

Cost of Therapeutic Care for Patients on Maintenance Hemodialysis in a Public Hospital in Congo Brazzaville in 2022

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Abstract

Objective: Evaluate the cost of CRD (Chronic Renal Disease) management at the dialysis stage, in a public hospital in Congo Brazzaville.

Patient and method: It was a longitudinal and descriptive study of 7 months, which took place over the period from February 1 to August 31, 2022, in the Nephrology-Hemodialysis department of HGELBO It focused on 35 patients identified in a way exhaustive. Socio-demographic and clinical information and expenses incurred over 3 months were collected from medical records and during individual interviews using pre-established survey sheets. SPSS 22 software was used for data analysis and processing.

Results: Of the 35 patients, 26 were men, i.e., a sex ratio of 2.9. The mean age was 51.2 ± 12.3 years. Only 3 patients (9%) had health insurance and 52.2% of working patients had lost their job after starting dialysis. The median monthly cost of a chronic HD patient was 630,800 CFA Francs. Direct expenses amounted to 589,367 CFA Francs, they represented 93.4% of the total cost and are dominated by the cost of dialysis consumables (56.9%). The monthly median indirect cost was evaluated at 60,000 CFA Francs and represents 9.2% of the overall cost. The average cost of an HD session was evaluated at 31,219.4 CFA Francs. The total annual cost of the patient in HD maintenance was estimated at 7,569,600 CFA Francs.

Conclusion: The cost of caring for HD patients is high. The cost of managing CR at the dialysis stage is beyond the reach of most patients, so there is a need to implement strategies to prevent and manage ESRD in our setting.

Keywords: Chronic hemodialysis; Costs; Public center; Republic of the Congo

Introduction

End-stage chronic renal failure (ESRD) is a major public health problem worldwide, due to the high costs of its treatment, the poor quality of life it generates, and its significant morbidity and mortality [1,2]. At the terminal stage, CRD requires intermittent dialysis while waiting for a difficult-to-reach kidney transplant [3-6]. The most widely used renal replacement technique in the world is hemodialysis (HD), but the latter constitutes a major obstacle in many countries due to its high cost. Indeed, the cost of the global management of HD in developed countries for a patient is approximately 100,000 USD or 55,496,253 CFA Francs per year, at the expense of public authorities and health insurance systems [6]. In Africa, this cost is estimated at 12,060 USD or 6,692,848 CFA Francs and is largely borne by the patients [6-8].

In the Republic of Congo, chronic HD patients pay out of pocket

for their care. The only public HD center in the country is located in Oyo. It was inaugurated in 2018, dialysis is subsidized by the state and the price of a HD session, material not included, is 10,000 CFA Francs [9]. However, it is located far from the 2 main cities of the country, that is to say Brazzaville and Pointe-Noire, which alone concentrate more than 50% of the total population of the country [10,11]. Thus the majority of patients are forced to move and settle in Oyo, thus leaving their families and for some their jobs to continue their treatment. Moreover, they are forced to pay out of pocket for HD consumables when there is a lack of supplies in the center in consumables by the state. Few studies have looked at the real cost of HD in the public sector in Congo. Such a study would make it possible to know the economic impact of ESRD at the dialysis stage in Congo Brazzaville. Thus, we carried out our study with the general objective of evaluating the cost of the management of ESRD at the dialysis stage, in a public center in Congo Brazzaville.

Patients and Methods

We conducted a longitudinal descriptive study with prospective data collection over 7 months which took place over the period from February 1 to August 31, 2022. The study was carried out in the HD center of the Nephrology department-Hemodialysis at the Edith Lucie BONGO ONDIMBA General Hospital (HGELBO) located in Oyo in the Cuvette department. It is the only public HD center in the country with five NIPRO brand generators in operation at the time of the study.

