

Cross-Sectional Survey on Cardiac Rehabilitation in Cameroon: Perceptions, Practices, and Barriers among Consultant and Resident Cardiologists

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How to cite this paper: Siddikatou, D., Ndofo, V., Tsague, H., Mandeng Ma Linwa, E., Ndom, M.S., Nkoke, C., Mouliom, S., Tchako, D., Kong, M., Tchounja Kamgang, R., Kuate, L. and Kamdem, F. (2026) Cross-Sectional Survey on Cardiac Rehabilitation in Cameroon: Perceptions, Practices, and Barriers among Consultant and Resident Cardiologists. *Open Journal of Epidemiology*, 16, 129-148.

<https://doi.org/10.4236/ojepi.2026.161010>

Received: December 17, 2025

Accepted: January 29, 2026

Published: February 2, 2026

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Abstract

Background: Cardiac rehabilitation (CR) is scarce in low- and middle-income countries like Cameroon, despite its proven benefits. Understanding cardiologists' and residents' perspectives is vital for developing effective CR programs in such settings. **Methods:** A cross-sectional survey targeted cardiologists and cardiology residents across Cameroon using a self-administered questionnaire. Data were collected on demographics, CR training, awareness of CR centers, referral practices, knowledge of CR benefits, and implementation barriers. Responses were analyzed using descriptive statistics (frequencies, percentages). **Results:** Of 83 participants (59 cardiologists, 24 residents; 46.9% of 177), most practiced in Yaoundé (47.0%) or Douala (38.6%), primarily in public hospitals (55.4%). All endorsed CR's benefits, including improved functional capacity (100%), reduced mortality (95.2%), and fewer rehospitalizations (98.8%). However, only 15.7% had formal CR training, and 75.9% knew of one or no CR centers. Referral willingness was high (97.6% for heart failure, 95.2% for post-cardiac surgery/acute coronary syndrome), but actual referrals were low (44.6%) due to unavailable centers (86.7%), patient financial constraints (81.9%), and perceived lack of interest (73.5%). Respondents strongly agreed (median 10/10) on the need for more CR studies (59%) and centers (62.7%). **Conclusion:** Cameroonian cardiologists and residents strongly support CR but face significant barriers, including limited training and CR facilities. Targeted training, infra-

structure development, and patient education are critical to bridge the gap between enthusiasm and implementation, improving cardiovascular outcomes in Cameroon.

Keywords

Cardiac Rehabilitation, Low- and Middle-Income Countries, Referral Practices, Health Systems Barriers, Implementation Challenges

1. Introduction

Cardiovascular diseases (CVDs) claim that 17.9 million lives annually, with SSA bearing a disproportionate burden, where over 1 million deaths occur yearly amid a rapid epidemiological transition [1] [2]. By 2030, non-communicable diseases are projected to surpass communicable diseases, however, progress towards the United Nations' target of reducing premature CVD deaths by 33% lags [2] [3]. Cardiac rehabilitation (CR), a comprehensive intervention involving exercise, education, and psychosocial support, reduces mortality by up to 26%, lowers rehospitalizations, and enhances quality of life for patients with coronary artery disease or heart failure [4] [5]. Exercise-based cardiac rehabilitation (EBCR) is endorsed as a Class I recommendation in the 2021 European Society of Cardiology (ESC) guidelines [6]. Participation in a medically supervised, structured, and multidisciplinary EBCR and prevention program is recommended for patients following atherosclerotic cardiovascular disease (ASCVD) events, revascularization procedures, or in those with heart failure, particularly heart failure with reduced ejection fraction (HFrEF), to improve clinical outcomes [6]-[8]. Yet, CR remains a stark health inequity.

Globally, cardiac rehabilitation (CR) is available in only 111 out of 203 countries (54.7%), 80% in Europe, 40% in low- and middle-income countries (LMICs) and 17% in Africa [9]-[12].

On average, there is just one CR spot (*i.e.*, annual patient capacity slot in a program or volume served in a year) available for every 12 patients in need worldwide, a disparity that worsens in LMICs, where only one spot exists for every 66 patients, further limited by obstacles such as shortages of trained healthcare professionals and low levels of patient awareness [10].

