Cost Implication of Inpatient Care of Chronic Kidney Disease Patients in a Tertiary Hospital in Southwest Nigeria

Oluseyi A. Adejumo¹, Akinkunmi A. Akinbodewa¹, Adeyemi Ogunleye², Adenike C. Enikuomehin¹, Olutoyin M. Lawal¹

Departments of ¹Internal Medicine and ²Medical Laboratory Sciences, University of Medical Sciences Teaching Hospital, Ondo City, Ondo State, Nigeria

ABSTRACT. The financial cost of inpatient care of chronic kidney disease (CKD) patients has not been well described in Nigeria; even though, the majority of these patients require inpatient care at the time of diagnosis due to late presentation. This study determined the cost implication of inpatient care among CKD patients in a Kidney Care Center in South-west Nigeria. This was an 18-month descriptive retrospective study. The financial records of the ward, laboratory, dialysis, pharmacy, and dietary services were obtained for each patient during their hospital stay and the sum of these costs was taken as the total direct cost of care. One hundred and twenty-three CKD patients with a male:female ratio of 2.3:1 and mean age of 50 ± 17 years were studied. One hundred and six (86.2%) patients had Stage 5 CKD, 105 (85.4%) had emergency hemodialysis (HD) at presentation and all patients paid out of pocket. The median number of HD sessions and days spent on admission was 4 and 14 days, respectively. The major contributors to the cost of care were total dialysis, ward, and pharmacy expenses with a median total cost of ₦70,000 ($200), ₦28,000 ($80), and ₦22,230 ($66), respectively. The median total direct cost of inpatient care of CKD was ₦150,770 ($431). The cost of care was higher in those with Stage 5 CKD and diabetic nephropathy. The cost of inpatient care of CKD is beyond the reach of most Nigerians. There is a definite need for the government to include CKD care under the national insurance scheme.

Introduction

Chronic kidney disease (CKD) has become a public health problem. The global prevalence is on the increase and it is associated with high morbidity and mortality.¹³ According to the 2010 Global Burden of Disease study, CKD was ranked 27th in the list of causes of the total number of deaths worldwide in 1990, but rose to 18th in 2010.⁴ More than 80% of all patients worldwide who receive treatment for kidney failure are in affluent countries with universal access to healthcare.⁴ This implies that the
majority of end-stage renal disease (ESRD) patients in developing countries do not have access to treatment because they cannot afford the cost.

The burden of CKD is felt more in developing countries like Nigeria where there is no adequate social security system or health insurance to meet the huge financial demands the disease places on its sufferers and their families. Furthermore, the disease affects the economically productive age group unlike in developed countries where the elderly are more affected.

CKD patients ideally should be seen by nephrologists when they are in Stage 3 or 4 so that their management could be well planned. This management also includes inputs from other members of the renal team such as dietician, social worker, clinical psychologist, and renal nurses. This multidisciplinary approach of the management of predialysis CKD patients retards progression to ESRD and ensures that the patients are well prepared for renal replacement therapy (RRT) such as having functional vascular access and being actively involved in the choice of the modality of RRT before its commencement. However, in Nigeria, majority of CKD patients present late to the nephrologists when they are very ill and uremic, hence requiring hospital admission and urgent RRT. This type of presentation is associated with increased health-care cost, frequency of hospitalization, morbidity, and mortality in CKD patients.

The financial cost of inpatient care of CKD patients has not been well described in Nigeria, even though the majority of these patients present very late in the uremic state to the nephrologists, which often necessitate admission and inpatient care at the time of diagnosis. The objective of this study was to determine the cost implication of inpatient care among CKD patients in a tertiary hospital in Southwest Nigeria.

Patients and Methods

This study is a descriptive retrospective study carried out in a state-government owned tertiary hospital located in Southwest Nigeria which receives referrals from hospitals within and outside the state. The study was carried out over a period of 18 months between March 2014 and August 2015.

Inclusion criteria were: CKD patients ≥18 years of age, who were managed for CKD as inpatients. CKD patients already on continuous RRT were excluded from the study. Case notes and records of all patients who fulfilled the inclusion criteria for the study were retrieved and reviewed. Information were obtained from patients records using a proforma that included age, gender, etiology of CKD, stage of CKD, blood pressure (BP), packed cell volume (PCV), serum creatinine (SCr), type of vascular access for hemodialysis (HD), numbers of days spent on admission, and mode of finance of health-care. The estimated glomerular filtration rate (eGFR) was calculated using SCr at presentation and the Modification of Diet in Renal Disease formula, which has been validated in Nigerians. CKD was staged using KDOQI staging. The financial records of inpatient ward, laboratory, dialysis, pharmacy, and dietary services were retrieved and recorded for each patient for their period of hospital stay. The pharmacy expenses included cost of all medications. The dialysis expenses included cost of all HD sessions, consumables and vascular accesses used for the procedures. The dietary expenses included cost of all specialized renal diets that were recommended by dieticians and served by the renal kitchen. The laboratory expenses included cost of all the laboratory investigations and blood given out for transfusion. The ward expenses included the cost of admission in the ward, nursing care, utility care, and ward consumables. The sum of all these costs for each patient was taken as the total direct cost of inpatient care and was compared with the minimum income needed to sustain basic living in Nigeria provided by the previous report. The cost of care was also presented in the United States dollars (USD) using the exchange rate of 350 Naira (₦) to US $1.
Statistical Analysis

Data generated were analyzed using the Statistical Package for the Social Sciences (SPSS) version 17.0 (SPSS Inc., Chicago, IL, USA). Results were presented in tabular form. Discrete variables were presented as frequency and percentages. Continuous variables were presented as means and standard deviation for unskewed data and median, interquartile range for skewed data.