We included patients in chronic HD for at least 3 months, of all ages, performing at least 2 sessions per week, able to answer questions and we saw them weekly during interviews in order to collect actual expense data. Each patient was followed for a period of 3 months from the time they met the study inclusion criteria. Patients who died during the study were excluded. The economic evaluation was carried out from the patient's point of view. Outcomes of interest were expenditures per patient or family related to ESRD care. Data and costs were obtained from patient interviews, medical records and drug bills, biology exams, and imagery. The direct costs analyzed included direct medical costs (cost of vascular access, HD session, HD session consumables, drugs, biological and imaging examinations) and non-medical direct costs (cost of return transport, from home or any other place such as work or school to the dialysis center; change of residence and food). The direct costing process was based on an analysis of the frequency of use of each resource, multiplied by the respective unit cost. The cost of a HD session was calculated for each patient by adding the cost of transport for the session, at the expense of an HD session fixed at 10,000 CFA Francs plus the cost of HD consumables purchased by the patient when these were not provided by the dialysis centre. The indirect cost considered was the loss of monthly productivity of patients and their companions due to the disease, estimated by the human capital approach, which consists of multiplying the number of working hours lost by the patient and/or his companions because of the Intravenous Renal Cell Transplantation (IRCT) by the gross hourly wage. The socioeconomic status of study participants was assessed using their monthly income. It was divided into strata of 3 classes which were defined by taking inspiration from the amount of the SMIG in Congo Brazzaville. The low socioeconomic level defined by a monthly income less than or equal to 100,000 CFA Francs.

Data analysis and processing were done using SPSS 22 statistical software. The various tables and graphs were generated using Microsoft Office Excel 2021 software. The costs were expressed as the median (or average) of the expenses recorded on 3 months per patient in the local currency, the African Financial Community Franc (CFA Francs) and converted into US dollars (USD), based on the exchange rate at the end of the study (1 CFA Franc=0.0015 USD). We estimated the annual cost of HD by multiplying the median cost by 4 and the monthly cost by dividing it by 3.

The study received administrative clearance from HGELBO and ethical approval was obtained from the Health Science Research Ethics Committee (CERSA).

Results

Annual expenditure on HD was higher for uninsured patients (8,958,900 CFA Francs; 13,438.3 USD) than for insured patients (2,508,000 CFA Francs; 3,762 USD) and also higher among those who dialyzed 3 times a week (11,230,600 CFA Francs; 16,845.9 USD) compared to those who only did 2 sessions (7,537,469.2 CFA Francs; 11,306.2 USD).

The average cost of an HD session was $31,219.4 \pm 19,086$ CFA Francs, with extremes of 12,000 CFA Francs and 58,000 CFA Francs. The cost of an HD session was 3.7 times higher when patients bought consumables (48,191.2 CFA Francs; 72.3 USD) than when they were offered per center (12,833.3 CFA Francs; 19. \$2). During the study, 10 patients (28%) declared that their income was sufficient the first months of dialysis, then gradually became insufficient to continue the treatment and 23 patients (66%) affirmed that their income from the initiation to HD were not enough to cover the cost of the treatment. Strategies used by patients to cover the cost of ESRD treatment when income was insufficient are shown in figure 1.

Discussion

The population of chronic HD patients in our study was young and male, results similar to those reported by most African authors [7,12,13]. The most represented NSE was the average level (63%) also observed by Eyeni Sinomono DT, et al. (93%) [14] (Table 1). Our results differ from those reported by other authors in West and

