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Survival of Elderly Patients on Maintenance Hemodialysis: A 6 Years' Experience from a Resource-Limited Country

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Abstract

Background: With the improvement of life expectancy in developing countries, there is a growing population of elderly admitted on maintenance hemodialysis. This study assessed the survival among incident elderly patients on maintenance hemodialysis in Cameroon.

Patients and method: We carried out a retrospective cohort study of 6.3 years in the main hemodialysis units of Cameroon. All incident chronic hemodialysis patients of at least 65 years of age at dialysis initiation were included. Participants were followed for a minimum of 4 months up until death or abandon of dialysis. Their baseline characteristics and survival outcome were assessed.

Results: A total of 107 patients were included in this study, representing a cumulative incidence of hemodialysis among elderly patients of 10.9% during the study period. The median age at dialysis initiation was 68 years [IQR 66-72]. The median modified Charlson Comorbidity Index (mCCI) was 2 [IQR 2-5], and 35 (33%) patients had a comorbidity index greater than 3. Emergency dialysis at initiation was noted in 71 (69%) participants. Twenty four (22.5%) patients were hospitalized, mainly because of sepsis. The median survival time was 19.5 months [IQR 42-6]. Survival rates at 1 year and 2 year were 65.4% and 41.5%, respectively. The lowest survival time (4 months) was observed in the very elderly (> 80 years) with high comorbidity index. Patients with a history of hospitalization and those with emergency dialysis initiation also had low survival rates.

Conclusion: In our setting, one out of ten incident hemodialysis patients is an elderly. Nearly two-thirds of elderly are still alive one year after hemodialysis initiation. Comorbidity, emergency dialysis initiation and hospitalization are the main factors associated with mortality.

Keywords: Elderly; Hemodialysis; Survival; Comorbidity; Emergency dialysis; Hospitalization

Introduction

Chronic kidney disease (CKD) is one of the major health concerns of the 21st century with an estimated worldwide prevalence of 13.4% [1]. In the 2015 Global Burden of Disease Study, kidney disease was the 12th most common cause of death, accounting for 1.1 million deaths worldwide [2]. Overall, CKD mortality has increased by 31.7% over the last 10 years, making it one of the fastest rising major causes of death [2]. With the higher life expectancy due to socioeconomic development, increased prosperity and improvement in medical services, the number of elderly patients with CKD has increased. This rise is also due to the high prevalence of traditional risk factors of CKD such as diabetes and hypertension in older adults. So, the number of older patients reaching end stage renal disease (ESRD) is rising. In the United States of America (USA), the prevalence of ESRD continues to increase, with the fastest growing rate among patients above 65 years. From 2000 to 2016, the prevalence of ESRD in older patients (≥ 65 years) increased by 50%; and since 2000, older patients have the highest incidence rate of ESRD [3]. In Europe, older patients accounted for 42% of the European ESRD patients treated in 2012 [4]. However, limited data on the survival benefits of elderly adults initiating dialysis have been reported. Recent studies highlighted the uncertain survival benefit of renal replacement therapy in elderly, particularly among those with extensive comorbidities [5-8]. Besides the high burden of preexisting comorbidities, dialysis treatment itself may be associated with a further deterioration in functional status in this population. In Austria, Reindl-Schwaighofe and al, observed that elderly patients with ERSD benefited from initiation of hemodialysis, but this survival benefit did not persist beyond the first two months compared to survivors on conservative treatment [8].

In Sub-Saharan Africa, more than 500,000 individuals develop ESRD every year and less than 2% of them have access to renal replacement therapy [9]. In Cameroon, CKD mainly affect young adults but recent studies have shown that elderly may account for 20% of CKD population [10]; meaning that older patient may reached ESRD and need dialysis. Thus, elderly could represent a significant proportion of the dialysis population. In resourced-limited countries such as Cameroon, although it is partially founded by The State, access to dialysis is still limited, with mortality rates of more than 50% and

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overall means survival of less than 12 months [11]. The picture could be worse among elderly patients.

Objectives

In this study, we evaluated the survival rate of incident elderly patients (>65 years) admitted in the three main hemodialysis centers of Cameroon.

Methodology

Study design

This was a multicenter retrospective cohort study conducted from the January 1st 2012 to April 30th 2018. Patients were recruited in 3 hemodialysis centers:

- The Douala General Hospital Hemodialysis Center (DGHC) is the oldest and largest center of the country. It was opened in 1991 and it is located in the economic capital. It has a capacity of 216 patients and it is held by 2 nephrologists. It is the only nephrology reference center serving the littoral region with an estimated population of around 3.2 million.
- The Yaoundé General Hospital Center (YGHC) is the second center of hemodialysis to open. It was open in 2002 and it has a capacity of 153 patients. It is held by 3 nephrologists.
- The Yaoundé Teaching Hospital Center (YTHC) is the third center of the country. It was open in 2012 with a total capacity of 90 patients and it is held by 2 nephrologists.

