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Research Article

Interest and Benefits of a Cardiac Rehabilitation Program for Revascularized Coronary Patients According to Age: a Pilot experience of a Cameroonian Rehabilitation Center

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Abstract

Given the mandatory role of cardiac rehabilitation (CR) in current guidelines for the management of coronary artery disease, its benefits are now well established. However, with the development of interventional cardiology in Yaoundé since 2022, the impact of CR on patient age is less well described in our setting for patients who have undergone coronary revascularization. Our series included elderly patients, and the reluctance of families and even of these patients themselves to perceive the benefits of CR at their age motivated our work. Then in partnership with a private center that pioneered this discipline, the aim was to evaluate two groups of revascularized patients six months after CR and to describe our first experience with 22 patients. The results of this first time study comparing ages showed an improvement in functional capacity and quality of life for our patients, regardless of age.

Keywords

Functional capacity, Cardiac rehabilitation, Acute coronary syndromes, Quality of life, Yaounde.

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Introduction

The World Health Organization defines cardiac rehabilitation (CR) as "the sum of activities required to influence favorably the underlying cause of the disease, as well as the best possible, physical, mental and social conditions, so that they may, by their own efforts, preserve or resume when lost, as normal a place as possible in the community" [1]. CR reduces mortality and improves the quality of life in patients with cardiovascular diseases [2]. Current American

clinical guidelines categorize CR as a Class I recommendation for patients who have experienced myocardial infarction, heart failure, or cardiac surgery [3,4]. A standard 12-week program, typically comprising 36 in-person sessions at a rehabilitation center, has demonstrated its efficacy in reducing hospitalizations and cardiovascular mortality while improving quality of life [5]. Despite its proven effectiveness, with all-cause mortality reduction reaching up to 25% and a significant decrease in hospital readmissions, global participation remains a major challenge: it is estimated that only one in four eligible patients participates. Factors such as gender, race, socioeconomic status, and geographic location have been identified as barriers limiting access to CR [6,7]. Modern CR programs integrate four fundamental pillars: structured physical exercise training, intensive risk factor management, nutritional counseling and psychosocial support. Cardiac rehabilitation is underutilized, particularly among women and elderly subjects. Results from EUROASPIRE III (8,845 patients across 76 centers in 22 countries) show that in Europe, CR is prescribed to fewer than 45% of eligible patients (including 75% of bypass surgery patients and 39% of patients following coronary angioplasty); in the French cohort, 32% of eligible patients are referred to CR [8].

Patients and Methods

Data on revascularized coronary patients were obtained from the interventional cardiology procedures registry of Yaoundé, known as **DéRICA** (*yaounDé Registry of Interventional Cardiology Achievements*). This registry includes all patients admitted to the Cardiac Catheterization Laboratory within the Cardiovascular Explorations Department of the Yaoundé General Hospital. This is the first and only catheterization laboratory in the city, equipped with a SIEMENS Artis One coronary angiography system.

We conducted a 6-month prospective observational study following the opening of this private cardiac rehabilitation center. We included all revascularized patients residing in Yaoundé who provided free and informed consent. Patients were invited to participate in a program as part of their post-coronary angioplasty follow-up and were evaluated before and after rehabilitation as follows:

- **Clinical Evaluation:** Physical examination and monitoring of clinical signs before and after rehabilitation at the cardiac rehabilitation center.
- **Electrical Evaluation:** Measurement of cardiac activity via electrocardiogram (ECG) to assess changes in heart rhythm and conduction before and after the program.
- **Echocardiographic Evaluation:** Assessment of left ventricular systolic function (LVEF) at the Cardiovascular Explorations Department of the Yaoundé General Hospital.
- **Functional Testing:** Performance of an exercise stress test (EST) and a 6-minute walk test (6MWT) to evaluate physical endurance before and after the program, in accordance with guidelines [9], at the cardiac rehabilitation center.
- The parameters evaluated included maximal workload during the stress test (W), peak heart rate (bpm) and functional capacity.