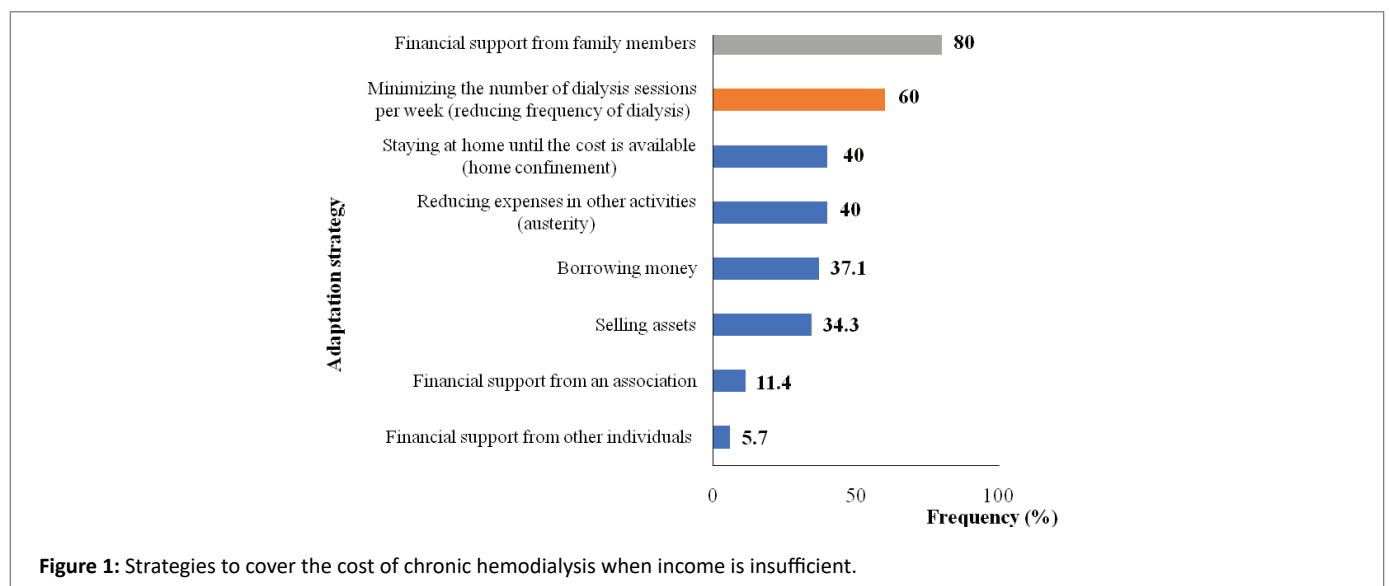


Table 1: Socio-demographic profile of participants.

	N=35	
	N	%
Sex		
Male	26	74.3
Female	9	25.7
Middle age	51.2 ± 12.3 years	
Age (min; max)	24 years ; 72 years	
Age groups		
≥ 55	17	48.6
45-54	9	25.7
35-44	5	14.3
25-34	3	8.6
< 25	1	2.9
Occupation		
State employee	12	34.3
Retirement	9	25.7
Private sector employee	6	17.1
Informal activity	5	14.3
Student	2	5.7
Unemployed	1	2.9
Marital status		
Married	15	43
Free Union	9	26
Bachelor	8	23
Widower	3	8
Socio-economic level		
Down	4	11
Average	22	63
Superior	9	26
Health Insurance		
Insured	7	9
Not insured	28	91
Monthly income		
Without income	10	28.6
< 200,000	7	20
[200,000 – 400,000]	9	25.7
[400,000 – 600,000]	2	5.7
[600,000 – 800,000]	4	11.4
≥ 800,000	3	8.6
Median monthly income	CFA Francs 320,000	
Hometown of patients		
Brazzaville	20	57.1
Black Point	13	37.1
Ewo	1	2.9
Ouéso	1	2.9

Central Africa where low NSE is the most represented level in African Hemodialysis catheters (HDCs) [15,16]. Diallo D, et al. in Mali reports a low NSE of around 60% [13]. If the underprivileged class is reported in the literature as the most affected class, this is explained by their frequent recourse to prohibited drugs from the parallel markets, to phytotherapy and to late specialized consultations. In addition, in some countries, HD screenings are free, which makes HD more accessible to the lower NSE. In Congo, the underprivileged class, as in other African

countries, is the most affected by MRCs, but because of the high cost of treatment for ESRD in the latter stage, they do not benefit from renal replacement therapy. This explains their under-representation in our study.

In our series, all the patients had to change their domicile and go to the only public HD center in Oyo to perform the HD sessions. These results differ from those of Kechach A, Benabbas S [17] in Algeria who shows a lower displacement rate for HD of around 55.8%. Although the change of residence seems to be classic in African literature [15,18]. The higher rate (100%) of displacement for HD in our study compared to other studies could be explained by the absence of public HD centers in the country's major cities. Indeed the 2 main cities of the country which concentrate nearly 50% of the national population do not have a public HD center; this justifies the exodus of patients to the HD center of the HGELBO. Additionally 94.2% of the patients during our study came from these large cities, in particular 57.1% from Brazzaville and 37.1% from Pointe Noire, results similar to those obtained by Gandzali Ngabe PE, et al. in 2020 [19]. This exodus is responsible for a change of scenery for patients and their families, who are forced to find new accommodation, a source of additional cost but also job loss, especially for employees in the private and informal sector.

Hypertension (26%), diabetes mellitus (17%), chronic glomerulonephritis (26%) were the most frequent causes for HD (Table 2). Our data are consistent with those of African literature [13,15,16,20]. Hypertension is the most common co-morbidity in chronic HD patients: 91.4% in our study. Kara L, et al. [21] and Berrachdi W, et al. [22] in Algeria reported frequencies of 56% and 84.3% respectively. Hypertension was followed by heart disease (31.4%) and diabetes (20%). These results are similar to those of Tsevi MY, et al. [23] in Togo who report 45.4% hypertension, 18.2% heart disease and 15.9% diabetes. Hemodialysis patients in Congo are at high cardiovascular risk despite their young age [24]; as reported in other black African countries [13,22,25].