Results

One hundred and twenty-three CKD patients seen during the period studied met the inclusion criteria that constituted the study population. The mean age of the study population was 50 ± 17 years. There were more males in a ratio of 2.3:1. Majority of the patients were ≤65 years and this accounted for 96 (78%) of the CKD subjects. The common etiologies of CKD were chronic glomerulonephritis, diabetes mellitus (DM), and hypertension in 47 (38.5%), 28 (22.8%), and 24 (19.5%), respectively. Five (4.1%) were in CKD Stage 3, 12 (9.8%) in Stage 4, and 106 (86.2%) in Stage 5. About 81% of the subjects were actively employed. Only 18 (14.6%) of them did not require HD at admission, whereas the remaining 105 (85.4%) had emergency HD. Femoral catheters were used as vascular access in all the patients who required urgent HD except for two patients who used non-tunneled internal jugular catheters as vascular access. All the patients paid out-of-pocket for their healthcare (Table 1).

The mean systolic BP, diastolic BP, PCV of the study population were 159.2 ± 34.9 mm Hg, 93.1 ± 25.5 mm Hg, and 25.8% ± 6.2%, respectively. The median (IQR) of serum urea, creatinine, and eGFR were 30.5 (21.2) mmol/L, 1082.8 (829.5) μmol/L, and 5.06 (4.85) mL/min, respectively. The median number of HD sessions and days spent on admission were four days and 14 days, respectively (Table 2).

The total direct cost of inpatient care of the patients ranged between ₦23,370 and ₦645,720 with a median total cost of ₦150,770 ($431). The major contributors to the cost of care were dialysis, ward, and pharmacy expenses with a median cost of ₦70,000 ($200), ₦28,000 ($80), and ₦22,230 ($63.5), respectively (Table 3).

The median total cost of care of stages 3 and 4 CKD patients was ₦95,950 ($274). This was lower than the median cost of care for Stage 5 CKD patients, which was ₦159,415 ($456); (P = 0.085) (Table 4).

CKD from DM had the highest median total cost of care of ₦206,383 ($590) compared

| Parameter                         | Frequency (%)/Mean(SD) |
|-----------------------------------|-------------------------|
| Gender                            |                         |
| Male                              | 86 (69.9)               |
| Female                            | 37 (30.1)               |
| Occupation                        |                         |
| Artisan                           | 22 (17.9)               |
| Trading                           | 34 (27.6)               |
| Civil Servant                     | 34 (27.6)               |
| Retiree                           | 12 (9.8)                |
| Unemployed (Schooling)            | 11 (8.9)                |
| Farming                           | 10 (8.1)                |
| Mean age (years)                  | 50 (17)                 |
| Age group                         |                         |
| ≤40 years                         | 38 (30.9)               |
| 40–64 years                       | 58 (47.2)               |
| ≥65 years                         | 27 (22.0)               |
| Diagnosis                         |                         |
| Chronic glomerulonephritis        | 47 (38.2)               |
| Hypertensive nephropathy          | 24 (19.5)               |
| Diabetic nephropathy              | 28 (22.8)               |
| Obstructive nephropathy           | 16 (13.0)               |
| Others                            | 8 (6.5)                 |
| Chronic kidney disease stages     |                         |
| 3                                 | 5 (4.1)                 |
| 4                                 | 12 (9.8)                |
| 5                                 | 106 (86.2)              |
| Hemodialysis requirement          |                         |
| Yes                               | 105 (85.4)              |
| No                                | 18 (14.6)               |
| Vascular access                   |                         |
| Femoral                           | 103 (98.0)              |
| Non-tunneled jugular              | 2 (2.0)                 |
| Source of finance for treatment   |                         |
| Out-of-pocket                     | 123 (100)               |
| Health insurance                  | 0 (0)                   |
| SD: Standard deviation.           |                         |

Table 1. Characteristics of the study population.
to other etiologies, although this was not statistically significant \((P = 0.284)\) (Table 5).

**Discussion**

This study showed that the median cost of inpatient care of CKD patients was about ₦150,770 ($431). Health is an important productive asset of humans; hence, the economic growth and development of a nation could be assessed indirectly by the health status of the people. In Nigeria, healthcare is financed in various ways such as government’s budgetary financing, out-of-pocket payments, health insurance (social and private) and external funding. All the patients in our study paid for their treatment from their pockets which corroborates the fact that majority of Nigerians pay through private expenditure. Previous report showed that out of pocket expenditure on health account for about 70% of total health expenditure in Nigeria.