The Short Form-12 version 2 (SF-12v2), updated in 2000, is an abbreviated version of the SF-36 developed by Ware Jr, Kosinski, and Keller. The SF-12v2 is an instrument used to estimate quality of life through 12 questions that determine a patient's profile across 8 domains: physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, and mental health [10]. It is divided into two summaries: the PCS (Physical Component Summary) and the MCS (Mental Component Summary). This questionnaire was administered both before and after the program;

- Nutritional follow-up at the National Center for the Fight against Obesity at the Yaoundé Central Hospital and smoking cessation support at the Yaoundé General Hospital.

Two weeks after discharge following uncomplicated post-angioplasty recovery, patients underwent a training program totaling 20 sessions, scheduled 5 days per week over 4 weeks. The daily program consisted of 30 minutes of interval-mode cycling, 30 minutes of treadmill walking, 30 minutes of gymnastics, and 30 minutes of respiratory physiotherapy. Activities were conducted by physiotherapists trained in CR, and patients were free to choose their working group (morning or afternoon). All hemodynamic parameters were recorded.

All patients were subjected to the same standardized cardiovascular rehabilitation program. During the final endurance evaluations, a physical activity goal chart expressed in METs was provided to each patient. The duration and frequency of the program were identical for all patients.

Statistical Analysis

Statistical analysis was performed using IBM SPSS Statistics software, version 26.0. Quantitative variables were expressed as mean ± standard deviation or as median [interquartile range], depending on the distribution. Before-and-after comparisons were conducted using the paired Student's t-test or the Wilcoxon signed-rank test. Comparisons between age groups utilized the independent Student's t-test or the Mann–Whitney U test. Individual variations (delta) were used to evaluate the effect of rehabilitation according to age. The statistical significance threshold was set at $p < 0.05$.

Ethical Considerations

The study complied with the ethical principles of the Declaration of Helsinki. All patients provided informed consent, and data confidentiality was strictly maintained.

Results

Population Characteristics

Twenty-two patients were included and divided into two groups:

- **Group 1:** 13 patients aged under 65 years;
- **Group 2:** 9 patients aged 65 years and over.

The mean age for those under 65 was 55.92 ±7.96 years [range: 38–65] and the mean age for those aged 65 and over was 71.22 ± 3.07 years [range: 68–76]. Both groups were predominantly male, with comparable proportions (76.9% vs. 77.8%).

Cardiovascular risk factors were frequent in both groups, with a higher prevalence of hypertension among patients aged 65 and older (100% vs. 69.2%). Figure 1 describes this distribution.

The indications for management were dominated by ST-segment elevation myocardial infarction (STEMI), representing more than

60% of cases in each group. The left anterior descending (LAD) artery was the most frequently treated vessel via angioplasty in both age groups. All patients had undergone a complete revascularization. Table 1 illustrates these data.

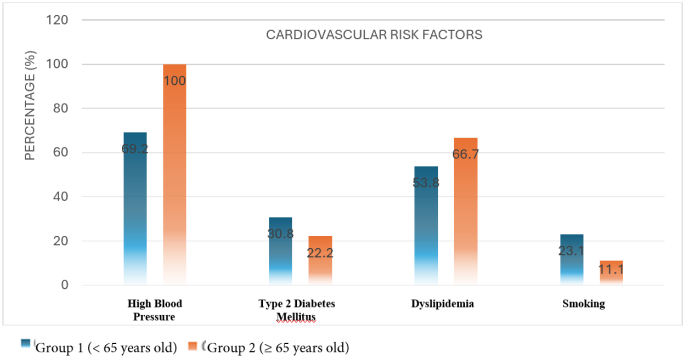


Figure 1: Distribution of cardiovascular risk factors by age

Three patients, including 1 in Group 1 (7.7%) and 2 (22%) in Group 2, had a reduced left ventricular ejection fraction (LVEF).

Table 1: Clinical and angiographic characteristics of the study population by age.

