



HEALTH RESEARCH IN AFRICA

High Quality Research with Impact on Clinical Care

ISSN: 3006-4090

EISSN: 3006-4104



Original Article

Short-Term Outcomes after Coronary Artery Bypass Grafting in Africa: A Narrative Systematic Review with New Evidence from Cameroon

Résultats à Court Terme Après un Pontage Aortocoronarien en Afrique : Une Revue Narrative Systématique Enrichie de Nouvelles Données Issues du Cameroun

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<https://doi.org/10.5281/zenodo.20169503>

ABSTRACT

Introduction. Although coronary artery disease (CAD) is increasingly prevalent in Africa, data on myocardial revascularization, whether by percutaneous procedures or coronary artery bypass grafting (CABG), remain scarce. This report reviews the outcomes following CABG in Africa and contextualizes new data from a Cameroonian institution within the existing literature. **Methods.** A narrative systematic review was conducted in accordance with PRISMA 2020 guidance. PubMed/MEDLINE, Scopus, African Journals Online (AJOL), and Google Scholar were searched for African studies reporting patient demographics, perioperative data, in-hospital, or 30-day outcomes after CABG. Unpublished data from 25 consecutive isolated CABG patients operated on in Cameroon between 2011 and 2025 were also included. **Results.** African patients undergoing CABG are typically men in their 60s with a high prevalence of angina, multivessel disease, and risk factors like hyperlipidemia and smoking. While pooled early mortality across Africa is 3.5%, it varies by region, reaching 11.2% in some series. In Cameroon, operative mortality is 4.5%, with key predictors of death being advanced heart failure (NYHA >class III), prolonged CPB time (≥ 180 min), and significant blood loss (≥ 2000 mL). **Conclusion.** In African patients, CABG is primarily performed on men with high cardiovascular risk, where early mortality is driven by advanced heart failure, necessitating optimized patient selection and regional clinical registries.

RÉSUMÉ

Introduction. Bien que la maladie coronarienne soit de plus en plus prévalente en Afrique, les données sur la revascularisation myocardique, qu'elle soit réalisée par procédures percutanées ou par pontage aortocoronarien (PAC), restent rares. Ce rapport examine les résultats après un PAC en Afrique et contextualise de nouvelles données issues d'une institution camerounaise au sein de la littérature existante. **Méthodes.** Une revue systématique narrative a été menée conformément aux directives PRISMA 2020. Les bases de données PubMed/MEDLINE, Scopus, African Journals Online (AJOL) et Google Scholar ont été consultées pour identifier les études africaines rapportant la démographie des patients, les données périopératoires, ainsi que les résultats hospitaliers ou à 30 jours après une PAC. Des données non publiées concernant 25 patients consécutifs ayant subi une PAC isolée au Cameroun entre 2011 et 2025 ont également été incluses. **Résultats.** Les patients africains subissant un pontage aorto-coronarien (PAC) sont généralement des hommes dans la soixantaine, présentant une forte prévalence d'angine de poitrine, d'atteintes multitrunculaires et de facteurs de risque tels que l'hyperlipidémie et le tabagisme. Alors que la mortalité précoce globale en Afrique est de 3,5 %, elle varie selon les régions, atteignant 11,2 % dans certaines séries. Au Cameroun, la mortalité opératoire est de 4,5 %, les principaux facteurs prédictifs de décès étant l'insuffisance cardiaque avancée (stade NYHA > III), un temps de circulation extracorporelle prolongé (≥ 180 min) et une perte de sang peropératoire importante (≥ 2000 mL). **Conclusion.** Chez les patients africains, le PAC est principalement pratiqué sur des hommes présentant un risque cardiovasculaire élevé, où la mortalité précoce est dictée par l'insuffisance cardiaque avancée, nécessitant une sélection optimisée des patients et la mise en place de registres cliniques régionaux.

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Keywords: coronary artery disease, coronary artery bypass grafting, cardiac surgery, Africa, early mortality

Mots clés : Maladie coronarienne, pontage aorto-coronarien, chirurgie cardiaque, Afrique, mortalité précoce

Article history

Submitted: 30 March 2026
Accepted: 23 May 2026
Published: 26 May 2026

HIGHLIGHTS FOR READERS IN A HURRY

What is already known on this topic. Coronary artery disease is rising in Africa, but data on surgical revascularisation outcomes are very limited. Most evidence comes from North Africa and private centres, with little information from sub-Saharan Africa.