Cameroon faces a considerable challenge with cardiovascular diseases (CVDs), evidenced by a high incidence of ischemic heart disease (107 per 100,000 population) [11]. CVDs, primarily heart failure, account for 15.9% of hospital admissions, leading to significant in-hospital mortality rates of up to 15% [13]. This critical situation is exacerbated by the virtual absence of cardiac rehabilitation (CR) services, highlighting an urgent need for intervention. Despite these challenges, evidence on the link between professional endorsement and the capacity to deliver effective CR programs is lacking in Cameroon. To address this, a survey is essential to systematically assess practitioners' perceptions, knowledge, and en-

dorsement of CR, as well as to identify specific training and infrastructural deficits hindering its implementation. This study aims to provide evidence to guide targeted interventions for scaling up CR services in Cameroon, addressing a critical health inequity in the face of rising CVD burden.

2. Methods

2.1. Study Design and Setting

This was a descriptive cross-sectional survey conducted in Cameroon between March and May 2025. The study targeted cardiologists and cardiology residents practicing in both public and private healthcare facilities across different regions of the country. Cameroon has approximately 120 registered cardiologists and 57 cardiology residents (all based in the capital, Yaoundé), forming a national pool of 177 physicians delivering specialized cardiac care.

2.2. Participants

The study population comprised all consultant cardiologists and cardiology residents identified through professional networks and hospital directories in Cameroon. Inclusion criteria were: being a board-certified cardiologist or a cardiology resident undergoing training in Cameroon, and willingness to participate in the survey. There were no exclusion criteria based on age, gender, or years of experience. A convenience sampling method was employed due to the specialized nature and relatively small number of this professional group in the country.

2.3. Variables

The main variables of interest included:

- Demographic and professional Characteristics: Age, gender, place of practice (region/city), practice sector (public, private secular, private faith-based, mixed-practice [*i.e.*, practicing in both public and private facilities]), main hospital of practice, professional status (consultant cardiologist or resident), years of experience/training, and sub-specialisation domain.
- Training and Awareness: History of formal training in cardiac rehabilitation (postgraduate diploma/certificate), and knowledge of the number of existing cardiac rehabilitation centres in Cameroon.
- Referral Practices: History of referring a patient to CR in Cameroon, and willingness to refer patients with specific cardiovascular conditions (general CR, heart failure, post-cardiac surgery, obliterative arterial disease of the lower limbs, post-acute coronary syndrome, stable angina, congenital heart disease).
- Knowledge and Perceptions of CR: Beliefs regarding physical activity for heart failure patients with low ejection fraction, knowledge of ACC/AHA recommendation class for CR post-MI/CABG/angioplasty, and awareness of CR's impact on mortality reduction post-MI. Perceived importance of various CR components and benefits (functional capacity, psychological well-being, cardiovascular mortality reduction, socio-professional reintegration, reduction in

re-hospitalizations, nutrition, therapeutic patient education, physical retraining, therapeutic optimization).

- Barriers to Implementation: Perceived obstacles to CR implementation for patients (low educational level, unavailability of local centres, low socio-economic level, patient lack of interest).
- Future Perspectives: Agreement on the need for more CR studies and more CR centres in Cameroon, and the main criterion for selecting a site for a new CR centre.

2.4. Data Sources and Measurement

Data were collected using a structured, self-administered questionnaire translated into both French and English to ensure clarity and accessibility for all participants. The questionnaire was distributed electronically via Google Forms to cardiologists and residents through professional mailing lists and WhatsApp groups. Most questions were closed-ended, with multiple-choice or Likert scale response options. For some questions, free-text comments were allowed.

2.5. Bias

Potential sources of bias included:

- Selection bias: Convenience sampling might lead to a sample that is not fully representative of all cardiologists and cardiology residents in Cameroon. Those more engaged or interested in CR might be more likely to respond.
- Information bias: Self-reported data might be subject to recall bias or social desirability bias, where respondents might provide answers, they perceive as more favourable.

2.6. Study Size

Our study targeted Cameroon's 177 cardiologists to assess CRs perspectives. For precise descriptive estimates, assuming a 95% confidence level and 5% margin of error, a sample size of 122 respondents was statistically required for this finite population ($N = 177$). Acknowledging that online surveys among professionals often yield response rates below 45% [14], we aimed to achieve at least 45% coverage of the target population, equivalent to approximately 80 participants. To maximize participation, we included strategies like reminder messages.