Variables	Group 1 (N=13)	Group 2 (N=9)
History		
Heart Failure	1 (7.7)	1 (11.1)
LVEF ≤ 40%	1 (7.7)	2 (22.2)
Optimal Medical Therapy (OMT)	1 (7.7)	2 (22.2)
Indications		
STEMI	8 (61.5)	6 (66.7)
NSTEMI	2 (15.4)	1 (11.1)
Unstable Angina	3 (23.1)	2 (22.2)
MI Location		
Anterior	8 (61.5)	5 (55.5*)
Inferior	1 (7.7)	1 (11.1)
Lateral	1 (7.7)	1 (11.1)
Septo-lateral	0	1 (11.1)
Target Vessels for PTCA		
Left Anterior Descending (LAD)	8 (61.5)	7 (77.8)
Right Coronary Artery (RCA)	2 (15.4)	1 (11.1)
Circumflex (Cx)	0	1 (11.1)
Marginal branch	1 (7.7)	0
Diagonal branch	1 (7.7)	0

LVEF: Left Ventricular Ejection Fraction; MI: Myocardial Infarction; PTCA: Percutaneous Transluminal Coronary Angioplasty; STEMI: ST-Elevation Myocardial Infarction; NSTEMI: Non-ST Elevation Myocardial Infarction.

Voici la traduction de cette section, en utilisant la terminologie spécifique à la physiologie de l'effort et en respectant vos consignes de formatage.

Effects of Rehabilitation

After 6 months of cardiac rehabilitation, the maximal workload achieved during the exercise stress test increased significantly, rising from a median of 40 [40–50] W before rehabilitation to 70 [60–90] W after the program ($p < 0.001$), as shown in Figure 2. Similarly, the peak heart rate significantly increased after rehabilitation (105 [92.5–119.3] vs. 129 [114–138] bpm; $p < 0.001$).

Functional capacity, assessed by the 6MWT, also improved significantly, with the mean distance covered increasing from 411.5 ± 74.3 m to 467.5 ± 67.1 m after rehabilitation ($p < 0.001$).

Voici la traduction de ce paragraphe, en conservant les acronymes spécifiques au questionnaire SF-12v2 et les valeurs de significativité :

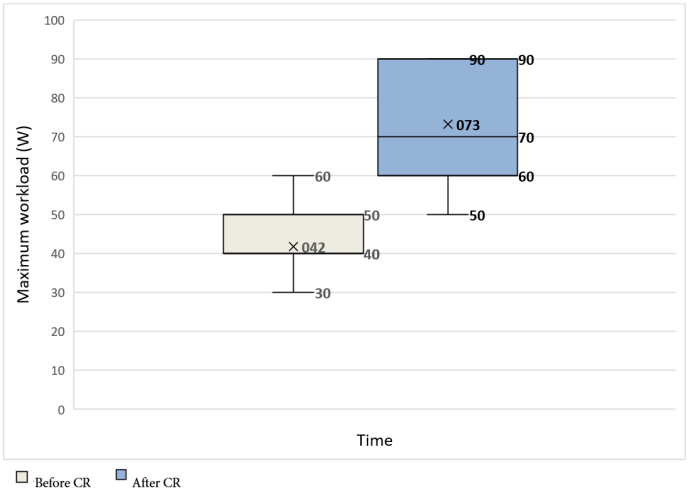
Regarding quality of life, a significant improvement in both physical (PCS) and mental (MCS) summary scores was observed after cardiovascular rehabilitation ($p < 0.001$ and $p = 0.027$, respectively). Table 2 and Figure 2 illustrate the improvements observed.

Table 2:

Variable	Before CR	After CR	Test	p-value
Max Workload (W)	40 [40 – 50]	70 [60 – 90]	Wilcoxon	**< 0.001**
Peak HR (bpm)	105 [92.5 – 119.3]	129 [114 – 138]	Wilcoxon	**< 0.001**
6MWT (m)	411.5 ±74.29	467.5 ±67.12	Paired t-test	**< 0.001**
PCS	39.1 ± 3.61	43.4 ±3.22	Paired t-test	**< 0.001**
MCS	40.9 ±4.25	42.87 ± 2.71	Paired t-test	**0.027**

PCS: (Physical Component Summary); MCS: (Mental Component Summary); HR: heart rate; 6MWT: 6 Minutes' Walk Test.