YGHC and YTHC are both located in the political capital of the country and are the only nephrology centers of the Center region, deserving a population of more than 3.1 million.

Clinical records of incident ESRD patients aged of at least 65 years and admitted in any of the above health facilities during the study period were retrospectively reviewed. Records with incomplete data were excluded. Participants were followed for a minimum of 4 months up until death, abandon of dialysis or kidney transplantation until the end of the study on April 30th 2018. Their baseline characteristics and survival outcome were studied. The modified Charlson Comorbidity index (mCCI) was used to evaluate comorbidity [12]. Patients with mCCI > 3 were considered patients with high comorbidity Index.

The study was approved by the University of Yaoundé I Ethical Committee.

Data Collection: Baseline characteristics were recorded in the medical record and completed during an interview if the patient was still alive. The following data was noted:

- Demographic and socio-economic data: age, sex, marital status, profession and residency
- Clinical data: comorbidities by mCCI, etiology of ESRD, pre-dialysis care
- Dialysis initiation data: vascular access, indication of dialysis, programmed or emergency dialysis
- Laboratory parameters: serum creatinine, eGFR, Calcium, potassium and hemoglobin level

The following outcome measures were assessed:

- Survival was defined as patient survival from the date of first dialysis to either death, abandon of dialysis, kidney transplant or end of the study.
- Patient lost to follow up was determined when no information was available concerning death or survival. Contact through phone call was attempted and the status was confirmed if no information on outcome could be obtain.

Statistical analysis: All statistical analysis was performed using the Statistical Package for the Social Science (SPSS), version 23.0. Basic descriptive statistics were computed for the demographic data. Survival outcomes were measured by Kaplan–Meier survival analysis. Chi-square tests and Fisher exact tests were used for the categorical variables and t-tests and Mann–Whitney U tests for continuous variables as appropriate. Cox proportional hazards models [setting confidence interval (CI) for Exp (B) at 95%] were used for predicting factors of mortality. The results were expressed as percentage (%) or number (n) for categorical variables, and as means ± standard deviation or median for continuous variables.

Results: From January 1st 2012 to December 31st 2017, 1219 incident patients were registered in the three centers. Among them, 133 were aged of 65 years or above with a cumulative incidence rate of 10.9% (Figure 1). Twenty six patients were excluded because of incomplete data and a total of 107 patients were included in the analysis.

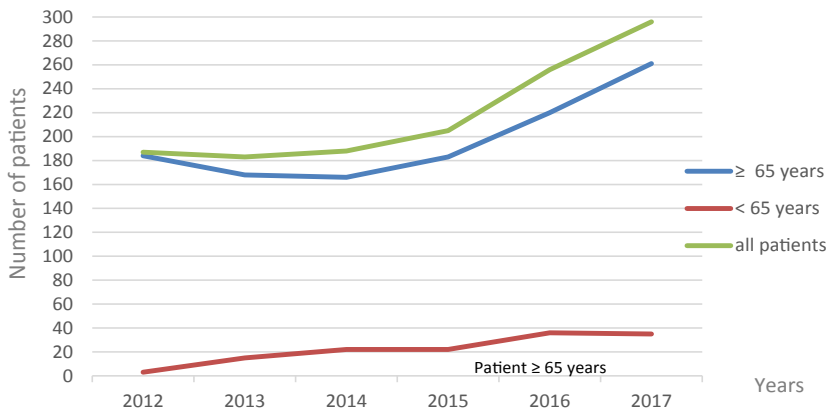

Figure 1: Incidence of end stage renal disease.

Baseline Characteristics

The median age of the included patients was 68 years (IQR 65-72) and was comparable between male and female (male=68 years, female=67 years, p=0.14). Most of the patients were married and a third of them were still professionally active. Hypertension (90.7%) and diabetes (72%) were the two main comorbidities. High comorbidity index was found in 24.3% of the patients (n=26). Only 54.2% of the patients had pre-dialysis nephrology care with a median follow up time of 8 months. Hypertension, diabetes and chronic tubulo-interstitial nephritis were the main etiologies of ESRD (Table 1).

Digestive uremic signs and uremic encephalopathy were the most common indications of dialysis initiation. Most of the patients (74%) started dialysis on a temporary catheter and 23.5% (n=25) had a hemoglobin level <7 g/dl (Table 2).