The question this study addressed. This systematic review synthesised published CABG outcomes from Africa and added unpublished data from a Cameroonian cohort to identify predictors of early mortality.

What this study adds to our knowledge. Pooled early mortality across African CABG series is 3.5%, but reaches 11.2% in some South African reports. In Cameroon, operative mortality was 4.5%. Key independent predictors of death were advanced heart failure (NYHA >III, OR=36.0), prolonged bypass time (≥ 180 min, OR=2.5) and major blood loss (≥ 2000 mL, OR=4.0). Across Africa, reduced ejection fraction and high EuroSCORE II also predict poor outcomes.

How this is relevant to clinical practice, policy or further research. These findings highlight the need for better preoperative risk stratification, especially for patients with advanced heart failure. Establishing regional cardiac surgery registries in Africa would enable continuous quality improvement and benchmark outcomes against international standards.

INTRODUCTION

Historically less common than in high-income regions, coronary artery disease (CAD) is now recognized as an important and underdiagnosed public health problem across the African continent [1,2]. Rapid urbanization and the increasing prevalence of hypertension and smoking, among other factors, have been associated with increasing CAD morbidity and mortality in settings with limited access to cardiovascular care [2–5].

Surgical myocardial revascularization through coronary artery bypass grafting (CABG) [6–8] remains anecdotal in the sub-Saharan Africa (SSA) literature, as it is performed infrequently in many countries due to infrastructural limitations, workforce shortages, and delayed patient presentation [9–11]. The few published outcome data are limited, geographically concentrated, and heterogeneous, making benchmarking and quality improvement challenging [12–14].

This review summarizes the available evidence on CABG outcomes in Africa and incorporates new data from Cameroon, thereby contributing to the literature on CABG in low-resource settings.

METHODOLOGY**Data Sources and Search Strategy**

A literature search was conducted using PubMed/MEDLINE, Scopus, African Journals Online (AJOL), and Google Scholar. Search terms included “coronary artery bypass grafting,” “CABG,” “coronary revascularization,” “cardiac surgery,” “Africa,” and “sub-Saharan Africa,” as well as country-specific terms where

relevant. The reference lists of all eligible articles were manually screened, and additional relevant publications were identified through citation tracking.

Eligibility Criteria

Studies were eligible if they were conducted in African countries and reported perioperative, in-hospital, or 30-day outcomes after CABG. Case reports and studies lacking early outcome data were excluded.

Data Extraction and Synthesis

Extracted data included country, year of study, sample size, patient characteristics, graft type, mortality definition, mortality rate, and predictors of mortality. A narrative review was performed. Due to a substantial heterogeneity in outcome definitions and study designs, metanalysis was not performed.

Cameroonian Data

Data from the Shisong Cardiac Center (Cameroon), comprising 25 consecutive isolated CABG procedures performed between February 2011 and April 2025, were included for contextual comparison and clearly labeled as unpublished.

Statistical Analysis

For published studies, statistical methods and effect estimates were extracted, as reported by the original authors. No reanalysis of the primary study data was performed.

For the Cameroonian cohort, statistical analyses were performed using IBM SPSS Statistics (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean \pm standard deviation or median with interquartile range, depending on the distribution. Categorical variables were summarized as frequencies and percentages. Univariate logistic regression was used to assess the associations between clinical and operative variables and 30-day mortality. Variables with a p-value of <0.10 in the univariate analysis were entered into a multivariate logistic regression model to identify the independent predictors of early mortality. Odds ratios (ORs) with 95% confidence intervals (CI) were reported. A p-value <0.05 was considered statistically significant.

RESULTS**Selected Studies**

Database searches yielded 312 records: PubMed/MEDLINE (n = 74), Scopus (n = 58), AJOL (n = 22), Google Scholar (n = 158), and other sources (n = 6). After removing 86 duplicates, 232 records were screened by title and abstract, and 196 were excluded. Thirty-six full-text articles were assessed for eligibility, and 28 were excluded for various reasons. Eight studies were included in the qualitative synthesis. The study selection process is summarized in the PRISMA 2020 flow diagram (Figure 1), and descriptions of the selected studies are listed in Table I.

