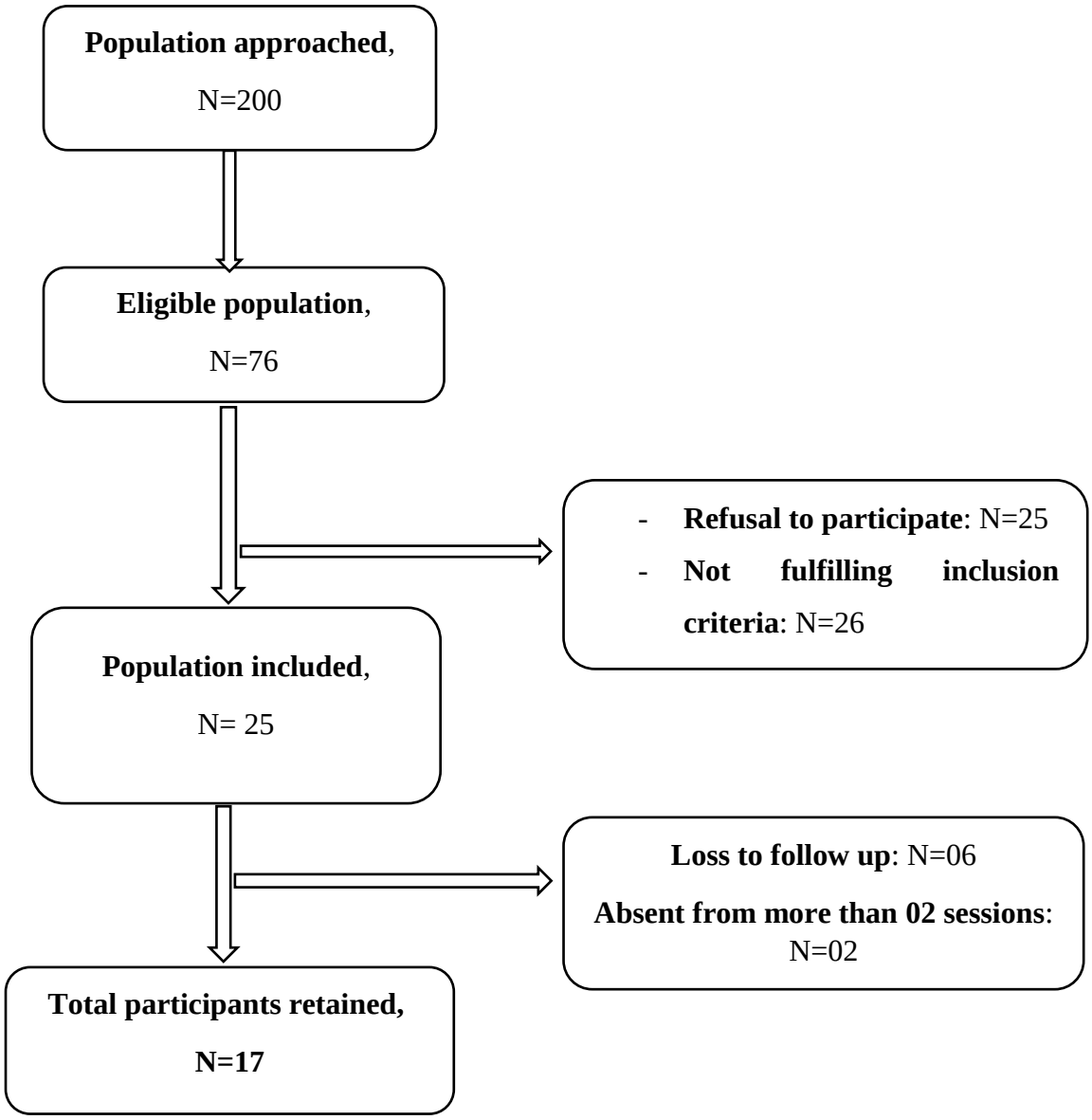

Figure 12: Flow chart of participants

4.1 Characteristics of the study population

4.1.1 Sociodemographic profile

At the end of this study,17 participants were included. From table VIII below, the mean age was 66.65 ± 8.65 years, ranging from 49 to 79 years. The sex-ratio was 0.89. Most participants were married (58,8). Also, the majority of the participants (n=9) had done secondary educational level and (n=7) were retired.

Table IX: repartition of the population according to sociodemographic characteristics

Variable	Frequency (N=17)	Percentage (%)
Age group		
[45-55[	2	11.8
[55-65[	5	29.4
≥ 65	10	58.8
Sex		
Male	8	47.1
Female	9	52.9
Marital status		
Single	1	5.9
Married	10	58.8
Divorce	1	5.9
Widow	5	29.4
Educational level		
None	2	11.8
Primary level	5	29.4
Secondary level	9	52.9
Higher education	1	5.9
Occupation		
Unemployed	2	11.8
Retired	7	41.2
Private sector	2	11.8
State employee	6	35.3

4.2 Clinical profile

4.2.1 Characteristics of heart failure

From the table below, 5 out of the 17 participants had received the diagnosis of heart failure for less than 6 months or between 61 and 120 months. Hypertension represented the most frequent etiology of heart failure was (58.8%), followed by ischemic heart disease (29.4%). About 15 (88.2%) of participants presented NYHA class I dyspnea.

Table X : repartition of the population according to characteristics of heart failure

Variable	Frequency (N=17)	Percent(%)
Duration since diagnosis(months)		
< 6	5	29.4
6-24	2	11.8
25-60	4	23.5
61-120	5	29.4
≥ 120	1	5.9
Etiology of heart failure		
Hypertensive heart disease	10	58.8
Ischemic heart disease	5	29.4
Others*	2	11.8
NYHA class		
I	15	88.2
II	2	11.8

*Others: rhythmic heart disease, dilated cardiomyopathy,

4.2.2 Cardiovascular risk factors (CVRF)

From the table below, 76.5% of participants had hypertension followed by 10 with obesity/overweight (58.8%) and 6 practiced a physical activity lasting less than 45 minutes (35.3%).