2.7. Quantitative Variables

Years of experience were collected as numerical values. Agreement on future perspectives was measured on a 0 - 10 scale. Perceived importance of CR benefits and components was measured on a 5-point Likert scale (e.g., Strongly Agree, Agree, Neither Agree nor Disagree, Disagree, Strongly Disagree).

2.8. Statistical Methods

All collected data were imported into a spreadsheet for analysis. Descriptive sta-

tistics were used to summarize the characteristics of the respondents and their responses to the survey questions. Frequencies and percentages were calculated for categorical variables (e.g., gender, professional status, training, referral practices, perceived barriers). Mean and standard deviation were calculated for continuous variables (e.g., age, years of experience, 0 - 10 agreement scales). No inferential statistical analyses were performed due to the descriptive nature of the study and the sample size. Only completed forms could be submitted, as such there were no missing data.

2.9. Ethical Considerations

This study adhered to institutional and international guidelines for minimal-risk, anonymous professional surveys, for which formal ethical review was not required. The survey collected fully anonymous responses on cardiac rehabilitation practices from cardiologists and cardiology residents in Cameroon, involving no sensitive personal data, as permitted under GDPR (Article 4(1)) for non-identifiable data [15]. Participants, as non-vulnerable professionals, provided implied consent through voluntary completion after receiving an introductory statement outlining the study's purpose and data handling, consistent with the Declaration of Helsinki (2013, Principle 17) [16] for minimal-risk research. Data were stored securely on a password-protected platform, ensuring confidentiality. All ethical principles were upheld. The absence of formal ethical clearance is acknowledged as a limitation.

3. Results

This study adhered to the STROBE reporting guidelines as seen in the **Annex**.

3.1. Participants

Out of a general pool of 177 respondents, a total of 83 (46.9%) cardiologists and cardiology residents from various regions of Cameroon completed the survey as shown in **Figure 1**. The mean age of participants was 39 years (SD 8.86, median 39, IQR 31.0 - 44.3, $n = 80$), with a male-to-female ratio of 1.3 (56.6% male, 43.4% female) as shown in **Table 1**. Approximately 71.1% were consultant cardiologists, and 28.9% were residents. The majority of respondents (70%) practiced in the country's political capital (Yaoundé, $n = 39$; 47%) and economic capital (Douala, $n = 32$, 38.6%), with 14.4% ($n = 12$) from other regions (Adamawa, Far-North, North, West, South, South-west), primarily within public ($n = 46$, 55.4%) or mixed-practice ($n = 18$, 21.7%) sectors, few within university teaching hospitals (3.6%, $n = 3$). Specialisations were predominantly general cardiology (49.4%, $n = 41$), with smaller proportions in interventional cardiology (2.4%, $n = 2$), pediatric cardiology (4.8%, $n = 4$), rhythmology (2.4%, $n = 2$), and cardiac imaging (1.2%, $n = 1$).

3.2. Educational Background and Referral Practices

Only a small proportion of participants ($n = 13$, 15.7%) reported having completed formal training in cardiac rehabilitation (postgraduate diploma/certificate)

as shown in **Table 2**. Regarding awareness of CR centres existence in Cameroon, 6% knew no centre and 69.9% knew only one centre. A notable proportion of respondents ($n = 37$, 44.6%) indicated that they had previously referred at least one patient for cardiac rehabilitation in Cameroon. Among those who had referred patients, 86.5% ($n = 32$) reported being satisfied with the care received, while 13.5% expressed dissatisfaction. For participants who had never referred a patient, non-referral was attributed to lack of known CR centres (12.0%, $n = 10$) or other reasons (43.4%, $n = 36$), primarily reiterating predefined barriers such as distance, time, cost or unstructured programs as further discussed in Section 3.5. When asked about their willingness to refer patients for general CR (96.4%). For specific conditions and for heart failure (97.6%) and least for congenital heart disease (53%).