Hospitalization and Mortality

Twenty four patients were hospitalized during the study with 19 patients been hospitalized once and 5 patients twice. Hospitalization was mainly due to sepsis. A total of 63 (59%) deaths were registered. Most of them occurred at home (>50%). Cause of death was available only for 19 patients (Table 3).

	Effective (n=107)	Percentage (%)
Socio-demographic data		
Male	73	68
Age*	68	[65-87]
>80 years	6	5.8
Marital status		
Married	79	73.5
Widow	20	19
Single	8	7.5
Professional activity		
Still working	36	33.6
Illiterate	9	8
Comorbidities		
Hypertension	97	90.7
Diabetes	77	72
HIV	4	3.7
Cerebral vascular accident	11	10.3
Cardiac failure	31	29
Cancer	11	10.3
malnutrition	5	4.6
mCCI*	2	[0-10]
mCCI ≥ 3	35	33
Pre-dialysis nephrology care		
Number of patient	58	54.2
Duration* (months)	8	[1-65]
>12 months	27	25.2
CKD stage (first consultation)		
5	35	60.3
4	12	20.7
3	8	13.8
2	3	5.2
Creation of a Fistula	24	41.4
Etiology of ESRD		
Hypertension	42	39.3
Diabetes	30	28
Chronic tubulo-interstitial nephritis	18	17
Chronic glomerulopathy	12	11.1
Unknown	5	4.6
*Median [range]		

Table 1: Baseline characteristics of patients.

	Effective (n=107)	Percentage (%)
Dialysis indication		
Digestive uremic signs	54	50.5
Uremic encephalopathy	52	48.6
Acute pulmonary edema	42	39.25
Refractory hyperkaliemia	18	17
Others	16	15
Emergency dialysis initiation	71	69
Vascular access		
Arterio-venous fistula	24	22.3
Permanent catheter	4	3.7
Temporary catheter	79	74
Infection at dialysis initiation	36	33.7
Laboratory parameters*		
eGFR (ml/min/1.73 m^2)	3.5 (1.2-5)	[0-12]
Hemoglobin (g/dl)	8.15 (7.2-9.5)	[3.3-12.7]
Calcium (mg/l)	82.8(70.25-93.13)	[38-136]
Potassium (mmol/l)	5.2 (4.4-6.4)	[2.7-8.8]
*Median (interquartile 25^{th}-75^{th}); [minimum-maximum].		

Table 2: Clinical and biological data at dialysis initiation.

	Effective	Percentage (%)
Causes of death (n=63)		
Dialysis redrawn	9	14.3
Infection	7	11.1
Digestive hemorrhage	2	3.1
Cerebral vascular accident	1	1.5
Unknown	44	70
Hospitalization (n=24)		
Catheter infection	11	45.8
Pneumonia	7	29
Digestive hemorrhage	2	8,4
Endocarditis	1	4.2
Others	3	12.6

Table 3: Death and hospitalization.

Survival

At the end of the study, 38 (35.5%) patients were still alive and 6 patients were lost of follow up. The median survival time was 19 months with range from 0.38 to 65 months. Survival at 3 months was 83.5%, at 6 months 73.3%, at 12 months 65.4% and at 24 months 41.5% (Figure 2).

Survival time was comparable in the three hemodialysis centers (DGHC=20 months vs. YTHC=19 months vs. YGHC=18 months, p=0.53). It was also similar among both sex (male=19 months vs. female 14 months, p=0.51). Survival was lower in very elderly (>80 years) compared to other age groups (median survival 65-74 years=19 months, 75-79 years=13 months; ≥ 80 years=11 months, p=0.4) but the difference was not statistically significant (Figure 2).

Patients with a high comorbidity index had a lower survival time with an overall survival of 13 months compared to 22 months in patients with lower mCCI (p=0.04). The difference between the 2 groups were more important after 6 months (60% Vs. 72%). At 24 months, only 25% of the high comorbidity group survived compared to 45% in the lower comorbidity group. The lowest survival was found in very elderly with high comorbidity index (median survival=4 months) compared