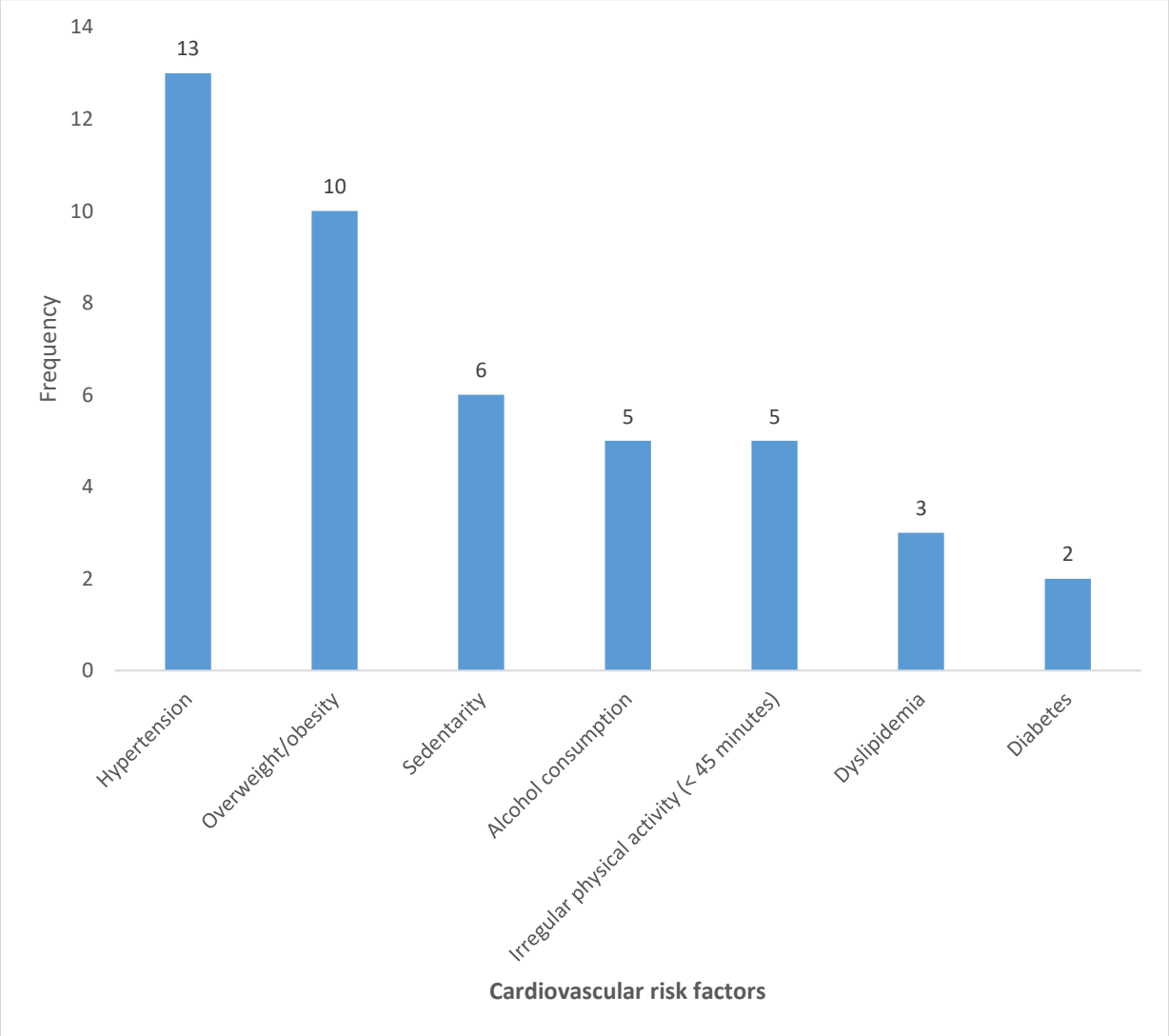

Figure 13: distribution of cardiovascular risk factors throughout the population

4.2.3 Lifestyle of participants

From the table below, 12 individuals out of the 17 participants declared weight measurement at a rate of more than 7 days. Also, 82.4% (n=14) participants had never use traditional remedies or herbs to treat their disease.

Table XI: lifestyle of participants

Variables	Frequency(N=17)	Percentage(%)
Regularity in weight measurement		
< 7 days	5	29.4
7-14 days	3	17.6
> 14 days	9	52.9
Use of traditional remedies or herbs based product for heart failure		
Yes	3	17.6
No	14	82.4

4.2.4 Clinical parameters

4.2.4.1 Blood pressure and Body mass index

During initial evaluation, the mean systolic blood pressure was 130.59 (±20.17) mmHg. Meanwhile, the mean diastolic blood pressure was represented by 83.88 (±13.14) mmHg and 99.45 (±14.25) mmHg was the mean blood pressure (from table XIII below). Most of the participants were overweight with a mean BMI at 28.49 (±7.36) Kg/m^2.

Table XII: blood pressure and BMI at inclusion

Variable	**Mean (± STD)**	**Minimum**	**Maximum**
Systolic blood pressure(mmHg)	130.59 ± 20.17	92	172
Diastolic blood pressure(mmHg)	83.88 ± 13.14	60	105
Mean blood pressure(mmHg)	99.45 ± 14.25	70.67	124.33

4.2.4.2 Body mass index(BMI)

Majority of participants (7 out of 17 participants) had a normal weight. The mean BMI was 28.49 (±7.36) kg/m^2 with females presenting higher BMI than males, as shown on figure 14 below.

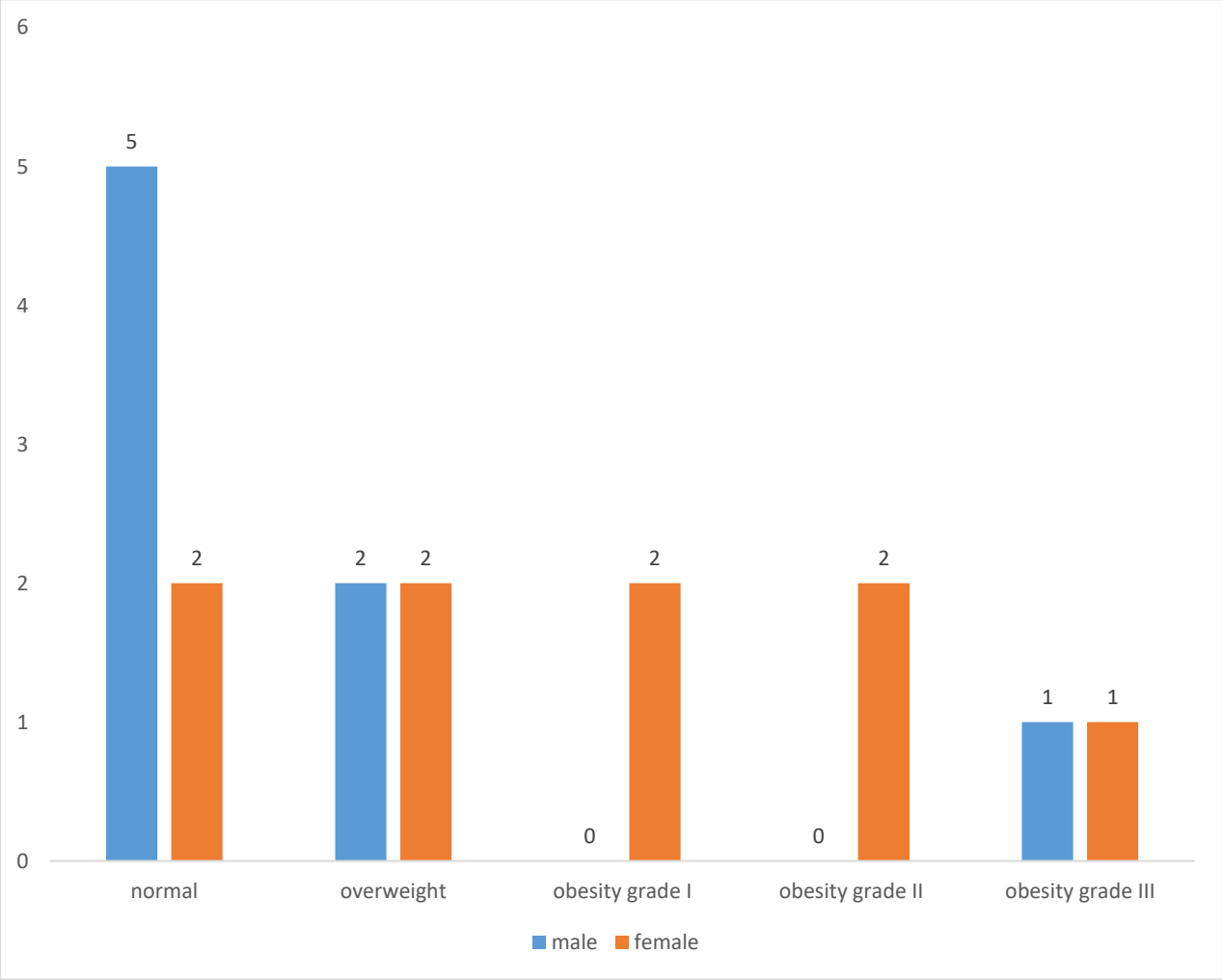

Figure 14: repartition of BMI with respect to sex.

4.2.4.3 Left ventricular ejection fraction(LVEF)

From the table below, 10 participants (58.8%) had a reduced ejection fraction, 6 had a preserved ejection fraction and 1 participants had a midly reduced ejection fraction. The mean ejection fraction was **40.12% (±15.85).**

Table XIII: Repartition of population according to LVEF

LVEF	Frequency(N=17)	Percentage(%)
Heart failure with reduced ejection fraction	10	58.8
Heart failure with preserved ejection fraction	6	35.3
Heart failure with midly reduced ejection fraction	1	5.9

4.3 Health management before beginning the intervention

All the participants were under medication and had received advice on how to take them though only 8 (47.1%) out of the 17 participants had been proposed a specific diet plan. 15 participants (88.2%) had not been told on what to do in case of rapid increase in weight or breathing difficulties. Also, 3 individuals (17.6%) had not received any advice on the benefits of practicing a physical activity with 7 out of the 17 participants being not aware of the effects of tobacco consumption on their disease and 6 participants not knowing the effects of alcohol consumption on their health.

Table XIV: advice received by participants during initial evaluation

Variables	Frequency(N=17)	Percentage(%)
Advice on drugs prescribed		
Yes	17	100.0
Specific diet proposed		
Yes	8	47.1
Advice in case of rapid increase in weight or breathing difficulties		
Yes	2	11.8
Advice on benefits of physical activity		
Yes	14	82.4
Advice on tobacco smoking		
Yes	10	58.8
Advice on alcohol consumption		
Yes	11	64.7

4.4 Evaluation of data obtained before and after the intervention

After 06 sessions of therapeutic education, the following data were obtained

4.4.1 Quality of life

As shown on figure 17 below, for quality of life before intervention the median score(Q2) was **49** ranging from **3** to **66,** the 25th percentile(Q1) was **26.5,** the 75th percentile(Q3) was **56,** giving an interquartile range(IQR) of **29.5.** For the quality of life after the intervention, the median score(Q2) was **26** ranging from **6** to **67**, the 25th percentile(Q1) was **15,** the 75th percentile(Q3) was **33.5**, giving an interquartile range(IQR) of **18.5**. The mean difference between quality of life level before (**43.12** ±18.45) and quality of life level after (**27.18** ±15.10) the intervention was statistically highly significant (**p<0.001**) with a decrease of **4.07 times** of the initial score.