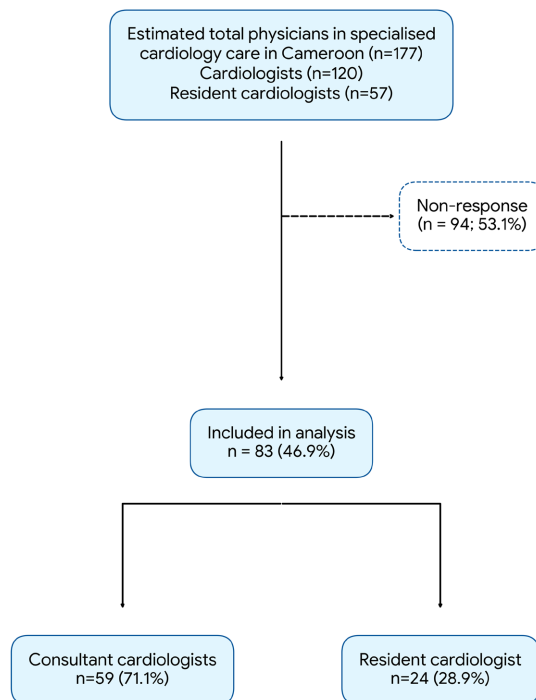


Figure 1. Recruitment flowchart.

Table 1. Baseline characteristics of respondents.

Baseline characteristics of respondents	n (%)
Age in years Median (IQR)	39 [31 - 44.25]
Sex of patient	
Female	36 (43.4%)
Male	47 (56.6%)
Consultant cardiologist/resident	
Consultant cardiologist	59 (71.1%)
Resident	24 (28.9%)

Continued

Place of practice (region and city)	
Adamawa (Ngaoundere)	2 (2.4%)
Centre (except Yaoundé ex Mbalmayo ou Bafia)	1 (1.2%)
Centre (Yaoundé)	39 (47%)
Far-North (Maroua)	1 (1.2%)
Littoral (Douala)	32 (38.6%)
Littoral (except Douala ex Nkongsamba ou Edéa)	2 (2.4%)
North (Garoua)	2 (2.4%)
West (Bafoussam)	1 (1.2%)
South (except Ebolowa ex. Kribi, Sangmélina, Ambam, Djoum)	2 (2.4%)
South-west (Buea)	1 (1.2%)
Type of practice	
Mixed practice	18 (21.7%)
Faith-based sector	4 (4.8%)
Private secular sector	15 (18.1%)
Public sector	46 (55.4%)
Main Hospital of Practice	
University Teaching Hospital	3 (3.6%)
Central Hospitals (Laquintinie, Hopital central Yaoundé/Hopital Jamot)	22 (26.5%)
District Hospital	11 (13.3%)
Reference Hospital (HGD, HGY, CHR)	19 (22.9%)
Regional Hospital	8 (9.6%)
Private practice	20 (24.1%)

Table 2. Educational background and referral practices.

Variables	n (%)
Cardiac rehabilitation training	
Currently in training	2 (2.4%)
No, I have received no training (postgraduate diploma/certificate)	68 (81.9%)
Yes, training completed	13 (15.7%)
Known Cardiac Rehabilitation Centers in Cameroon	
None	5 (6%)

Continued

Two centres	19 (22.9%)
More than two centres	1 (1.2%)
Only one centre	58 (69.9%)
Referral Practices: Have you ever referred, at least once, a patient for cardiac rehabilitation in Cameroon?	
No, because I know none in Cameroon.	10 (12%)
No, for other reasons.	36 (43.4%)
Yes, and rather satisfied with the care my patient received	32 (38.6%)
Yes, but rather dissatisfied with the care my patient received	5 (6%)
Would you refer a patient to cardiac rehabilitation?	
I don't know	1 (1.2%)
No	2 (2.4%)
Yes	80 (96.4%)
Would refer if ... (response = yes)	
Heart failure	81 (97.6%)
Post-cardiac surgery	79 (95.2%)
Obliterative arterial disease of the lower limbs	60 (72.3%)
Post-acute coronary syndrome	79 (95.2%)
Stable angina	52 (62.7%)
Congenital heart disease	44 (53%)

3.3. Knowledge and Perceptions of CR

For the ACC/AHA recommendation class for CR in post-MI/CABG/angioplasty patients, 77.1% (n = 64) correctly identified it as Class I. On the timing of CR initiation for hospitalised heart failure patients, 45.8% (n = 38) believed it should start during hospitalisation or as soon as the patient is discharged (33.7%, n = 28), while 16.9% (n = 14) suggested within the first month of discharge as shown in **Table 3**.

3.4. Perceived Importance and Components of CR

Perceptions of CR benefits were overwhelmingly positive, with 100% (n = 83) agreeing or strongly agreeing that CR improves functional capacity, 95.2% (n = 79) for cardiovascular mortality reduction, 98.8% (n = 82) for rehospitalization reduction, and 100% (n = 83) for socio-professional reintegration. Essential CR components were endorsed as follows: therapeutic patient education (100%, n = 83), physical retraining (98.8%, n = 82), psychological well-being (98.8%, n = 82), therapeutic optimization (98.8%, n = 82), and nutrition (97.6%, n = 81) as shown in **Table 4**.