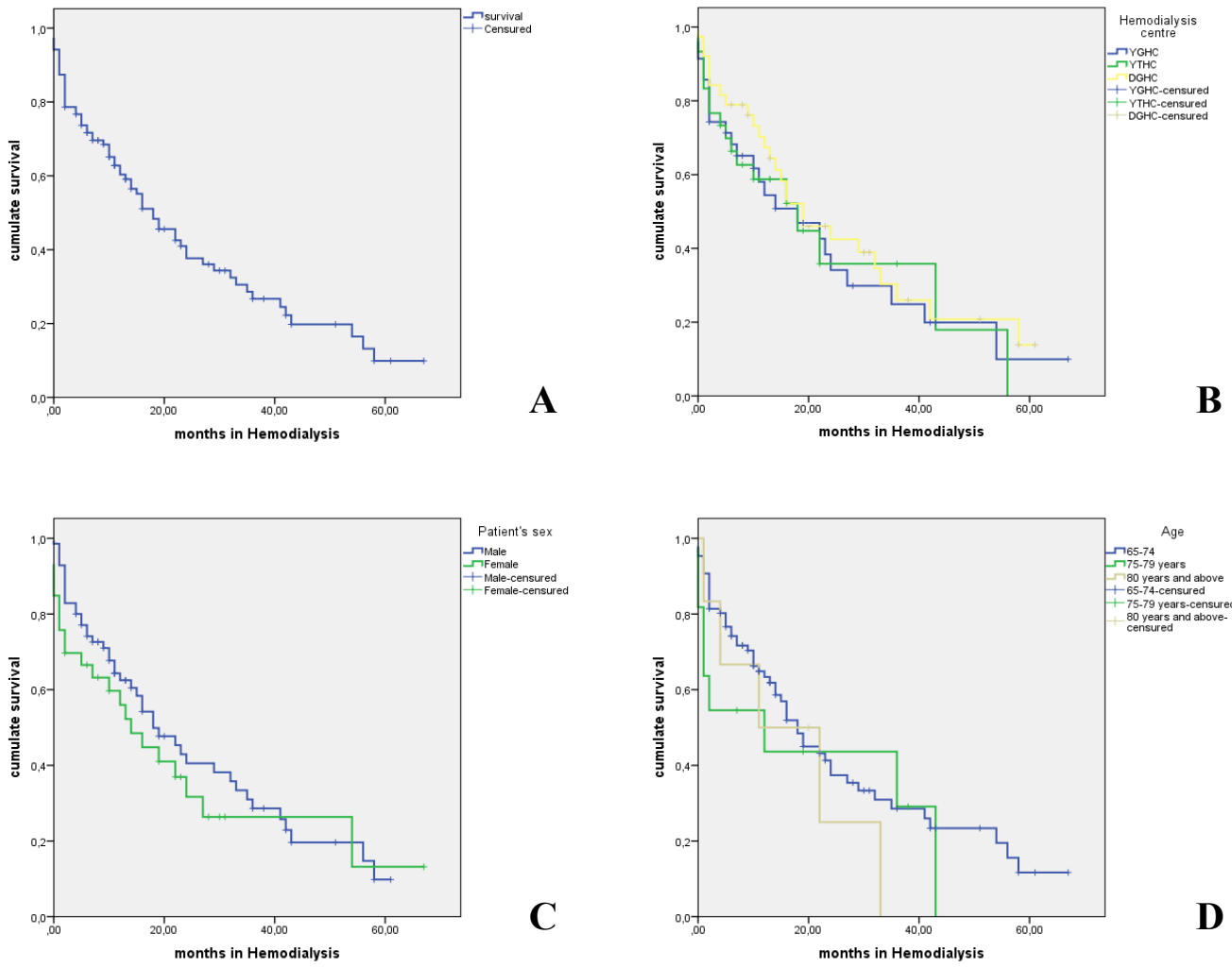

Figure 2: Elderly survival. (A) Overall survival. (B) Survival according to hemodialysis center. (C) Survival according to sex. (D) Survival according to age.

to those with low comorbidity index (33 months, p=0.016) (Figure 3).

Emergency dialysis at initiation was also associated with low survival (14 months vs. 23 months p=0.04). Mean survival of patients with high comorbidity index and emergency dialysis was 7 months compared to 54 months in high comorbidity and programmed dialysis (p=0.069). Patients with an arteriovenous fistula at dialysis initiation had a better survival compared to those without (median survival time: 27 months vs. 4 months, p<0.001) (Figure 4).

Absence of hospitalization was associated with a better survival (25 months vs. 11 month p=0.007) (Figure 5). High comorbidity index hospitalized patients had a survival of 7 months compared to 24 months for the low comorbidity index non-hospitalized group (p=0.022). Survival of patients with one hospitalization was similar to that of patients with several hospitalizations (10 months vs. 12 months, p=0.5).

High comorbidity index (adjusted HR 2 [CI 1.125-3.57], p=0.018) and hospitalization (adjusted HR 2.12 [CI 1.198-3.77], p=0.010) were both associated with low survival in multivariate analysis (Tables 4 and 5).