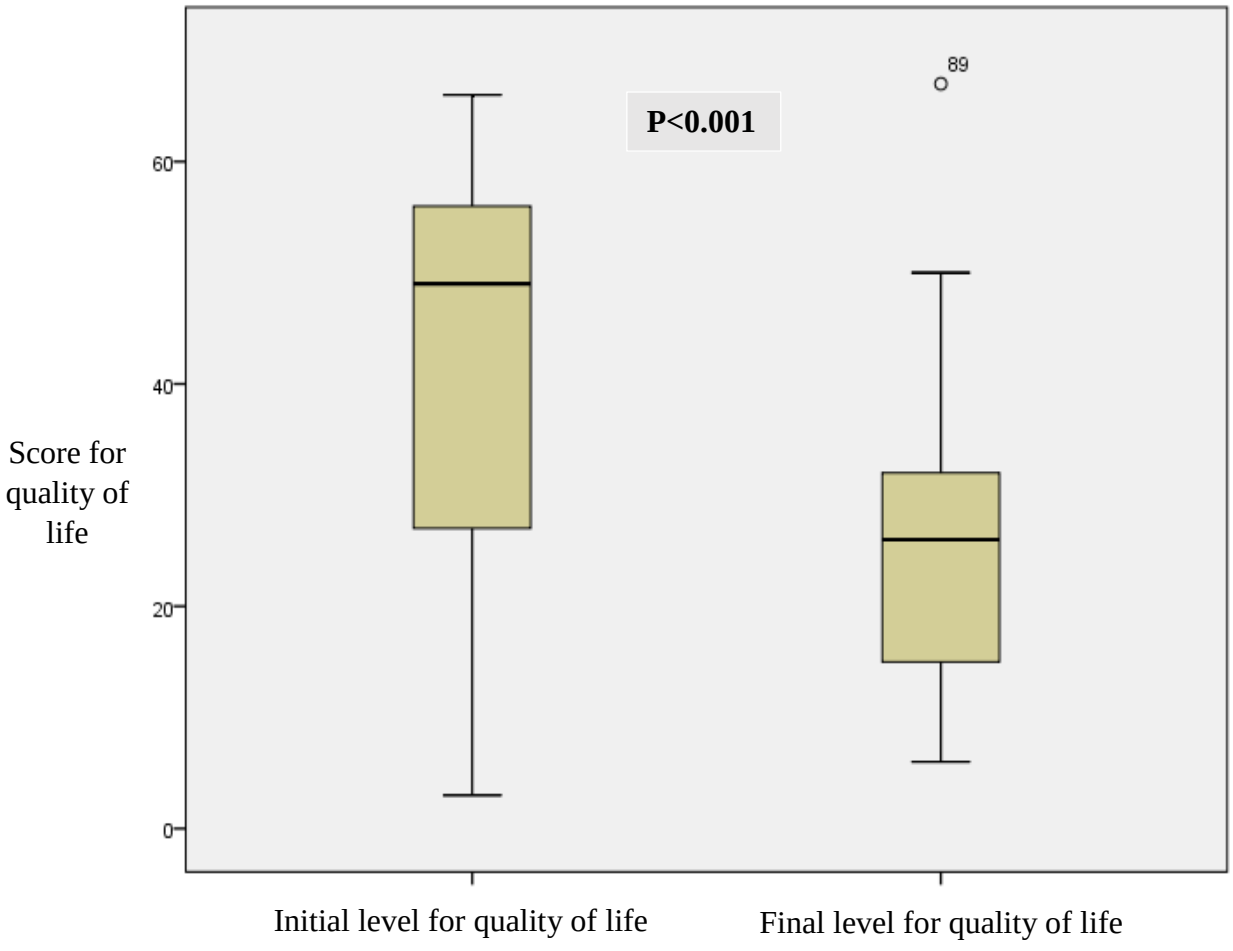

Figure 15: quality of life of the participants before and after the intervention

4.4.2 Evaluation of knowledge level

As shown on figure 15 below, for knowledge level before intervention the median score(Q2) was **60 % (±15.64)** ranging from **26.67%** to **93.33%,** the 25th percentile(Q1) was **50%,** the 75th percentile(Q3) was **63.33%,** giving an interquartile range(IQR) of **13.33%.** For the knowledge level after the intervention, the median score(Q2) was **80%(±18.86)** ranging from **33.33%** to **100%**, the 25th percentile(Q1) was **63.33%,** the 75th percentile(Q3) was **93.33%**, giving an interquartile range(IQR) of **30%**. The mean difference between knowledge level before **57.25%** (±15.64) and knowledge level after **77.25%** (±18.86) was statistically significant (**p<0.004**), with an improvement of **3.35 times** of the initial value.

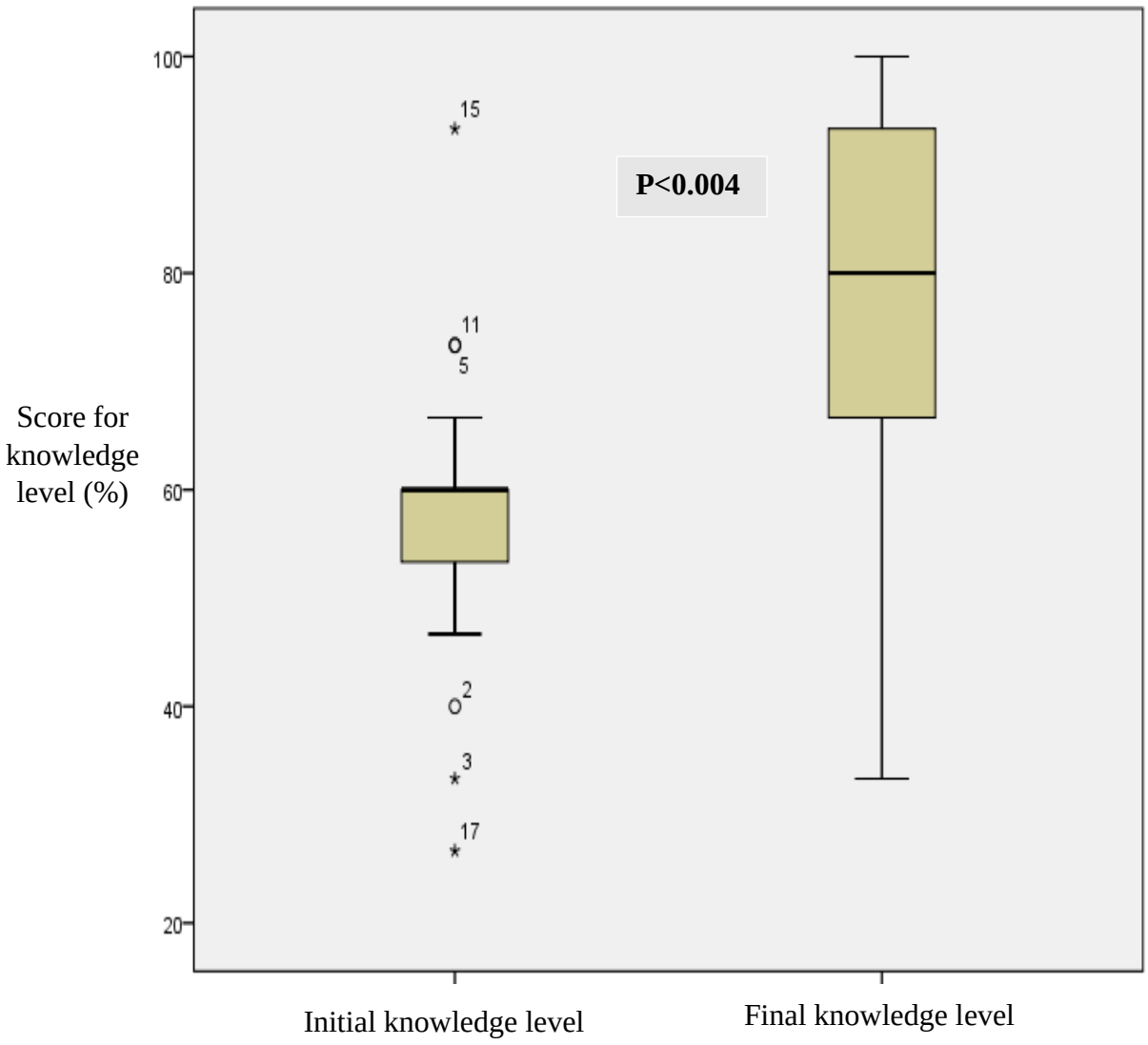

Figure 16: knowledge level of the population before and after the intervention

4.4.3 Self-care level

As shown on figure 16 below, for self-care level before intervention the median score(Q2) was **50%** ranging from **25%** to **75%,** the 25th percentile(Q1) was **41.67%,** the 75th percentile(Q3) was **60.83%,** giving an interquartile range(IQR) of **19.16%.** For the self-care level after the intervention, the median score(Q2) was **78%** ranging from **33.33%** to **100%**, the 25th percentile(Q1) was **68%,** the 75th percentile(Q3) was **83%**, giving an interquartile range(IQR) of **15%**. The mean difference between self-care level before [**61.06%** (±16.55)] and self-care level after [**74.47%** (±11.03)] the intervention was statistically significant (**p<0.006**) with an improvement of **3.13 times** that of the initial score.