Figure 2: Evolution of maximal workload before and after cardiovascular rehabilitation.



CR: Cardiac rehabilitation

The analysis of individual variations (delta) in functional parameters and quality of life according to age revealed no statistically significant differences between patients aged under 65 years and those aged 65 years and older (Table 3).

Table 3: Improvement (delta) in functional parameters and quality of life by age group.

Variable	Group 1 (< 65 years) N=13	Group 2 (≥ 65 years) N=9	Test	p-value
Delta Max Workload (W)	30 [30 – 40]	20 [20 – 35]	Mann-Whitney	0.065
Delta Peak HR (bpm)	19 [11 – 26.5]	22 [14.5 – 33]	Mann-Whitney	0.442
Delta 6MWT (m)	52.8 ±25.6	60.8 ± 25.7	Independent t-test	0.480
Delta PCS	4.2 ±4.1	4.4 ± 2.3	Independent t-test	0.920
Delta MCS	1.1 ± 4.6	3.2 ± 2.4	Independent t-test	0.172

HR: Heart rate; 6MWT: 6 Minutes' Walk Test; PCS: (Physical Component Summary); MCS: (Mental Component Summary).

Discussion

While data on CR outcomes in heart failure are available, this is the first study carried out among patients revascularized by angioplasty in the city of Yaoundé. In a country lacking universal health coverage, coronary angioplasty costs approximately 3,400 euros. The cost of CR is also borne by the patients, which limits access to this therapeutic modality and explains our small sample size.

Currently, Cameroon has three cardiac rehabilitation centers, two of which are located in the capital. To date, there is no consensus on the specific cardiac rehabilitation programs to offer patients. Internationally, rehabilitation programs also vary from one country to another [11]. Indeed, some programs in France offer 20 sessions over 6 weeks, compared to 36 sessions over 12 weeks in the United States [12]. In their study, Sugimoto et al. in Japan subjected elderly patients to a cardiac rehabilitation program twice a week [13]. We applied the protocol of the first cardiac rehabilitation center in Tunisia, which consists of 20 sessions over 4 weeks. It is therefore difficult to compare these studies directly.

Most of our patients were sedentary, explaining the low baseline MET levels compared to the series by Adgar et al. in Algeria, where patients with stents showed high exercise levels of 75W before starting the program [14].

Although the improvement in maximal workload tended to be greater in younger patients (30 [30–40] vs. 20 [20–35] W), this difference did not reach statistical significance ($p = 0.065$). Variations in peak heart rate, 6-minute walk test distance, and PCS and MCS scores were comparable between the two age groups ($p > 0.05$ for all comparisons). Since questionnaires can be a source of bias due to their subjectivity, patients completed them in the presence of the principal investigator. The lack of significant difference between age groups highlights that patients aged 65 and older benefit from cardiovascular rehabilitation in proportions comparable to younger patients.

Advanced age, therefore, does not constitute a barrier to the effectiveness of cardiovascular rehabilitation in coronary patients. These results suggest that cardiovascular rehabilitation allows for a significant improvement in functional capacity and quality of life in coronary patients, regardless of age. Our observations are consistent with those of Lutz et al. and O'Neil et al., who demonstrated that although beneficial in elderly patients, CR remains underutilized in this subgroup [15,16].

We initiated this pilot project to encourage our revascularized patients to adhere to a CR program. Above all, in terms of public health, we aimed to demonstrate the role of CR in the secondary prevention of coronary artery disease, thereby highlighting the urgent need for health insurance.

Conclusion

These are preliminary results illustrating the experience of a private cardiac rehabilitation center in the city of Yaoundé. With the development of interventional cardiology, Cameroonian patients can now benefit from comprehensive management as recommended by scientific societies. Although our sample size is small, our results showed an improvement in functional capacity and quality of life in our patients, regardless of age. This will serve as a basis to encourage patients with coronary artery disease and other heart conditions to undergo a cardiac rehabilitation program without age limits.