Discussion

Baseline characteristics

ESRD in Cameroon mainly affects young adults since more than 80% of incident chronic hemodialysis patients were aged between 20-64 years. However, from 2012 to 2017, the proportion of elderly patients who initiated hemodialysis raised from 1.6% to 12%. A recent study in Cameroon reported that older patients represent up to 20% of the CKD patients [10] and the proportion of elderly needing dialysis may continue to increase.

Most of the older patients were male (68%) and no female was found among very elderly patients (>80 years). This could be explained by the fact that male gender is a CKD risk factor [13]. It could also reflect the local socio-cultural habits where older males are still considered as the pillar of the family and everything is done for their survival. Another reason could be that women seem to preferred conservative treatments as noted by previous studies [8,14]. Notably, in Austria, Reindl-Schwaighofer et al observed that elderly ESRD woman were more prevalent in conservative treatment compared to hemodialysis (95% vs. 5%) [8].

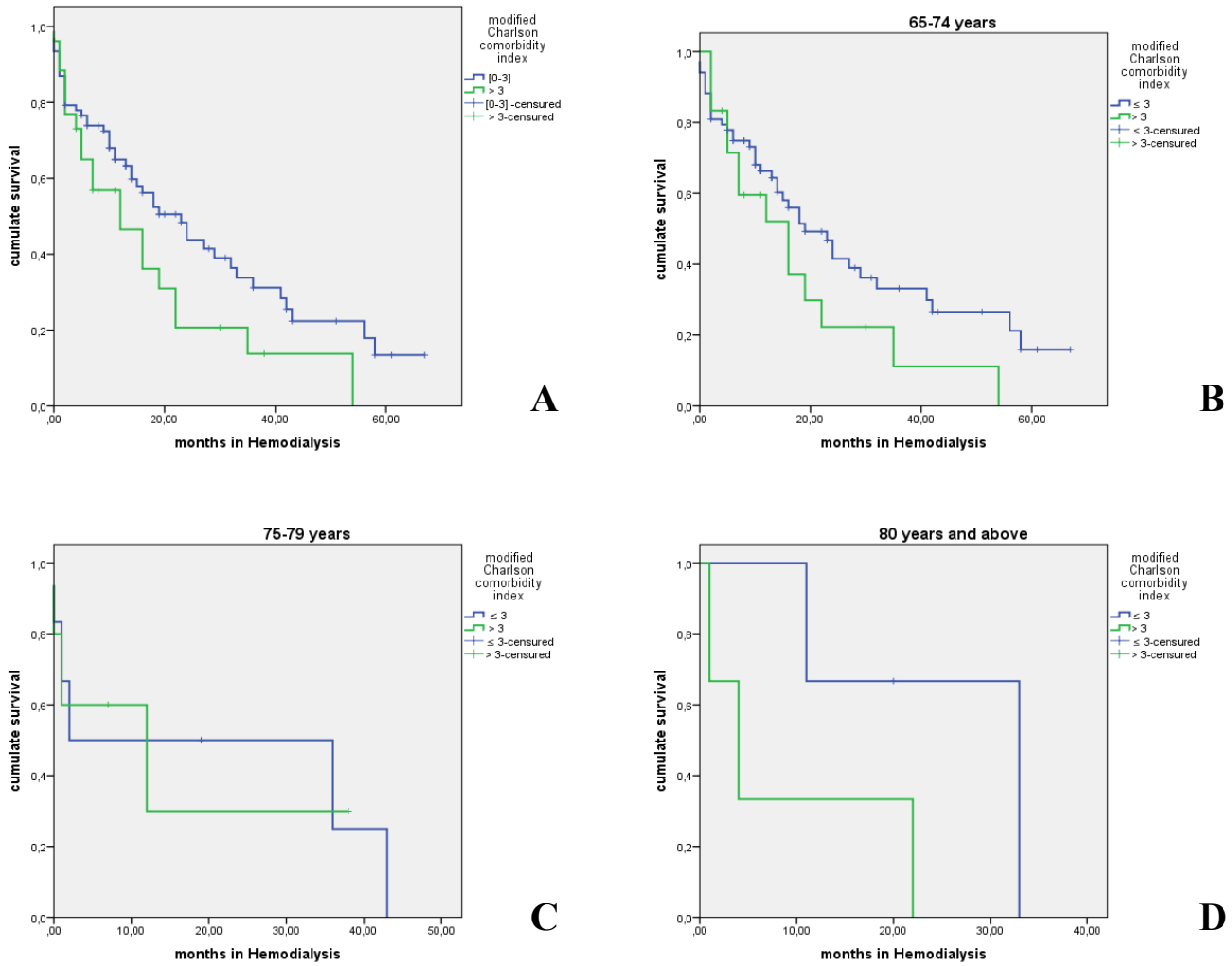

Figure 3: Elderly survival according to comorbidity. (A) Overall survival according to Charlson index. (B) Survival of patients 65-74 years according to comorbidities. (C) Survival of patients 75-80 years according to comorbidities. (D) Survival of very elderly according to comorbidities.