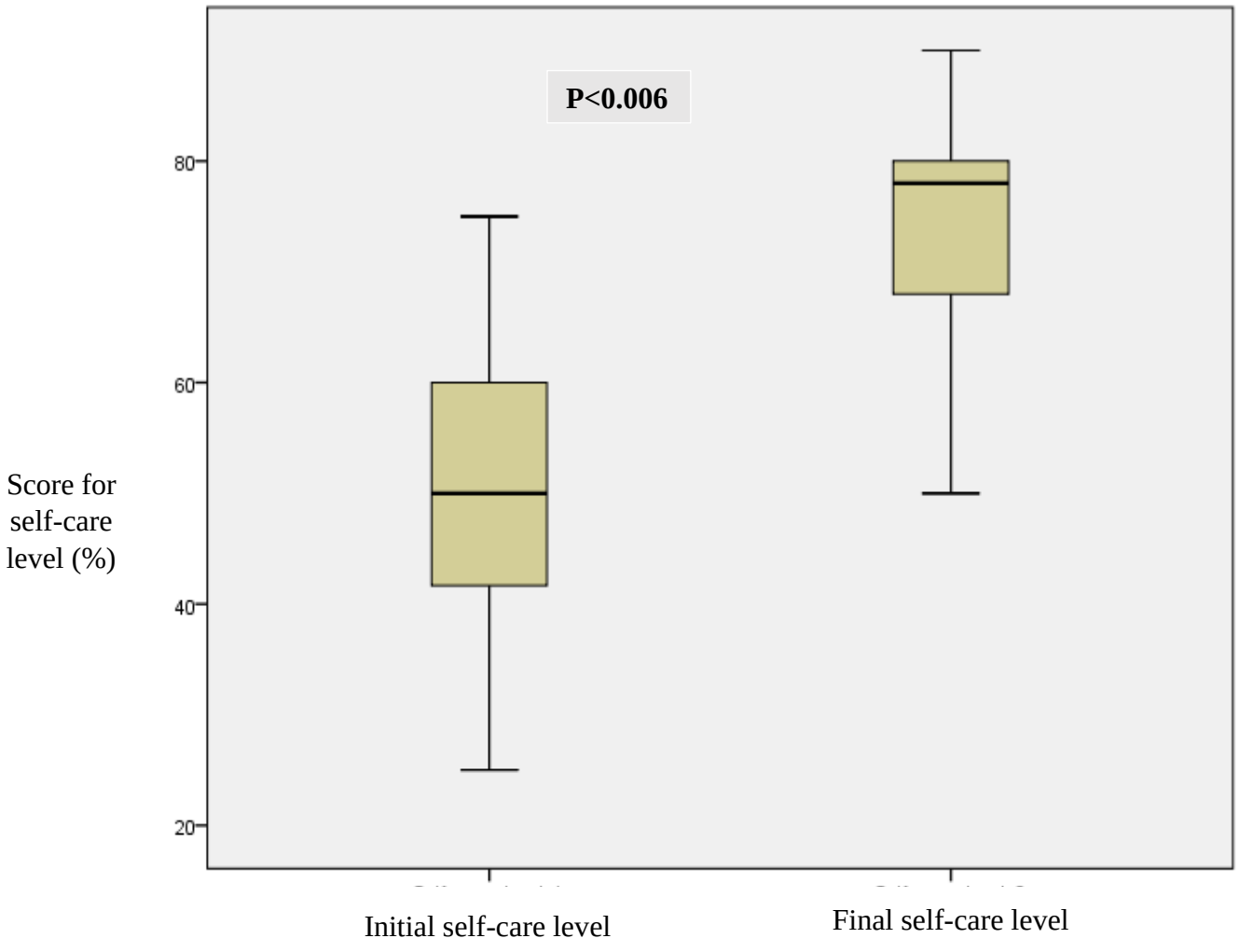

Figure 17: self-care level of the population before and after the intervention

Chapter 5 : DISCUSSION

5 Discussion

Heart failure usually represents the end stage of most cardiovascular disease, and in Cameroon, there is poor monitoring of individuals with this condition leading to increase case of hospital admission and mortality. In order to improve this monitoring, we proposed to carry out a group therapeutic education program for a period of 6 weeks with a weekly follow up in order to evaluate the short term effect of the program on individuals with stable chronic heart failure. Specifically, we evaluated the change in knowledge level, self-care and quality of life before and after the intervention.

The present intervention concerned 17 participants from the out-patient unit of two public health facility in the city of Yaoundé: YCH and Biyemassi District Hospital.

5.1 Clinical profile

Hypertension was the most frequent etiology of heart failure (64.47%), this finding was similar to that of Pio et al. in Togo, which found in 2014, 43.1% of participants[17] and Nganou et al. in 2018 which found hypertensive cardiopathy as the first etiology of heart failure in 39.4% of participants[14]. The simalirities in the findings is explained by the fact that the population in all these studies had the same sociodemographic profile. Nevertheless, these results were different from those of Tchoumi et al. in 2011, at the Shisong's cardiac disease center in Cameroon which found valvular heart disease as the first etiology; this difference can be explained by the fact that, the study was carried out in a center specialize in cardiac surgery and hence valvular heart disease[60]. The most frequently encountered cardiovascular risk factors were hypertension (76.5%) and obesity (58.6%). These findings were similar to those of pio et al. in Lomé which found in 2014, 52.5% of participants with hypertension[17] and Nganou et al. in 2021, which had in Cameroon, 59.4% of participants with hypertension[14]. Indeed, this is in accordance with literature which describe hypertension as the greatest contributor to the population burden of heart failure due to its greater prevalence[61]. The majority of participants did not weight regularly (52.9%) as only 29.4% declared weekly weight measurement. Indeed, these findings were similar to that of Wang et al. in China, which found in 2014 that only 33% of patients with heart failure regularly weight themselves with 48% of patients giving little attention to weight measurement[62].This could be explained by the fact that, health professionals do not systematically require from patients regular weight measurement neither after hospital discharge

nor during out-patient visits. In our study, a greater amount of individuals, 58.8% presented with a reduced ejection fraction and only 35.3% had a preserved ejection fraction.

5.2 Advice received on health management

During our intervention we realized that, up to 88.2% of participants had never being told on what to do by health professionals in case of any rapid increase in weight or breathing difficulties. Likewise, 52.9% had never received an advice on a specific diet, though 88.4% had received advice on the benefits of a regular physical activity on their health. Also, 58.8% had received advice on the negative effects of alcohol consumption and 64.2% on effects of tobacco consumption. This can be explained by the fact that during consultations, the limited time does not enable practicians to discuss on all the aspects regarding disease management.

5.3 Evaluation of quality of life

Concerning the quality of life, we used The Minnesota Living With Heart Failure questionnaire (MLHFQ), which showed a significant decrease of the mean sore for quality of life before and after the intervention by about **4.07 times** at final evaluation. Indeed, this is similar to the findings of Qiong wang et al. in China (2017) and Jing Wang et al. (2021). which showed that MLHFQ scored decreased significantly in the intervention group by 3.37 times and 5.34 times respectively[63] [64]. This is explained by the fact that, follow-up of participants was done weekly through telephone calls and text messages in between educative sessions in order to minimize recall bias and to ensure that the content of the education program were being practiced. Also, a low number of participants (17%) had an initial good level for life quality. This is different from the finding of Hagglund et al. in Sweden (2015) which had 30% of participants having a good quality of life at initial testing[65]. This may be due to the fact that, few patients in our setting, have access or are even aware of psychological aspect in the management of their conditions, since much effort are placed by health professionals on the management of signs and symptoms. This is probably due to financial, educational and health system discrepancy in the study populations. This supports previous literature which suggests that, psychological stress receives relatively limited attention as a potential disease modifier in HF, though emerging evidence suggest that, psychological stress can affect physiological and behavioral pathways associated with HF disease progression and prognosis, and that aspects of the HF experience can decrease quality of life[66][67]. Indeed, these

results were different from those of Vaillant-Roussel and collaborators which find no improvement in patients' quality of life compared with routine care[68]. This difference can be explained by the fact that, although their study lasted for a longer period of time (13 months), educative sessions were practiced only after every 03 months with no follow-up of participants in-between educative sessions. Also, health professionals in charge of the educative sessions had been trained for a short period of time of 2 days with the educative sessions not being supervised by a cardiologist as was the case in our study.