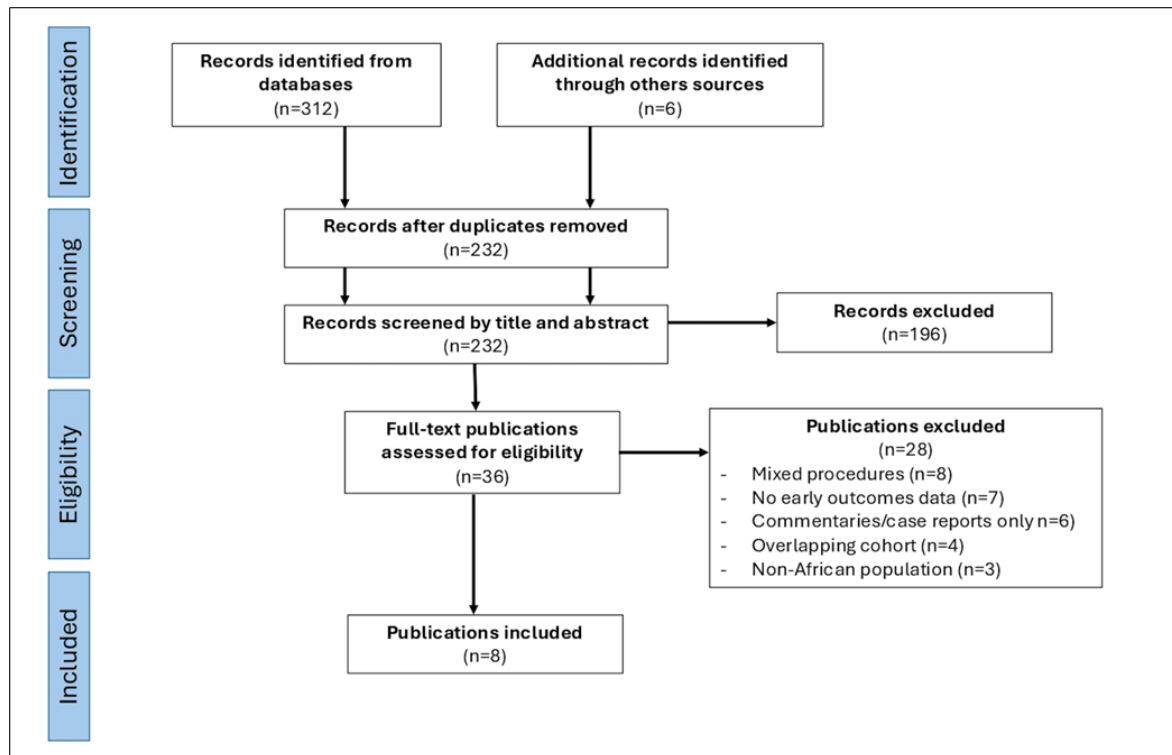


Figure 1. PRISMA 2020 flow diagram of study selection

Table I: Characteristics of key African studies reporting CABG outcomes

Study	Year	Country	Design	CABG
Waly et al. [25]	1997	Egypt	Retrospective	290
Chelli et al. [27]	2012	Tunisia	Retrospective	196
Moutakiallah et al. [28]	2019	Morocco	Retrospective	Large
Reiche et al. [15]	2021	South Africa	Retrospective	1218
Akintoye et al. [14]	2023	Multicountry	Metanalysis	-
Diagne et al. [30]	2024	Senegal	Early experience	10
El Mourabit et al.	2025	Morocco	Retrospective	Large
*Mve Mvondo et al	2026	Cameroon	Retrospective	25

Profile of Patients Undergoing CABG

In the African CABG series, patients were predominantly male and commonly operated on in their sixth decade of life. In the Johannesburg cohort, the mean age was 60.1 ± 10.1 years, with 78.1% male patients [15]. In Senegal, the mean age was 62.1 ± 9.6 years and 80% were male [30].

Moroccan diabetic CABG cohorts reported a mean age of around 61.1 ± 8.3 years [28]. Cardiovascular risk factors were commonly reported. In the Egyptian cohort, hyperlipidemia (69.7%), smoking (66.6%), family history (53.1%), hypertension (46.9%), obesity (46.2%), and diabetes (32.4%) were prevalent [25]. Patient demographics are summarized in Table II.