Table 3. Knowledge on cardiac rehabilitation.

Questions	n (%)
Do you think that heart failure patient with an ejection fraction below 30% can do physical activity (response = yes)?	77 (92.8%)
According to the ACC and AHA, what is the recommendation class for cardiac rehabilitation in patients with myocardial infarction, coronary bypass surgery, or post-angioplasty?	
Class I	64 (77.1%)
Class IIa	7 (8.4%)
Class IIb	2 (2.4%)
I don't know	10 (12%)
True or false "Studies have shown that cardiac rehabilitation leads to a reduction in the risk of mortality after a myocardial infarction"	
True	75 (90.4%)
False	2 (2.4%)
I don't know	6 (7.2%)
When do you think a patient hospitalised for heart failure should begin cardiac rehabilitation?	
Within the first month of discharge	14 (16.9%)
As soon as the patient is discharged	28 (33.7%)
During hospitalisation	38 (45.8%)
More than one month after discharge	1 (1.2%)
I don't know	2 (2.4%)

Table 4. Perceived importance and components of cardiac rehabilitation.

Items	Strongly agree	Agree	Neither Agree nor Disagree	Disagree	Strongly disagree
PERCEIVED IMPORTANCE					
Cardiac rehabilitation is beneficial	80 (96.4%)	3 (3.6%)			
Improvement in the functional capacity	71 (85.5%)	12 (14.5%)	-	-	-
Reduction of cardiovascular mortality	59 (71.1%)	20 (24.1%)	4 (4.8%)	-	-
Socio-professional reintegration one of the benefits	65 (78.3%)	18 (21.7%)	-	-	-
Reduction in the risk of re-hospitalizations	69 (83.1%)	13 (15.7%)	-	1 (1.2%)	-

Continued**PERCEIVED COMPONENTS**

Psychological wellbeing is an essential component	63 (75.9%)	19 (22.9%)	1 (1.2%)	-	-
Nutrition is an essential component	53 (63.9%)	28 (33.7%)	1 (1.2%)	1 (1.2%)	-
Therapeutic patient education is an essential component	70 (84.3%)	13 (15.7%)	-	-	-
Physical retraining is an essential component	66 (79.5%)	16 (19.3%)	1 (1.2%)	-	-
Therapeutic optimisation is an essential component of cardiac rehabilitation for secondary prevention	55 (66.3%)	27 (32.5%)	1 (1.2%)	-	-

3.5. Barriers to Implementation and Future Perspectives

The most frequently cited barriers to CR implementation for patients were unavailability of local cardiac rehabilitation centres (86.7%), followed by socio-economic level of the patient (81.9%) as shown in **Figure 2**. There was a very high level of agreement (median 10, IQR 8 - 10, 59.0%, n = 49 rated 10/10) that more studies and that many more cardiac rehabilitation centres should be opened in Cameroon [median 10, IQR 8 - 10, 62.7%, n = 52] as shown in **Table 5**. When asked about the main criterion for selecting a site for a new CR centre, respondents most frequently cited availability of qualified human resources (39.8%) and proximity to existing hospitals (22.9%).