5.4 Evaluation of knowledge level

Concerning the knowledge level, it was evaluated using the Dutch Heart Failure Knowledge Scale questionnaire which showed that the number of individuals with an average knowledge level was higher at initial testing. This may be due to the fact that 58.8% of the participants had the diagnosis of heart failure for at least 25 months, hence they had a certain amount of time to improve their knowledge on their condition though not sufficient. This finding is similar to that of kolasa and al. in 2021 at Poland which found that, patients with chronic HF who were diagnosed for at least one year, had higher HF knowledge than those diagnosed de novo[69]. Also, a significant difference was obtained between the mean knowledge scores before and after the intervention with an improvement of **3,35 times** of the initial score at the time of final evaluation. This is in line with Huey-ling Liou et al. in Taiwan (2015) which had a significantly higher mean score in knowledge of CHF of **2.95 times** higher during post education testing[70]. This can be explained by the fact that although the population of study was greater at Taiwan, the duration of the intervention, materials used during the sessions and the educative content were very similar and hence contributed greatly to the results obtained.

About 23% of participants had a good knowledge level at initial evaluation. This is similar to that obtained by Roncalli et al. in France which had 28.7% of participants having a good knowledge level[71]. This may be explained by the fact that participants from both studies had similar age and educational level, which enabled them to seek for information concerning their conditions from various sources. The slight difference obtained in the studies are due to the fact that more efforts are placed by public authorities on education of transmissible diseases than non-transmissible diseases which are given lesser concern.

5.5 Evaluation of self-care level

Concerning self-care, it was evaluated using the European Heart Failure Self-care Behavior Scale questionnaire, it showed a significant difference between the mean self-care score before and after the intervention with an improvement of **3.13** times of the initial score at the time of post-education evaluation. Indeed, this is similar to that obtained by Huey-ling Liou et al. in Taiwan (2015), which showed that, self-care significantly improved after the education program was completed[70] and Getenet Dessie et al. in Ethiopia (2021), which showed that, after the intervention, patients in the intervention group(n=88) had a higher self-care adherence scores[72], this difference was statistically significant and increased with each round of education. This can be explained by the fact that the level of self-care was low at initial testing since during routine consultations, health professionals usually place more emphasis on treatment adherence and less emphasis is placed on education of signs of decompensation, weight monitoring and counting of number of steps covered per day.

About 11% of participants had a prior education on what to do in case of worsening signs and symptoms which corresponds to the proportion of individuals with a good self-care level at initial evaluation. This is in line with Ni et al which found that, previous HF education by health care professionals was the only factor that positively affected the level of self-care behaviors [73].

5.6 Limitations

Our study was limited by:

- Our small sample size, which was due to the fact that, many of the individuals approached had transport and financial barriers as reasons not enabling them to participate in the study.
- The non-respect of weekly weight measurements by participants during the intervention period.
- Absence of a control group.
- The refusal to participate by certain individuals who do not find the importance of the study.

Chapter 6 : CONCLUSION

6 CONCLUSION

The objective of this study was to evaluate the short term effect of a group therapeutic education program for patients with stable chronic heart failure living in Yaoundé.

At the end of the study, we can state that therapeutic education can:

- Improve significantly the knowledge level of individuals with CHF
- Improve significantly the self-care behavior
- Significantly ameliorate the quality of life of individuals with CHF

In front of the multiple benefits brought about by therapeutic education, it may constitute an important aspect to exploit in the management of patients with heart failure.

RECOMMENDATIONS

7 Recommendations

We humbly recommend the following:

TO THE PATIENTS

- To set as a priority the treatment of their disease and to conform to the constrain required for their disease management,
- To persevere in the long term application of knowledge and aptitudes provided to them by their physicians or any other healthcare professional.

TO CLINICIANS

- To enable patients benefits from education of heart failure by providing sufficient time and educative sessions with regular follow-up so as to make patients, take actively part in the management of their conditions.

TO RESEARCHERS

- To carryout studies, so as to show the long-term benefits of therapeutic educations in our environment.

TO THE FACULTIES OF MEDECINE

- To include in the training of medical students, modules specifically dedicated to therapeutic education of patients.

TO THE MINISTRY OF PUBLIC HEALTH

- To set apart, halls dedicated to therapeutic education of patients with chronic heart failure in our health facilities.
- To make available materials and human resources adapted for long-term efficacy of educative programs.

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APPENDIX

9 APPENDIX

9.1 APPENDIX 1: Informed Consent Form

English version

Title: << Trial of group therapeutic education program for patients with stable chronic heart failure living in yaounde >>

I, Mrs/Ms: _____, the undersigned, acknowledge that I have been informed and fully briefed by the final year medical student, **BITA BITA STEVE**, on the study entitled **"Trial of group therapeutic education program for patients with stable chronic heart failure living in yaounde"**, in view of his M.D. Thesis under the supervision of **Pr NGANOU-GNINDJIO Chris Nadège and Dr NDOBO Juliette Valerie**

. He precised that I am free to accept or deny participation in the research.

- I have received and understood information pertaining to the aim of this study, the procedure and possible constraints.
- I have been given adequate time to ask questions about the study.
- I accept that my medical records be consulted by the research personnel for research purposes only and all data concerning me will be strictly confidential.
- My participation can be interrupted at any time if the principal investigator deems it necessary or if I so wish.
- The research proposal has been reviewed and validated by the Ethics and Research Committee of the Faculty of Medicine and Biomedical Sciences of the University of Yaoundé I.
- At any time, I can ask for additional information from the investigator BITA BITA STEVE using number +237 694 83 31 85/670 39 61 38.
- I hereby accept to participate in the study under the aforementioned conditions.

Date : ____/____/____

Investigator's signature Participant's signature

Fiche de consentement éclairée (Version Française)

Titre : « Trial of group therapeutic education program for patients with stable chronic heart failure living in yaounde »

Mme/Mlle _____

L'étudiant **BITA BITA STEVE**, étudiant en 7ème année de formation médicale à la FMSB, m'a proposé de participer à une étude qu'ils mènent à L'Hôpital Central De Yaoundé, à l'Hôpital de District de Biyem-assi, pour sa thèse en fin de formation.

Cette étude a pour but principal d'évaluer la faisabilité d'utiliser une application mobile pour l'éducation thérapeutique des patients avec insuffisance cardiaque chronique.