The cost of an HD session was calculated for each patient by adding the cost of transport for the session, to the cost of a HD session set at 10,000 CFA Francs plus the cost of HD consumables when they were purchased by the patient. In our series, the average cost of a HD session was 31,219 CFA Francs (46.8 USD).

The average cost of a HD session varies from state to state. It is estimated at 51,573.8 CFA Francs (78.9 USD) in Iran by Mahdavi-Mazdeh M, et al. [26]; between 14,119 CFA Francs (21.6 USD) and 67,327 (103 USD) in Malaysia by Hooi LS, et al. [27]; to 156,878.4 CFA Francs (240 USD) in Greece by Kaitelidou D, et al. [28] (Table 3). This difference is explained by the cost of consumables which varies from state to state, and some studies include drugs such as erythropoietin in the calculation of the cost of the session. In addition, variations in terms of payment for HD sessions differ from one State to another and may justify this difference. For example, outpatient HD centers in the USA receive an amount of approximately 122,234.42 CFA Francs (187 USD) for each HD session according to the MEDICARE reimbursement system [29].

The cost of a HD session was 3.7 times higher when patients bought consumables with a gap of 35,358 CFA Francs (53 USD). This significant difference in cost with and without the purchase of consumables reflects the additional charge that patients must pay in the event that the State does not supply the HD center with consumables. Hence the need for a continuous supply of consumables to the centre.

This study showed that the annual expenditure on HD borne by patients and their families, estimated at 7,569,600 CFA Francs (\$11,580)

Table 2: Clinical characteristics of patients.

	N=35	
	N	%
Etiology		
Diabetes	6	17
Hypertension	9	26
HIV	2	7
Polycystic kidney disease	1	3
CNG	6	17
Indeterminate nephropathy	11	30
Comorbidity		
Hypertension	32	91.4
Heart disease	11	31.4
Diabetes	7	20
Alcohol	6	17.1
Tobacco	2	5
Stroke	2	5
HIV	2	5
Vascular access		
Arteriovenous fistula	22	63
Permanent catheter	3	8
Temporary catheter	10	29
Number of sessions per week		
2 sessions	22	62.9
3 sessions	13	37.1

Table 3: Patient expenditure on maintenance hemodialysis.

	Monthly cost (CFA Francs)	Annual cost (CFA Francs)	Annual cost (USD)	%
Direct cost	589,367	7,072,400	10,819.6	92
Direct medical cost	540,833	6,490,000	9,735	75
Vascular access	260,000	260,000	390	3
HD session fees	80,000	960,000	1,440	11
CKD drugs	87,258	1,047,096	1,570.6	14
Consumable	335,600	4,027,200	6,040.8	53
Drugs for comorbidities	18,650	223,800	335.7	3
Cost of paraclinical examinations	27,667	332,000	498	4
Direct non-medical cost	99,000	1,188,000	1,782	17
Transportation	20,000	240,000	360	3
Accommodation	26,000	312,000	468	4
Feed	67,500	810,000	1,215	10
Indirect cost	60,000	720,000	1,101.6	8
Global cost	630,800	7,569,600	11,354.4	100

are 5 times higher than the GDP per capita of Congo (1,447,138 CFA Francs; 2,213.9 USD) [30]. The monthly expenses (630,800 CFA Francs; US\$946) are 2 times higher than the median salary of participants in the study (320,000 CFA Francs; 480 USD) and 7 times higher than the SMIG (90,000 CFA Francs; 135 USD) [31]. Chronic HD thus takes a heavy toll and is beyond the reach of most patients, who belong to the lower and middle socioeconomic classes. This justifies the need to put

into effective operation the universal health insurance system (AMU) and to include the management of IRCT in its basket of care.

The reported cost of dialysis varies considerably by region and country [32]. Our annual cost was approximately 7,569,600 CFA Francs (\$11,580). This cost is close to that reported in Cameroon (8,877,356 CFA Francs; 13,581 USD) by Halle MP, et al. [7] and in Iran (8,809,375.8 CFA Francs; 13,477 USD) by Moradpour A, et al. [33] but is lower than that of most developed countries and some low-income countries. The annual cost of HD has been estimated at 53,239,953.3 CFA Francs (81,449 USD) in France according to Benain JP, et al. [34]; to 57,195,250 CFA Francs (87,500 USD) in the United States according to Collins AJ, et al. [35]; between 13,073,200 CFA Francs (20,000 USD) and 32,683,000 CFA Francs (50,000 USD) in Nigeria by Abu-Aisha H, et al. [36]; 30,285,375 CFA Francs (46,332 USD) in Saudi Arabia by Saran KA, et al. [37]; to 17,936,430.4 CFA Francs (27,440 USD) in Tanzania by Mushi L, et al. [38] and 18,675,066.2 CFA Francs (28,570 USD) in Brazil by Li J, et al. [39]. One of the reasons for the lower costs observed in our study is the difference in methodology. Indeed our study was carried out from the patient's point of view, so we did not include the costs of staff, construction of the center, the use of electricity and water by the centre, as was done in the other studies.