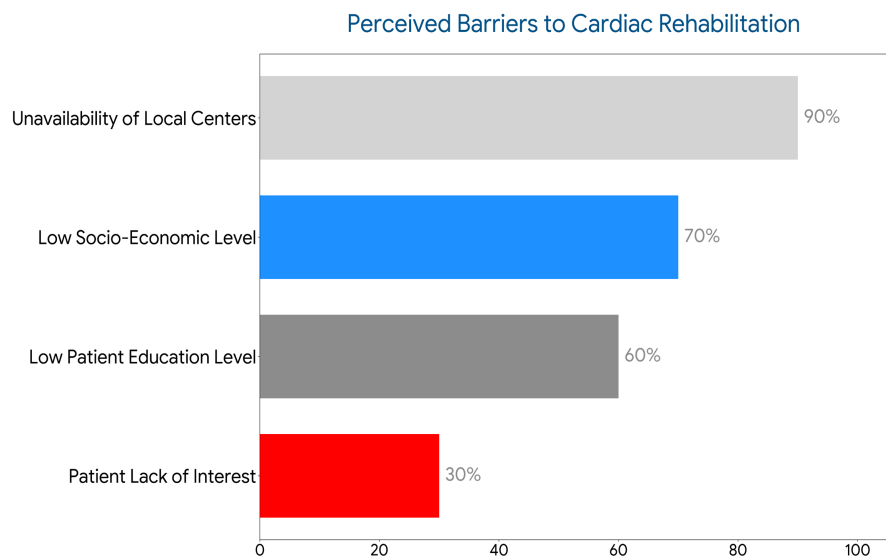


Figure 2. Cameroonian cardiologist's perspectives on perceived barriers to Cardiac Rehabilitation (CR).

Table 5. Future perspective and recommended criteria in establishing a CR site.

Variables	
FUTURE PERSPECTIVES	
	Median (IQR)
On a scale of 0 - 10 (10 being the maximum agreement), to what extent do you agree that many more studies on cardiac rehabilitation in Cameroon should be carried out?	10 (8 - 10)
On a scale of 0 - 10 (10 being the maximum agreement), to what extent do you agree that many more cardiac rehabilitation centres should be opened in Cameroon?	10 (9 - 10)
	n (%)
If a post-graduate diploma (PGD) in cardiac rehabilitation was opened in Cameroon, would you actively participate, whether as learners or teachers? (response = yes)	72 (86.7%)
MAIN CRITERION IN ESTABLISHING A CR SITE	
	n (%)
High-risk population density	10 (12%)
Proximity to hospitals	19 (22.9%)
Financial resources	4 (4.8%)
Qualified human resources	33 (39.8%)
Infrastructural resources	17 (20.5%)

IQR = Interquartile Range.

4. Discussion

This study provides novel insights into the landscape of cardiac rehabilitation (CR) in Cameroon, revealing strong practitioner endorsement juxtaposed against significant training and infrastructure deficits, as reported by 83 cardiologists and cardiology residents (46.9% response rate from a pool of 177). Respondents were primarily consultant cardiologists (71.1%) with a median age of 39.0 years (IQR 13) and a male-to-female ratio of 1.3, practicing mainly in urban centers Yaoundé (47%) and Douala (38.6%). Only 15.7% (n = 13) had formal CR training, despite 84.6% of trained respondents actively practicing CR. Most practitioners (69.9%) knew of only one centre and 6% unaware of any. Referral practices showed 44.6% (n = 37) had referred patients to CR, with 86.5% satisfied with care received, and high willingness to refer for CR (96.4%); mostly for heart failure (97.6%), though lower for congenital heart disease (53%). Knowledge of CR benefits was strong, with 90.4% recognising mortality reduction post-myocardial infarction and 77.1% correctly identifying CR as a Class I recommendation. The primary barriers to CR implementation included unavailability of local CR centres (86.7%), low patient socioeconomic status (81.9%), and lack of patient interest (73.5%). Respondents strongly supported future CR research (59%), with 86.7% willing to participate in a postgraduate CR diploma, and advocated for the establishment of more CR centres (62.7%), prioritising qualified human resources (39.8%) and proximity to hospitals (22.9%) when selecting sites for new centres.

This study reveals near-universal endorsement of cardiac rehabilitation (CR) benefits (95.2% - 100%) and high referral willingness (96.4% - 97.6%), yet only 44.6% had referred patients, primarily due to unavailable CR centres (86.7%) as similarly reported in Portugal where 45.4% of respondents did not refer and 76.2% of respondents cite lack of CR centres in their region as main reason for non-referral [17]. Comparable support among Saudi Arabian physicians (83% - 96%) has been reported but with higher referral rates (58% - 59%), citing CR centre scarcity (48%) and patient comorbidities (42%) as major barriers [18]. Pesah *et al.* (2019) found CR in only 39.9% of low- and middle-income countries (LMICs), with no programs identified in Cameroon at that time, highlighting severe regional gaps (one CR spot per 66 patients) [9] [10]. Cameroon's unique barriers like low patient socioeconomic status (81.9%) and limited education (48.2%), contrast with regions like Saudi Arabia with comorbidity focus, reflecting challenges in low-income settings [18]. Only 15.7% of Cameroonian respondents had formal training in cardiac rehabilitation (CR), aligning with findings from a study in Portugal, where 52.6% of participants reported either not having dedicated time or not intending to allocate residency time specifically for CR training [17]. Lack of CR-trained personnel, patient issues like late presentation and poor adherence due to low socioeconomic status, insufficient equipment and funding, low public awareness, and systemic barriers such as poor referral rates for women, elderly, rural, and low-income groups, compounded by transport issues, lack of physician endorsement, obesity, smoking, and depression have been reported in other Sub-Saharan African countries like Nigeria, highlighting context-specific cardiac rehabilitation challenges [19]. In the USA, with better organisational structure, cardiac rehabilitation participation rates are still very low, ranging from 19% to 34% [20] and therefore, with these context-specific challenges, we could expect even much lower participation rates, implying the urgent need to develop adequate strategies.