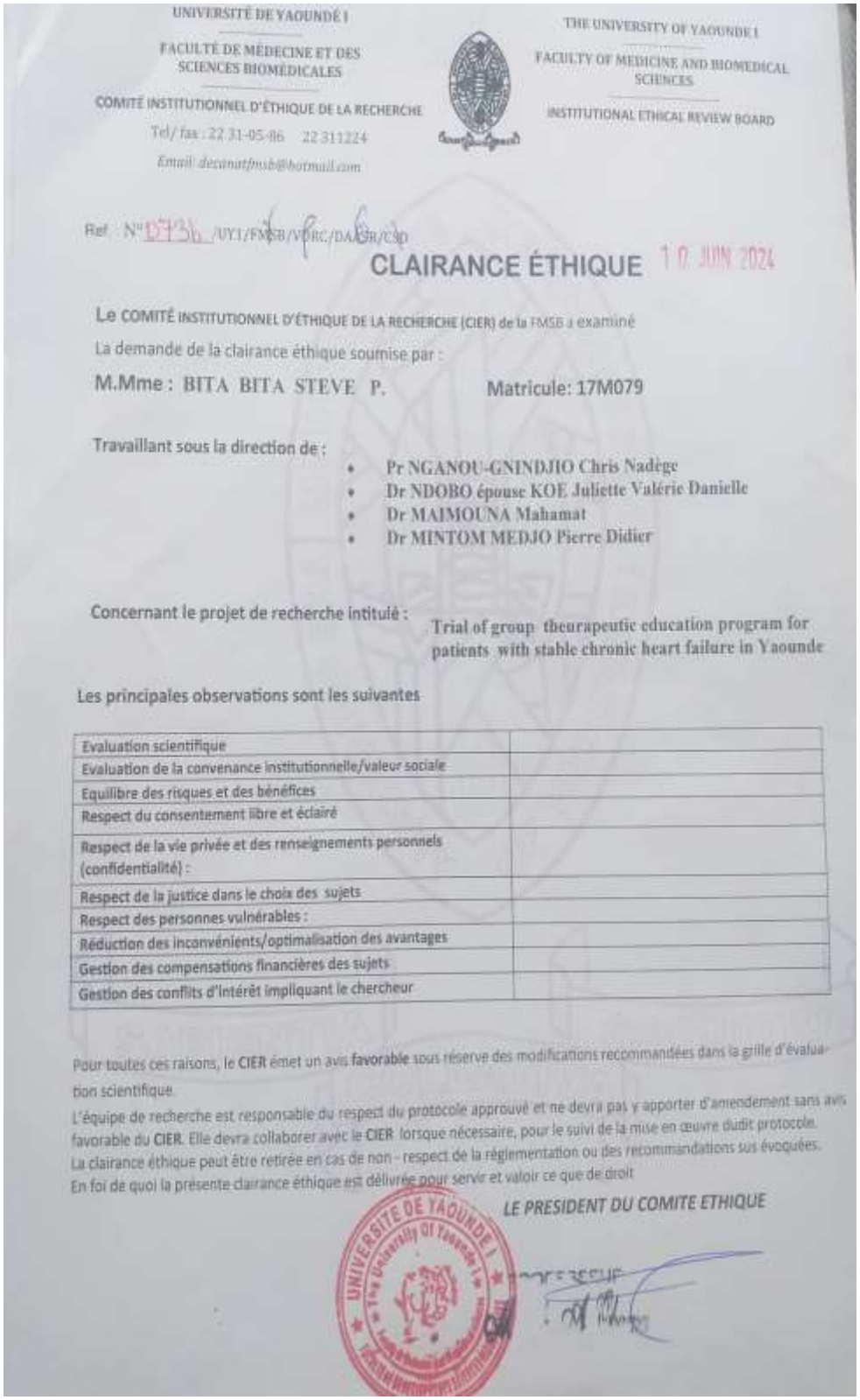
Il m'a précisé que je suis libre d'accepter ou de refuser sa proposition. J'ai reçu des informations concernant : le but de l'étude, la procédure et l'intervention réalisées, les possibles risques et les contraintes liés à l'étude et les avantages liés à l'étude.

- J'accepte que mon dossier médical soit consulté par les membres de l'équipe de recherche et les informations utilisées dans le but de la recherche seulement. Toutes les informations personnelles seront confidentielles.
- Le protocole de recherche relatif à cette étude a été revu et validé par le comité institutionnel d'éthique et de la recherche de la faculté de médicine et des sciences biomédicales.
- À tout moment, je pourrai demander des informations supplémentaires à l'étudiante à travers le contact : +237 694 83 31 85/ 670 39 61 38.
- J'accepte donc de participer à cette étude sous les termes susmentionnés.

Date: ____/____/____

Signature de l'investigateur Signature de la participante

9.2 APPENDIX 2: Ethical clearance form of the Institutional Review Board(IRB) of FMBS/UY1



UNIVERSITE DE YAOUNDE I

FACULTE DE MEDECINE ET DES SCIENCES BIOMEDICALES

COMITE INSTITUTIONNEL D'ETHIQUE DE LA RECHERCHE

Tel/ fax : 22 31-05-86 22 311224

Email: decanatfmsb@hotmail.com

THE UNIVERSITY OF YAOUNDE I

FACULTY OF MEDICINE AND BIOMEDICAL SCIENCES

INSTITUTIONAL ETHICAL REVIEW BOARD

Ref : N°0736 /UY1/FMSB/VDRC/DAASR/CSD

CLAIRANCE ÉTHIQUE 10 JUIN 2024

Le COMITÉ INSTITUTIONNEL D'ÉTHIQUE DE LA RECHERCHE (CIER) de la FMSB a examiné

La demande de la clairance éthique soumise par :

M.Mme : BITA BITA STEVE P. Matricule: 17M079

Travaillant sous la direction de :

- Pr NGANOU-GNINDJIO Chris Nadège
- Dr NDOBO épouse KOE Juliette Valérie Danielle
- Dr MAIMOUNA Mahamat
- Dr MINTOM MEDJO Pierre Didier

Concernant le projet de recherche intitulé : Trial of group therapeutic education program for patients with stable chronic heart failure in Yaounde

Les principales observations sont les suivantes

Evaluation scientifique	
Evaluation de la convenance institutionnelle/valeur sociale	
Equilibre des risques et des bénéfices	
Respect du consentement libre et éclairé	
Respect de la vie privée et des renseignements personnels (confidentialité) :	
Respect de la justice dans le choix des sujets	
Respect des personnes vulnérables :	
Réduction des inconvénients/optimalisation des avantages	
Gestion des compensations financières des sujets	
Gestion des conflits d'intérêt impliquant le chercheur	

Pour toutes ces raisons, le CIER émet un avis favorable sous réserve des modifications recommandées dans la grille d'évaluation scientifique

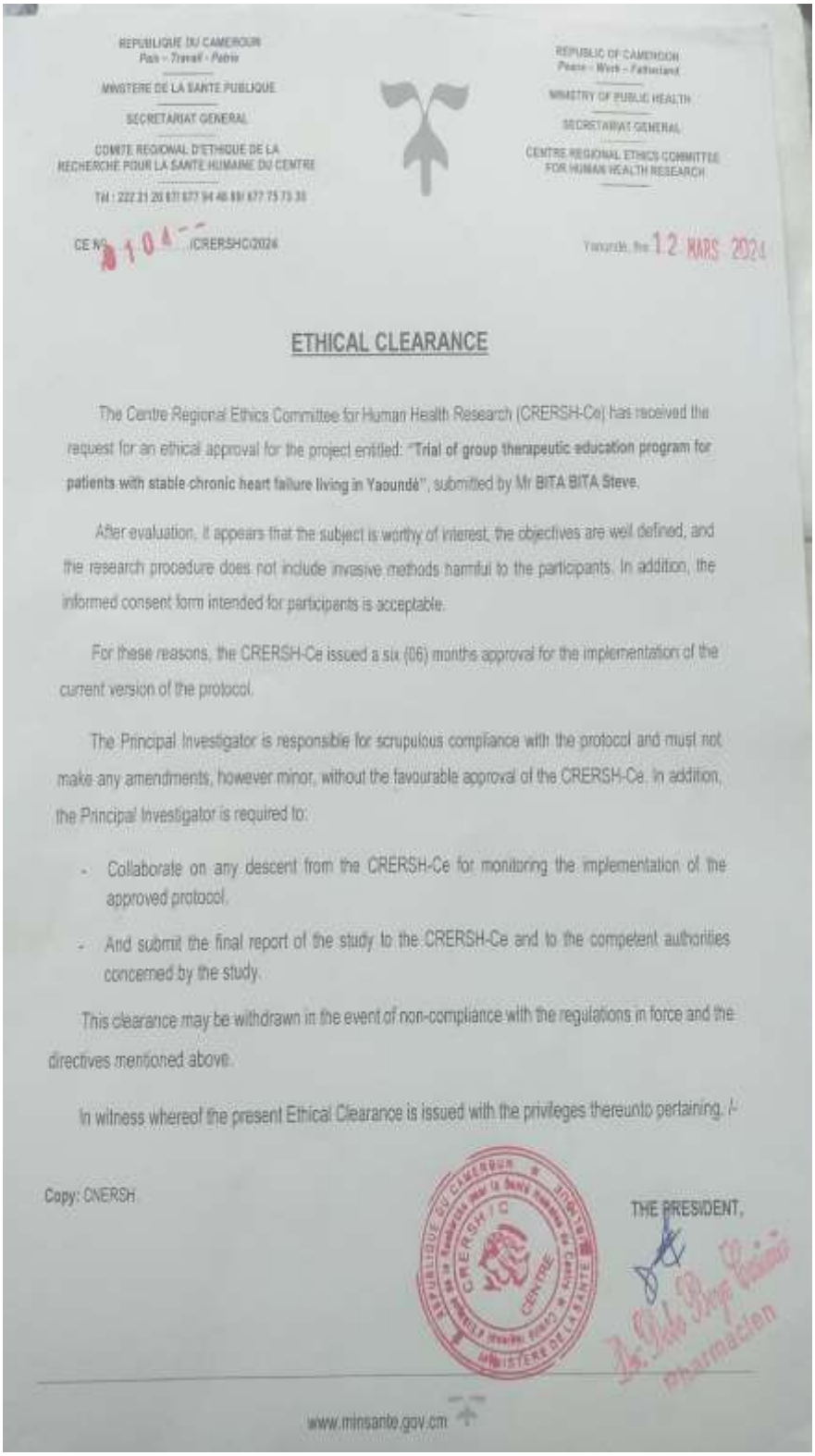
L'équipe de recherche est responsable du respect du protocole approuvé et ne devra pas y apporter d'amendement sans avis favorable du CIER. Elle devra collaborer avec le CIER lorsque nécessaire, pour le suivi de la mise en œuvre dudit protocole.