Annual HD costs lower than ours have been observed in some low/middle income countries. Prodjosudjadi W, et al. in Indonesia reports a cost ranging from 3,202,934 CFA Francs (4,900 USD) to 4,248,790 CFA Francs (6,500 USD) [40], Li PK, Chow KM in Sri Lanka report a cost ranging from 3,836,330.54 CFA Francs (5,869 USD) to 5,754,822.64 CFA Francs (8,804 USD) [41], Elsharif ME, et al. [42] in Sudan estimated the annual cost at 4,475,610 CFA Francs (6,847 USD) and Khanna U [43] in India at 1,960,980 CFA Francs (3,000 USD). These differences can be explained by many factors, in particular the annual per capita income which varies from one country to another, the methods used to estimate the costs, the different treatment protocols for ESRD and the differences in local import duties for drugs, laboratory tests and consumables.

During our study, expenditure on HD was higher for uninsured patients (8,958,900 CFA Francs; 13,438.3 USD) than for insured patients (2,508,000 CFA Francs; 3,762 USD). Insured patients received better dialysis (3 sessions per week), better care, because the cost of HD sessions, drugs and paraclinical examinations were covered by health insurance. Only expenses related to transport, accommodation and food were their responsibility.

This result reflects the need for health coverage to drastically reduce the expenses borne by patients, which can make treatment more accessible, especially since the majority of patients with CRDs in Congo have a low socio-economic level [44]. In our country, health insurance is almost non-existent; our study noted that only 3 patients (9%) were covered by health insurance, a result similar to those of Akomola SK, et al. in Togo who reports a health coverage rate of around 6% [45]. Other studies have also shown that in sub-Saharan African countries, even when the state subsidizes dialysis, as in the case of Congo, the cost borne by patients remains high and inaccessible to the majority [46-54]. Morbidity and mortality are therefore high. Simono DTE, et al. in 2021 in a study on CKD carried out at the Brazzaville University Hospital, the largest health center in Congo, noted that 74.6% of CKD patients were unable to benefit from HD replacement therapy, which leads to poor results with high hospital mortality of around 49.9% [44]. The results of the study showed that the average expenditure on HD was significantly higher in patients who dialyzed 3 times a week compared to those who did it 2 times, with a difference of 923,283

FCFA. Twenty-two patients (62.9%) during the study performed 2 sessions per week against 13 (37.1%) who performed 3 sessions per week. Indeed, few patients manage to perform 3 sessions per week because this program is expensive and inaccessible in relation to their income. Ten patients (28%) declared that their income was sufficient during the first months of dialysis, and thereafter, gradually became insufficient to continue the treatment and 23 patients (66%) affirmed that their income from the start of HD was not enough to cover the cost of the treatment. Thus, as in our study, the use of a program of 2 sessions per week is frequently used in developing countries because it is less costly for patients [55].

Our study has certain limitations. The first concerned the evaluation of the socio-economic level of the patients, which was only estimated in our study by taking into account the income of the patients because of the difficulty in determining the socio-economic level of the patients in our context (not hierarchy of occupations, size and type of accommodation difficult to obtain and difficulty in obtaining information related to the household). The second was the difficulty of evaluating the loss of production of patients and carers carrying out an informal activity (no stable income, no tax return). Finally, the exclusion of certain components of healthcare costs, such as the cost of consultations and various hospitalizations during data collection, probably led to an underestimation of the real cost. Despite these limitations, this study provides the first estimates of the operational costs of HD in Congo. The results will help health care planners develop strategies to improve the care of these patients.

Conclusion

This study demonstrated that the overall cost of managing ESRD in the Congo is extreme. Despite the state subsidy, out-of-pocket expenses are extremely high and unaffordable for patients. This cost is broken down firstly by the direct costs linked to substitution treatments for the disease, dominated by the cost of consumables, and then by the production losses due to the effects of the disease on economic activity. Therefore, strategies such as the establishment of universal health insurance, the removal of import duties on consumables and the construction of HD centers in the major cities of the country must be implemented.

Conflict of Interest

None.

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