The concentration of respondents in urban centers (Yaoundé and Douala) and limited awareness of CR facilities (69.9% knew only one center) reflect a centralized healthcare infrastructure, restricting rural access. Since 2009, the Cardiac Centre Shisong in Kumbo, Cameroon's sole cardio-surgical unit, has offered effective CR [21], but newer less structured programs in other towns like Yaoundé and Garoua remain under-recognised [21]. This study's findings align with international guidelines (e.g., 2021 ESC Class I recommendation), likely driven by the 71.1% consultant cardiologists with advanced training (Current Study). However, the 81.9% training deficit suggests CR's limited integration into medical education, possibly due to Cameroon's historical focus on communicable diseases.

To address this translational gap, Cameroon may require: 1) capacity building through CR training in cardiology curricula and postgraduate diplomas, supported by 86.7% of respondents. Advocacy for task-shifting to non-physicians, could be a feasible strategy in Cameroon where cardiologist-led programs dominate [9]; 2) infrastructure development via new hospital-based CR centers, prioritizing quali-

fied personnel (39.8%) and hospital proximity (22.9%); 3) policy integration into national health strategies to secure funding and expand access; and 4) patient-centric approaches, such as education campaigns and subsidies, to overcome socioeconomic (81.9%) and literacy barriers (48.2%). Establishing a collaborative network among CR facilities could enhance advocacy and oversight. Future research could explore cost-effective community-based CR models for sub-Saharan Africa, incorporating broader sampling and inferential statistics to assess training and referral impacts.

The convenience sampling method may limit generalizability to all cardiologists in Cameroon, particularly those in rural areas, as 85.6% of respondents practiced in urban centres (Yaoundé and Douala). The sample size ($n = 83$), while adequate for descriptive analysis, may restrict the ability to detect nuanced differences in subgroups (e.g., by experience level), due to limited statistical power. Self-reported data are subject to recall and social desirability biases, potentially inflating reported knowledge or referral willingness. The study's descriptive design precludes inferential analyses of associations between variables, such as training and referral practices. Also, full ethical clearance could have helped refine questionnaires and methods and therefore the absence of formal ethical clearance is acknowledged as a limitation. Moreover, the exclusion of other CR team members (e.g., nurses, physiotherapists) limits the holistic understanding of CR implementation challenges. Nonetheless, this is the first survey of Cameroonian cardiologists and residents on Cardiac rehabilitation, one of the rare data in Sub-Saharan Africa on this topic. The 46.9% response rate from a finite population of 177 cardiologists provides a representative sample for a low-resource setting, surpassing the usual 30% - 45% response rate in online surveys. The inclusion of both consultant cardiologists and residents across various training and experience levels enhances the representativeness of perspectives from key stakeholders in Cameroon's cardiac care system. The use of a structured survey allowed a comprehensive assessment of knowledge, referral practices, and barriers, providing actionable data for policy and practice.

5. Conclusion

This study reveals strong endorsement of cardiac rehabilitation (CR) among Cameroonian cardiologists and cardiology residents, with 96.4% - 97.6% willing to refer patients for general CR and heart failure, and 90.4% - 100% recognizing its benefits in reducing mortality, rehospitalizations and improving functional capacity. However, significant barriers, including a lack of formal CR training (81.9%), unavailability of local CR centres (86.7%), and patient socioeconomic challenges (81.9%), severely limit implementation. Strategic interventions are urgently needed, including integrating CR training into medical education, establishing new CR centres with qualified personnel, and developing patient-centric approaches to address socioeconomic and educational barriers. These actions are critical to bridging the gap between practitioner enthusiasm and accessible CR services, ulti-

mately improving cardiovascular outcomes in Cameroon and potentially other LMICs facing similar challenges.