Table II: Patient profile and cardiovascular risk factors in African CABG cohorts

Study (year)	Country	N	Age (years)	M sex	HTN	DM	Smoking	Dysp	Obesity	Familiarity
Reiche et al.	South Africa	1218	60.1 ± 10.1	78.1%	NR	NR	NR	NR	NR	NR
Diagne et al.	Senegal	10	62.1 ± 9.6	80%	50%	30%	50%	0%	0%	NR
Moutakiallah et al.	Morocco	529	61.1 ± 8.3	80%	NR	100%	NR	NR	NR	NR
Waly et al.	Egypt	NR	54.5 (30-70)	NR	46.9%	32.4%	66.6%	69.7%	46.2%	53.1%
*Mve mvondo et al.	Cameroon	25	53.3 ± 9.6	81.8%	59.1%	NR	NR	68.2%	45.4%	NR

NR = not reported ; Msex= male sex; HTN=hypertension; DM=diabetes; Dysp=dyslipidemia; * : unpublished data

Clinical Presentation, Coronary Anatomy, and Surgical Data

The most frequently reported symptom was angina (89% in Egypt and 80% in Senegal) [25,30], with dyspnea reported in 40% of patients in Senegal [30]. Multivessel

disease was the most common pattern, including triple-vessel disease in Senegal (70%) and in a Moroccan diabetic CABG cohort (72.2%). Left main disease was reported in only 26.1% of the Moroccan cohort [28,30]. Clinical and operative data are summarized in Table III.

Table III: Clinical and operative data

Study (year)	Symptoms/presentation	Coronary lesions	Use of ITA	Technique	Mortality
Reiche et al.	NR	NR	NR	NR	11.2% (In-hosp.)
Diagne et al.	80% angina ; dyspnea 40%	3VD 70%	100%	On-pump	3% (Operative)
Moutakiallah et al.	NR	3VD 72.2%	NR	On-pump	5.9% (In-hosp.)
Waly et al.	Angina 89%	NR	NR	NR	NR
Chelli et al.	NR	3VD 100%	100%	NR	6%
Sanusi et al.	NR	NR	NR	Off-pump	NR
*Mve mvondo et al.	NR	3VD 40.9%	100%	On-pump 80%	4.5% (Operative)

NR =not reported; 3VD=triple-vessel disease; ITA=internal thoracic artery; * : unpublished data

Most African series reported on-pump CABG [28, 30], although the feasibility of off-pump CABG has been demonstrated in Nigeria [26]. Internal thoracic artery grafting was commonly used (100% in Senegal), often combined with saphenous vein grafts [30].

Overview of CABG Outcomes in Africa

A recent Africa-wide systematic review and meta-analysis estimated pooled early mortality following CABG to be approximately 3.5%, although most of the included studies originated from North Africa and private-sector institutions [14].

North African Experience

North African studies report relatively favorable early outcomes following CABG. Egyptian series reported hospital mortality rates below 2% in early analyses, with outcomes influenced by left ventricular function and perioperative complications [25]. Others Egyptian series have described early mortality of approximately 3%–4%, supporting the feasibility of CABG with acceptable short-term outcomes in established programs [31, 32]. In Tunisia, Chelli et al. reported in-hospital mortality rates of 6.9% and 5.9% in cohorts undergoing multivessel CABG using single versus bilateral internal thoracic artery grafting, respectively [27]. Moroccan studies reported in-hospital mortality ranging from approximately 1.5% to 5.9%, with adverse outcomes associated with diabetes,

reduced ejection fraction, transfusion requirements, and postoperative cardiac complications [28,29].

Sub-Saharan Africa

The largest sub-Saharan African cohort came from Johannesburg, South Africa, where Reiche et al. reported in-hospital mortality of 11.2% among 1,218 patients undergoing CABG over 17 years [15]. Prolonged CPB time and higher EuroSCORE II were independent predictors of mortality (Table 4).

Beyond South Africa, evidence remains limited but is expanding. In Senegal, Diagne et al. reported operative mortality of approximately 3% in the first 10 CABG cases performed locally, despite prolonged CPB and cross-clamp times reflecting early program development [30]. Reports from Nigeria also demonstrate the feasibility of surgical myocardial revascularization, including off-pump CABG, in a teaching hospital [26].