La clairance éthique peut être retirée en cas de non - respect de la règlementation ou des recommandations sus évoquées.

En foi de quoi la présente clairance éthique est délivrée pour servir et valoir ce que de droit

LE PRESIDENT DU COMITE ETHIQUE

9.3 APPENDIX 3: Ethical clearance for the Centre Regional Comitee for Human Health Research



REPUBLIQUE DU CAMEROUN
Paix - Travail - Patrie

MINISTERE DE LA SANTE PUBLIQUE

SECRETARIAT GENERAL

COMITE REGIONAL D'ETHIQUE DE LA RECHERCHE POUR LA SANTE HUMAINE DU CENTRE

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REPUBLIC OF CAMEROON
Peace - Work - Fatherland

MINISTRY OF PUBLIC HEALTH

SECRETARIAT GENERAL

CENTRE REGIONAL ETHICS COMMITTEE FOR HUMAN HEALTH RESEARCH

CE N° 3104 /CRERSHC/2024

Yaounde, the 12 MARS 2024

ETHICAL CLEARANCE

The Centre Regional Ethics Committee for Human Health Research (CRERSH-Ce) has received the request for an ethical approval for the project entitled: "**Trial of group therapeutic education program for patients with stable chronic heart failure living in Yaoundé**", submitted by Mr **BITA BITA Steve.**

After evaluation, it appears that the subject is worthy of interest, the objectives are well defined, and the research procedure does not include invasive methods harmful to the participants. In addition, the informed consent form intended for participants is acceptable.

For these reasons, the CRERSH-Ce issued a six (06) months approval for the implementation of the current version of the protocol.

The Principal Investigator is responsible for scrupulous compliance with the protocol and must not make any amendments, however minor, without the favourable approval of the CRERSH-Ce. In addition, the Principal Investigator is required to:

- Collaborate on any descent from the CRERSH-Ce for monitoring the implementation of the approved protocol.
- And submit the final report of the study to the CRERSH-Ce and to the competent authorities concerned by the study.

This clearance may be withdrawn in the event of non-compliance with the regulations in force and the directives mentioned above.

In witness whereof the present Ethical Clearance is issued with the privileges thereunto pertaining. /-

Copy: CNERSH

THE PRESIDENT,

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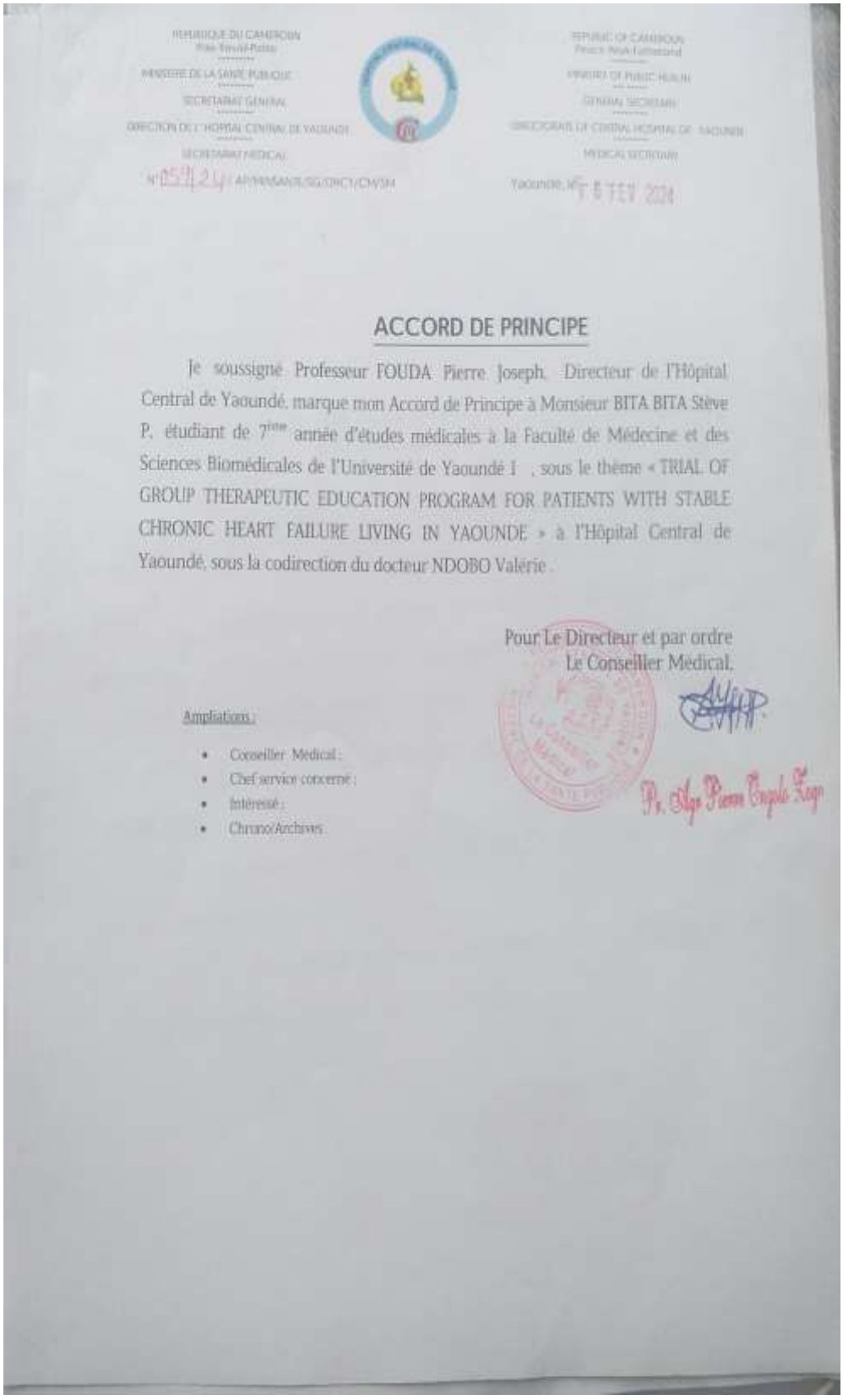
9.4 APPENDIX 4: Research authorization of YCH



ACCORD DE PRINCIPE

Je soussigné Professeur FOUDA Pierre Joseph, Directeur de l'Hôpital Central de Yaoundé, marque mon Accord de Principe à Monsieur BITA BITA Stève P, étudiant de 7ème année d'études médicales à la Faculté de Médecine et des Sciences Biomédicales de l'Université de Yaoundé I , sous le thème « TRIAL OF GROUP THERAPEUTIC EDUCATION PROGRAM FOR PATIENTS WITH STABLE CHRONIC HEART FAILURE LIVING IN YAOUNDE » à l'Hôpital Central de Yaoundé, sous la codirection du docteur NDOBO Valérie .

Pour Le Directeur et par ordre
Le Conseiller Médical,

Ampliations :

- Conseiller Médical ;
- Chef service concerné ;
- Intéressé ;
- Chrono/Archives.

9.5 APPENDIX 5: Research authorization of BDH

REPUBLIQUE DU CAMEROUN
Paix - Travail - Patrie
MINISTERE DE LA SANTE PUBLIQUE
DELEGATION REGIONALE DU CENTRE
DISTRICT DE SANTE DE BIYEM-ASSI
HOPITAL DE DISTRICT DE BIYEM-ASSI
BP : 31 350 Yde ,Tél./Fax 222.31.64.09

REPUBLIC OF CAMEROON
Peace-Work-Fatherland
MINISTRY OF PUBLIC HEALTH
CENTER REGIONAL DELEGATION
BIYEM-ASSI HEALTH DISTRICT
BIYEM-ASSI DISTRICT HOSPITAL
E-mail:hopital_biyemassi@yahoo.fr

N°[illegible]/AR/MINSANTE/DRSPC/DSBA/HDBA

AUTORISATION DE RECHERCHE

Le Directeur de l'Hôpital de District de Biyem-Assi à Yaoundé soussigné, donne autorisation de recherche à Monsieur **BITA BITA STEVE P.**, étudiant en 7ème année de médecine à la Faculté de Médecine de l'Université de Yaoundé I, dont le thème porte sur : « *TRIAL OF GROUP THERAPEUTIC EDUCATION PROGRAM PATIENTS WITH STABLE CHRONIC HEART FAILURE LIVING IN YAOUNDE*».