What Is Known about the Topic?

- Cardiovascular diseases (CVDs) cause 17.9 million deaths globally, with over 1 million in Sub-Saharan Africa (SSA) annually. Cameroon faces a high CVD incidence (e.g., ischemic heart disease at 107 per 100,000), with heart failure causing 15.9% of hospital admissions and up to 15% mortality.
- Cardiac rehabilitation (CR) reduces mortality by up to 26%, lowers rehospitalizations, and improves quality of life, yet is available in only approximately 54.7% of countries globally (based on 2019 data), with just 17% in Africa and one CR spot (*i.e.*, annual patient capacity slot in a program or volume served in a year) per 66 patients in need in low- and middle-income countries (LMICs) like Cameroon.
- Despite CR's proven benefits and guideline endorsements (e.g., 2021 ESC Class I), there is a lack of evidence on Cameroonian practitioners' perceptions, knowledge, and barriers to CR implementation, necessitating a survey to guide targeted interventions.

What Does Your Study Bring That Is New?

- This is the first study to systematically evaluate cardiac rehabilitation (CR) knowledge, referral practices, and barriers among cardiologists and residents in Cameroon, a sub-Saharan African country with a rising cardiovascular disease burden.
- The study reveals a critical paradox: near-universal endorsement of CR's benefits (95.2% - 100%) and high referral willingness (96.4% - 97.6%) among practitioners, yet only 15.7% have formal CR training and 69.9% know of just one CR centre, highlighting a severe implementation gap in a low-resource setting.

This study highlights the need for targeted clinical interventions such as accessible CR programs, specialized training, and patient education addressing socio-economic and literacy barriers while providing baseline data to guide research into cost-effective, community-based models and strategies to overcome systemic barriers in Cameroon and similar LMICs.

Statement on Authorship

All authors meet the 4 ICMJE criteria for authorship.

Acknowledgements

The authors thank the administration of the hospital for permitting us to conduct this research. The authors also thank the hospital personnel for collaborating with us to ease data collection.

Reporting Checklist

The authors have completed the STROBE reporting checklist.

Author Contributions

Study concept and design: SD, VD and EMM. Data collection: EMM. Analysis and interpretation of data: EMM. Manuscript writing: All authors. Final approval of manuscript: All authors. KF supervised the study. SD, and EMM had full access to all the data in the study and took responsibility for the integrity of the data and the accuracy of the data analysis. All authors agreed to submit the manuscript in its current form.

Data Availability Statement

Data supporting the findings of this study are available from the corresponding author (SD) upon reasonable request.

Funding

This study received no specific funding.

Conflicts of Interest

The authors declare no conflicts of interest.

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Annex: STROBE Guidelines

	Item No.	Recommendation	Page No.
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2-3
Objectives	3	State specific objectives, including any prespecified hypotheses	3
Methods			
Study design	4	Present key elements of study design early in the paper	3
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	3
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls	3
		<i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	3
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	N/A
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	4
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	4
Bias	9	Describe any efforts to address potential sources of bias	4-5
Study size	10	Explain how the study size was arrived at	3
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	4
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	4 - 5
		(b) Describe any methods used to examine subgroups and interactions	4 - 5
		(c) Explain how missing data were addressed	4 - 5

Continued

		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed	
		<i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed	4 - 5
		<i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy	
		(e) Describe any sensitivity analyses	4 - 5
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—e.g., numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	5
		(b) Give reasons for non-participation at each stage	5
		(c) Consider use of a flow diagram	Figure 1
Descriptive data	14*	(a) Give characteristics of study participants (e.g., demographic, clinical, social) and information on exposures and potential confounders	6
		(b) Indicate number of participants with missing data for each variable of interest	6
		(c) <i>Cohort study</i> —Summarise follow-up time (e.g., average and total amount)	6
		<i>Cohort study</i> —Report numbers of outcome events or summary measures over time	7
Outcome data	15*	<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure	N/A
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	N/A
		(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included	7
Main results	16	(b) Report category boundaries when continuous variables were categorized	7
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	7
Discussion			
Key results	18	Summarise key results with reference to study objectives	15
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	16 - 17

Continued

Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	17
Generalisability	21	Discuss the generalisability (external validity) of the study results	17
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	18

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies. Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at <https://www.strobe-statement.org/>.