	Hazard ratio (95% CI)	p
Socio-demographic factors		
Age<70 years	0.9 (0.5-1.4)	0.54
Male	0.8 (0.5-1.3)	0.4
single	1.3 90.7-2.2)	0.36
Professional active	1.1 (0.7-1.9)	0.66
Clinical factors		
Pre-dialysis care > 3 months	0.9 (0.5-1.8)	0.8
Emergency dialysis	2.2 (1.2-3.9)	0.013
Dialysis initiation on catheter	2.1 (1.1-4.2)	0.032
Hospitalization	2.1 (1.2-3.5)	0.007
Diabetes	0.8 (0.4-1.4)	0.39
mCCI ≤3	0.5 (0.3-0.9)	0.013
Hemoglobin >7 g/dl	0.9 (0.6-1.8)	0.98

Table 4: Factors associated with low survival: univariate analysis.

They as in other reports, Hypertension, diabetes mellitus and cardiac failure were the main CKD comorbidities [14]. In our cohort, more than 90% of the participants had hypertension and more than 70% had Diabetes Mellitus. However, most of our patients had low comorbidity since less than 25% had high comorbidity index. The proportion of malnutrition at dialysis initiation was also low in our

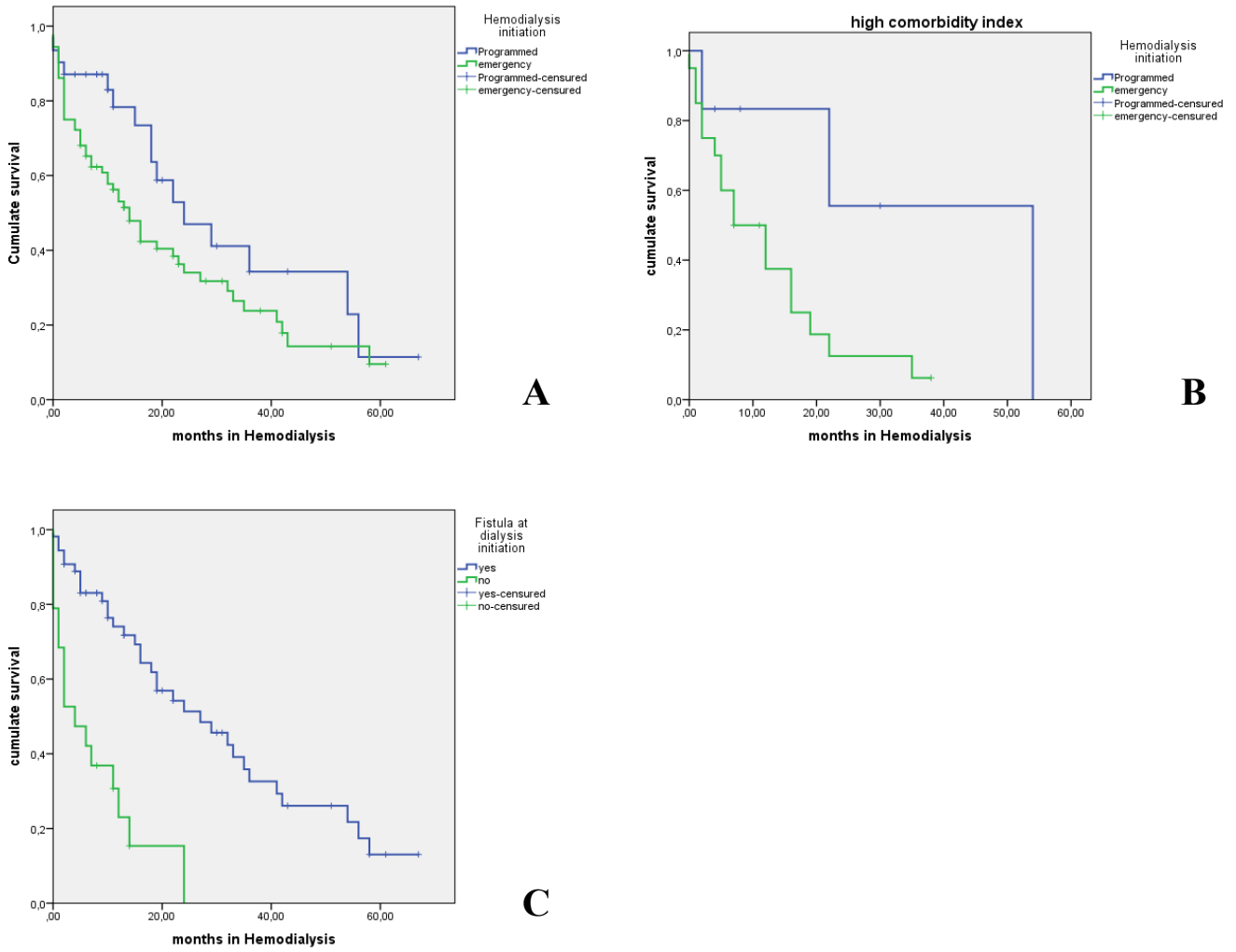

Figure 4: Elderly survival according to dialysis initiation. (A) Survival according to emergency/programmed dialysis initiation. (B) Survival among patients with high comorbidity index according to type of dialysis initiation. (C) Survival according to presence of fistula at dialysis initiation.

	Ajusted HR (CI 95%)	P
Hospitalization	2 (1.125-3.57)	0.018
Emergency dialysis initiation	1.4 (0.658-3.38)	0.121
Dialysis initiation on catheter	1.206 (0.48-2.98)	0.684
High comorbidity index	2.12 (1.198-3.770)	0.010

Table 5: Factors associated with low survival: multivariate analysis.

population. Thus, the survival time observed was largely independent from co-morbidities.

Pre-dialysis nephrology care was noted in 54.2% (n=58) of our patients although less than a quarter had a fistula at dialysis initiation. Half of the patients who had a pre-dialysis >12 months started dialysis as emergency dialysis and without fistula. Halle et al. previous reported that emergency hemodialysis without a fistula is frequent among patients with pre-dialysis care (62.5%) [15]. Since CKD as an indolent evolution, many patients are asymptomatic before ESRD and they do not understand the importance of programmed dialysis initiation.

Mortality

We found a mortality rate (59%) similar to those reported in developed countries varying from 46-66% [14-18]. As known in adult populations, cardiovascular and infection remain the main causes of death described in older hemodialysis patients [14]. Unfortunately, the cause of death was available only for 30% of case because most of them happened at home. We assumed that dialysis redrawn and sudden death probably accounted for most of them.

We also found that hospitalization was associated with increase mortality. Hospitalization rate is known to be higher in elderly patient, however, in our setting, it may more reflect the hospitalized mortality. Moreover, since hemodialysis care is expensive, hospitalization usually concern very severe illness with high mortality risk such as catheter infection.