Cameroonian Experience

In Cameroon, 25 consecutive patients underwent isolated CABG. The mean age was 53.3 ± 9.6 years, and 81.8% were male. operative mortality was 4.5%. Independent predictors of early mortality were NYHA >class III (OR: 36.0; 95% CI: 1.57–826.1), CPB time ≥ 180 minutes (OR: 2.5; 95% CI: 1.00–7.30), and intraoperative blood loss ≥ 2000 mL (OR: 4.0; 95% CI: 7.33–21.74) (Table 4).

Table IV: Predictors of early mortality following CABG in African studies

Predictor	Studies reporting association
Advanced heart failure at surgery (NYHA III-IV)	Morocco, Cameroon
Prolonged cardiopulmonary bypass time	South Africa, Senegal, Cameroon
High EuroScore II	South Africa
Excessive blood loss/transfusion	Cameroon, Morocco
Reduced LVEF	Morocco, South Africa
Poor glycemic control	Morocco

NYHA= New York Heart Association; LVEF=left ventricular ejection fraction

DISCUSSION

This systematic review confirms that CABG is performed in African settings with acceptable early outcomes, although mortality rates vary widely across regions. North

African centers with longer-established programs and higher volumes generally report outcomes closer to international benchmarks, whereas public-sector sub-Saharan African cohorts demonstrate higher mortality,

reflecting late presentation, higher comorbidity burden, and system-level constraints [14,15,25,27–30].

In addition to mortality estimates, this review offers insight into the profiles of CABG patients in Africa. Across cohorts, CABG patients were predominantly male and underwent surgery in the sixth decade of life, with a mean age of approximately 60–62 years in large sub-Saharan and West African series [15,28,30]. Traditional cardiovascular risk factors were highly prevalent, including hypertension, diabetes mellitus, smoking, dyslipidemia/hyperlipidemia, obesity, and family history [25,28]. Angina was the dominant presenting symptom [25,30], and angiographic findings frequently showed multivessel disease with high rates of triple-vessel involvement and nonnegligible left main coronary disease in some cohorts [28,30]. Operative strategies were mainly on-pump CABG [28,30], although off-pump feasibility has been shown in selected low-resource contexts [26]. Importantly, conduit use often included at least one internal thoracic artery combined with saphenous vein grafts, reflecting the adoption of evidence-based revascularization practices [27,30].

Prolonged CPB time emerged as a recurrent predictor of early mortality across African studies. In a study from Johannesburg, prolonged CPB independently predicted mortality [15], while experiences in Senegal and Cameroon reinforced the relationship between longer CPB duration and early adverse outcomes [30]. CPB duration reflects operative complexity and is associated with systemic inflammatory response, coagulopathy, renal dysfunction, and prolonged ventilation [17,18].

Advanced heart failure at presentation is still a major challenge, particularly in sub-Saharan Africa. Late referral patterns and limited access to coronary angiography and preventive cardiology may contribute to severe presentations [2,13]. The Cameroonian finding that NYHA class III heart failure independently predicted early mortality emphasizes the need for earlier diagnosis and clinical optimization prior to surgery. Bleeding and transfusion requirements also appear to play an important role in early outcomes. The Cameroonian cohort identified significant intraoperative blood loss as an independent predictor of mortality, while Moroccan diabetic CABG data show that transfusion requirements and postoperative cardiac complications are strongly associated with adverse outcomes [28]. Global evidence links perioperative transfusions to increased infection, renal dysfunction, and mortality after cardiac surgery [23,24]. Collectively, these results suggest that improved outcomes will require not only intraoperative efficiency and postoperative critical care but also earlier referral, aggressive risk factor control, optimization of heart failure, and standardized strategies to reduce CPB time and bleeding.

Limitations

The African CABG evidence base consists largely of retrospective single-center series with heterogeneous outcome definitions and incomplete reporting of clinical variables. The Cameroonian dataset is limited by its small sample size and status as unpublished conference data, but

it provides rare evidence from Central Africa that corresponds with patterns observed across the continent.

CONCLUSION

CABG is feasible across diverse African settings, but early mortality remains linked to disease severity and intraoperative complexity. Advanced heart failure, prolonged CPB time, and significant bleeding are consistent and actionable determinants of early mortality. The improvement of perioperative protocols, patient selection, and development of regional registries are fundamental for advancing CABG outcomes in Africa.

CONFLICT OF INTEREST STATEMENT

The authors declare that they have no conflicts of interest related to this manuscript.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the medical, nursing, and perfusion teams of the cardiac surgery program in Cameroon for their contribution to patient care and data collection.

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