References

1. World Health Organization. Needs and Action Priorities in Cardiac Rehabilitation and Secondary Prevention in Patients with CHD: Report of Two WHO Consultations: Udine Italy. 1992; 28-30.
2. Dibben G, Faulkner J, Oldridge N, Rees K, Thompson DR, et al. Exercise-based cardiac rehabilitation for coronary heart disease. Cochrane Database Syst Rev. 2021; 11.
3. Fihn SD, Gardin JM, Abrams J, Berra K, Blankenship JC, et al. American College of Cardiology Foundation/American Heart Association Task Force. 2012 ACCF/AHA/ACP/AATS/PCNA/SCAI/STS guideline for the diagnosis and management of patients with stable ischemic heart disease: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines, and the American College of Physicians, American Association for Thoracic Surgery, Preventive Cardiovascular Nurses Association, Society for Cardiovascular Angiography and Interventions, and Society of Thoracic Surgeons. Circulation. 2012; 126: 354-471.
4. Thomas RJ, Balady G, Banka G, Beckie TM, Chiu J, et al. 2018 ACC/AHA clinical performance and quality measures for cardiac rehabilitation: a report of the American College of Cardiology/American Heart Association Task Force on Performance Measures. Circ Cardiovasc Qual Outcomes. 2018; 11: 000037.
5. Park LG, Schopfer DW, Zhang N, Shen H, Whooley MA. Participation in Cardiac Rehabilitation Among Patients With Heart Failure. J Card Fail. 2017; 23: 427-431.
6. Anderson L, Thompson DR, Oldridge N, Zwisler AD, Rees K, et al. Exercise-based cardiac rehabilitation for coronary heart disease. Cochrane Database Syst Rev. 2016 5.
7. Castellanos LR, Viramontes O, Bains NK, Zepeda IA. Disparities in Cardiac Rehabilitation Among Individuals from Racial and Ethnic Groups and Rural Communities-A Systematic Review. J Racial Ethn Health Disparities. 2019; 6: 1-11.

8. Kotseva K, Wood D, De Backer G, De Backer D. UROASPIRE III Study Group. Use and effects of cardiac rehabilitation in patients with coronary heart disease: results from the EUROASPIRE III survey. Eur J Prev Cardiol. 2013; 20: 817-826.
9. ATS Committee on Proficiency Standards for Clinical Pulmonary Function Laboratories. ATS statement: guidelines for the six-minute walk test. Am J Respir Crit Care Med. 2002; 166: 111-117.
10. Ware J Jr, Kosinski M, Keller SD. A 12-Item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. Med Care. 1996; 34: 220-233.
11. Pavy B, Caillon M. Effects of a cardiac rehabilitation program in coronary patients according to age. Annals of Cardiology and Angiology. 2012; 61: 338-344.
12. Audelin MC, Savage PD, Ades PA. Exercise-based cardiac rehabilitation for very old patients (> 75 years). J Cardiopulm Rehabil Prev. 2008; 28: 163-173.
13. Hiroe S, Shinichi D, Yoshinori N. Effects of Participation Frequency of Rehabilitation Classroom on Physical Functions and Their Sex-related Differences in Elderly Patients with Cardiac Diseases during Maintenance Period. American Journal of Sports Science and Medicine. 2017; 5: 5-10.
14. Adghar D, Bougherbal R, Hanifi R, Khellaf N. Cardiac rehabilitation for coronary patients: First experience in Algeria. Annals of Cardiology and Angiology. 2008; 57: 44-47.
15. Lutz AH, Forman DE. Cardiac rehabilitation in older adults: Apropos yet significantly underutilized. Prog Cardiovasc Dis. 2022; 70: 94-101.
16. O'Neill D, Forman DE. Never Too Old for Cardiac Rehabilitation. Clin Geriatr Med. 2019; 35: 407-421.