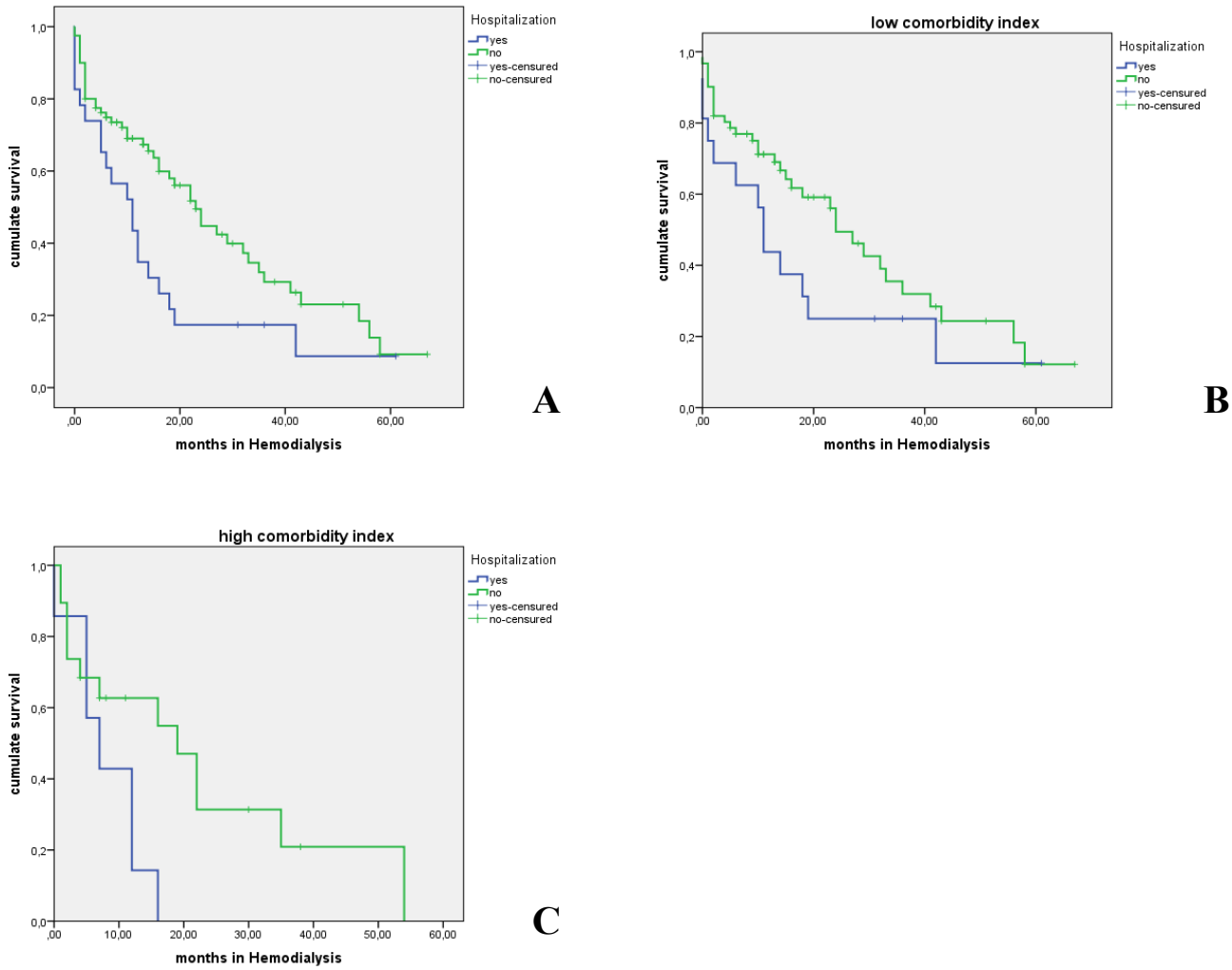

Figure 5: Elderly survival according to hospitalization. (A) Overall survival according to hospitalization. (B) Survival of patient with low comorbidity index according to hospitalization. (C) Survival of patient with high comorbidity index according to hospitalization.

Survival

Median survival time was 19 months and was comparable among sex, hemodialysis centers and age group. Kwok et al reported a median survival of 44.6 month in elderly dialysis patient in Hong Kong. However, Reindl-Schwaighofer et al, in Austria, and Jeloka et al, in India, respectively reported median survival of 26.9 month and 26.5 months [8,19]. Similar to our findings, Jeloka also reported that survival was comparable in elderly and very elderly patients [19].

As noted by many authors [8,14,16,18,19], elderly patients with high comorbidity index had lower survival (13 months vs. 22 months, p=0.04). As most of our patients had a low comorbidity index, it could explain our survival rate comparable to survival rate in India and Austria.

Emergency dialysis at initiation was associated with low survival, but after 5 years, survival rates were similar between emergency and programmed hemodialysis initiation. Older Cameroonian studies on dialysis survival also reported the importance of pre-dialysis care and programmed dialysis initiation [10]. More recently, Halle and al found that in adult hemodialysis patients, survival of patient with pre-dialysis compared to those without pre-dialysis care are better only during the first months but long term outcome of HD patients is more affected by initial comorbidity [15].

Conclusion

Incidence of elderly in chronic hemodialysis in Cameroon is increasing. Their survival time seems to be comparable to the survival time in some developed region. Comorbidity, programmed dialysis initiation and hospitalization are the main factor affecting survival in this population. Old age alone should not be an absolute contraindication of chronic hemodialysis initiation. A significant survival benefit could be observed in elderly as well as very elderly patients with low comorbidity and programmed dialysis initiation on an arteriovenous fistula.

Study Limitations

As a retrospective design, this study had many limitations. Twenty six patients (19.5%) were excluded because of incomplete data. The data collected depended on the documentation of attending physician

during the follow up and some may be wrong, incomplete or biased. Some important information was also not available such as the mobility or mental status of elderly patients which could be important factors of survival. Evaluation of comorbidity was only clinical and some other comorbidity could have influence the outcome.

Data availability

The data used to support the finding of this study are available from the corresponding author upon request

Conflicts of interest

The authors declare that they have no conflicts of interest

Funding statement

The research was performed as the part of the employment of the authors at the Faculty of Medicine and Biomedical Sciences of Yaoundé-Cameroon.

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