Cette recherche sera supervisée par Dr EBENE Manon, Chef de service de Médecine.

En foi de quoi la présente autorisation est établie et lui est délivré pour servir et valoir ce que de droit.

Yaoundé, le

Le Directeur

Dr. Daniel [illegible]
Médecin - Cardiologue

9.6 APPENDIX 6 : Patient Questionnaire Form

Parte A: IDENTIFICATION SHEET

SHEET NUMBER: /--/--/--/

DATE OF INTERVIEW (dd/mm/YYYY) /--/--/--/

Section 1 : sociodemographic parameters

	QUESTIONS	**PROPOSITIONS**	**ANSWER**
Q1	**Language of internship**	1=French 2=English 3= Dialect	
Q2	**Place of residence**		
Q3	**Telephone number**		
Q4	**Date of birth**		
Q5	**Age**		
Q6	**Sex**	1=male 2= female	
Q7	**Marital status**	1=Single 2=Married 3=common-law union 4=Divorce 5=widow(er)	
Q8	**What is the highest educational level ?**	1=No official education 2= Primary level 3= Secondary level 5= Higher education	
Q9	**What is your principal professional activity ?**	1=State employee 2=Unemployed 3=Retired 4=Commerce 5= Others	

HISTORY OF HEART FAILURE

	QUESTIONS	**PROPOSITIONS**	**RESPONSE**
Q1	For how long(months) did you receive the diagnosis of heart failure ?		
Q2	What is the etiology of your heart failur	1=Hypertensive heart disease 2=Rheumatic heat disase 3=Ischemic heart disase 4=Others	
Q3	When was the last time(days) was your weight measured by a health professionals (nurse, pharmacist, physician) ?		
Q4	Do you use any traditional remedies or herbs based product for your heart failure ?	1=yes 2=no	
Q5	Have you receive any advice on the drugs prescribed by a health professional ?	1=yes 2=no	
Q6	Was a specific diet proposed to you ?	1=yes 2=no	
Q7	Have you receive any advice in case of rapid increase in body weight or breathing difficulties ?	1=yes 2=no	
Q8	Did you receive any advice on physical activity and its benefits?	1=yes 2=no	
Q9	Did you receive any advice on tobacco and its disadvantages ?	1=yes 2=no	
Q10	Did you receive any advice on alcohol and its disadvantages?	1=yes 2=no	
Q11	Did you have any decompensation episode for the last 02 months? if yes which type?	1=yes 2=no	

Measurements	
PARAMETERS	**VALUES**
Blood pressure (mmHg)	
Pulse (beats/minute)	
Weight (Kg)	
Height (m)	
Body mass index (kg/m^2)	
Abdominal circumference (cm)	
Ejection Fraction	

a. DUTCH'S HF KNOWLEDGE SCALE

This questionnaire is divided into 03 parts**: HF symptoms/symptom recognition** (1-5), **HF in general** (6-11), **HF treatment** (12-15)

1	How often should patient with severe heart failure weight themselves? ❑ Every week ❑ Now and then ❑ Everyday	9	What is the function of the heart? ❑ To absorb nutrients from the blood ❑ To pump blood around the body ❑ To provide the blood with oxygen
2	Why is it important that patient with heart failure should weight regularly? ❑ Because many patients with heart failure have a poor appetite ❑ To check whether the body is retaining fluid ❑ To assess the right dose of medicines	10	Why should someone with heart failure follow a low salt diet? ❑ Salt promotes fluid restriction ❑ Salt causes constriction of blood vessels ❑ Salt increases the heart rate
3	How much fluid are you allowed to take at home each day? ❑ 1.5 to 2.5 litres at most ❑ As little fluid as possible ❑ As much fluid as possible	11	What are the main causes of heart failure? ❑ A myocardial infarction and high blood pressure ❑ Lungs problem and allergy ❑ Obesity and diabetes
4	Which of these statements is true? ❑ When I cough a lot, it is better not to take my heart failure medication ❑ When I am feeling better, I can stop taking my medication for heart failure ❑ It is important that I take my heart failure medication regularly	12	Which of the statements about exercise for people with heart failure is true? ❑ It is important to exercise as little as possible at home in order to relieve the heart ❑ It is important to exercise at home and rest regularly in between ❑ It is important to exercise as much as possible at home
5	What is the best thing to do in case of increase shortness of breath or swollen legs? ❑ Call the doctor or the nurse ❑ Wait until the next check-up ❑ Take less medication	13	Why are water pills prescribed for someone with heart failure? ❑ To lower the blood pressure ❑ To prevent fluid retention in the body

			❑ Because then they can drink more
6	What can cause a rapid worsening of heart failure symptoms? ❑ A high-fat diet ❑ A cold or the flu ❑ Lack of exercise	14	Which statements about weigh increase and heart failure is true? ❑ An increase of over 2 kilograms in 2 or 3 days should be reported to the doctor at the next check-up ❑ In case of an increase in of over 2 kilograms in 2 or 3 days, you should eat less
7	What does heart failure mean? ❑ That the heart is unable to pump enough blood around the body ❑ That someone is not getting enough exercise and is in poor condition ❑ That there is a blood clot in the blood vessels of the heart	15	What is the best thing to do when you are thirsty? ❑ Suck an ice cube ❑ Suck a lozenge* ❑ Drink a lot
8	Why can the legs swell when you have heart failure? ❑ Because the valves in the blood vessels in the legs do not function properly ❑ Because the muscles in the legs are not getting enough oxygen ❑ Because of accumulation of fluids in the legs		

The maximum score possible is 15, which means one point for a correct answer and zero point for an incorrect or missing answer.

Satisfactory level of knowledge at 60% or more

Not satisfactory level of knowledge below 60%

b. 12-ITEM EUROPEAN HEART FAILURE SELF-CARE BEHAVIOR SCALE

	Item	All of the time	Most of the time	A good bit of time	Some of the time	A little of the time	None of the time
1	I weight myself everyday						
2	If I am short of breath, I take it easy						
3	If my shortness of breath increases, I contact my doctor or nurse						
4	If my feet/legs become more swollen than usual, I contact my doctor or nurse						
5	I limits the amount of fluids I drink(not more than 1.5L-2L/day)						
6	I take a rest during the day						
7	If I experience increased fatigue, I contact my doctor or nurse						
8	I eat a low salt diet						
9	I take my medication as prescribed						
10	I get a flu vaccine every year						
11	I exercise regularly						
12	Global Score						

Scores varies as follows: 0= none of the time, 1= a little of the time, 2= some of the time, 3= a good bit of the time, 4= most of the time, 5= all of the time

Excellent behavior at ≥ 75%

Good behavior at greater than 60% but less than 75%

Poor behavior at ≤ 60%

c. MINNESOTA LIVING WITH HEART FAILURE

The following questions ask how much your heart failure (heart condition) affected your life during the past month (4 weeks). After each question, circle the 0, 1, 2, 3, 4 or 5 to show how much your life was affected. If a question does not apply to you, circle the 0 after that question.

Did your heart failure prevent you from living as you wanted during the past month (4 weeks) by -	**No**	**Very Little**				**Very Much**
1. causing swelling in your ankles or legs?	0	1	2	3	4	5
2. making you sit or lie down to rest during the day?	0	1	2	3	4	5
3. making your walking about or climbing stairs difficult?	0	1	2	3	4	5
4. making your working around the house or yard difficult?	0	1	2	3	4	5
5. making your going places away from home difficult?	0	1	2	3	4	5
6. making your sleeping well at night difficult?	0	1	2	3	4	5
7. making your relating to or doing things with your friends or family difficult?	0	1	2	3	4	5
8. making your working to earn a living difficult?	0	1	2	3	4	5
9. making your recreational pastimes, sports or hobbies difficult?	0	1	2	3	4	5
10. making your sexual activities difficult?	0	1	2	3	4	5
11. making you eat less of the foods you like?	0	1	2	3	4	5
12. making you short of breath?	0	1	2	3	4	5
13. making you tired, fatigued, or low on energy?	0	1	2	3	4	5
14. making you stay in a hospital?	0	1	2	3	4	5
15. costing you money for medical care?	0	1	2	3	4	5
16. giving you side effects from treatments?	0	1	2	3	4	5
17. making you feel you are a burden to your family or friends?	0	1	2	3	4	5
18. making you feel a loss of self-control in your life?	0	1	2	3	4	5
19. making you worry?	0	1	2	3	4	5
20. making it difficult for you to concentrate or remember things?	0	1	2	3	4	5
21. making you feel depressed?	0	1	2	3	4	5

11/10/04

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