### Table 2. Parameters of the study population.

| Parameter                   | Minimum | Maximum | Mean (SD)/Median (IQR) |
|-----------------------------|---------|---------|------------------------|
| Systolic BP (mm Hg)         | 76      | 270     | 159.2 (34.9)           |
| Diastolic BP (mmHg)         | 50      | 190     | 93.1 (25.5)            |
| Packed cell volume (%)      | 14      | 45      | 25.8 (6.2)             |
| Serum urea* (mmol/L)        | 5.3     | 96.9    | 30.5 (21.20)           |
| Serum creatinine* (μmol/L)  | 137.1   | 4989.2  | 1082.8 (829.5)         |
| estimated GFR* (ml/L)       | 1.02    | 58.32   | 5.06 (4.85)            |
| Number of days on admission*| 1       | 55      | 14 (16)                |
| Number of HD sessions*      | 1       | 19      | 4 (4)                  |

BP: Blood pressure, GFR: Glomerular filtration rate, HD: Hemodialysis, SD: Standard deviation, IQR: Interquartile range. *Skewed data are expressed as median (IQR).

### Table 3. Cost analysis of in-patient care.

| Parameter                   | Minimum (₦) | Maximum (₦) | Median (IQR) (₦) | Median (IQR) ($) |
|-----------------------------|--------------|--------------|------------------|-----------------|
| Pharmacy expenses*          | 2350         | 167,070      | 22,230 (24,215)  | 63.5 (69.2)     |
| Dialysis expenses*          | 0            | 310,000      | 70,000 (64,000)  | 200 (182.9)     |
| Diet expenses*              | 0            | 91,000       | 13,850 (16,600)  | 39.6 (47.4)     |
| Ward expenses*              | 2000         | 110,000      | 28,000 (32,000)  | 80 (91.4)       |
| Laboratory expenses*        | 300          | 75,400       | 16,300 (14,425)  | 46.6 (41.2)     |
| Total cost*                 | 23,370       | 645,720      | 150,770 (129,530)| 430.8 (370.1)   |

*Skewed data are expressed as median (IQR), Exchange rate: ₦350 = $1, IQR: Interquartile range.

### Table 4. Comparison of the total cost of care between Stage 4 and Stage 5 chronic kidney disease patients.

| Stage of CKD | Median (IQR) Total cost of care (₦) | Median (IQR) Total cost of care ($) |
|--------------|-------------------------------------|-------------------------------------|
| Stage 3 and 4| 95,950 (139,462)                    | 274 (399)                           |
| Stage 5      | 159,415 (125,643)                   | 456 (359)                           |

Exchange rate: ₦350 = $1, CKD: Chronic kidney disease, IQR: Interquartile range.

### Table 5. Comparison of total cost of care across different etiologies of chronic kidney disease.

| Etiology of CKD             | \(n\) | Median (IQR) Total cost of care (₦) | Median (IQR) Total cost of care ($) | \(P\)  |
|-----------------------------|-------|-------------------------------------|-------------------------------------|-------|
| Diabetes mellitus           | 28    | 206,383 (149,610)                   | 590 (428)                           |       |
| Chronic glomerulonephritis  | 46    | 153,219 (91,032)                    | 438 (260)                           | 0.284 |
| Hypertension                | 24    | 171,340 (111,117)                   | 490 (318)                           |       |
| Others                      | 25    | 173,134 (104,966)                   | 495 (300)                           |       |

Exchange rate: ₦350 = $1, CKD: Chronic kidney disease, IQR: Interquartile range.
The funding of healthcare in Nigeria is grossly inadequate with a health budgetary allocation that does not exceed 3% of the total budget of the country. Health insurance in Nigeria still has limited coverage with only about 5% of Nigerians having prepaid health care through social and voluntary private insurance. The National Health Insurance Scheme (NHIS), which became fully operational in 2005, covers majorly Federal government employees and selected family members. Most workers who are under the employment of the State Government are not yet covered by the scheme. Furthermore, the informal sector of the country and those living in the rural areas of the country that constitute majority of the Nigerian population are not covered by the NHIS. This buttresses the fact that healthcare access in Nigeria is not equitable. At present, the NHIS does not cover all aspects of renal care in Nigeria; only six sessions are covered yearly. This is grossly inadequate in sustaining life of CKD patients. However, with persistent efforts and advocacy of the Nigerian Association of Nephrology, the NHIS will cover the cost 36 sessions of HD yearly for ESRD patients and immunosuppressant therapy for kidney transplant patients; although, this is yet to be implemented.

A report showed that the minimum yearly income needed to sustain a living that provides the basic needs in Nigeria stands at $1016 per year in urban areas (₦355,600 per year or ₦29,633 per month) and $758 per year in rural areas (₦265,300 per year or ₦22,108 per month). However, 74% of Nigerians live below this income level. Out of this, about 40% live under the poverty line, i.e., live on less $1.25 per day which translates to ₦13,125 per month and ₦157,500 per annum. What the average Nigerian is expected to earn to cater for his basic needs is far below what he earns. For Nigerians with CKD who require an average sum of ₦151,000 ($431) for initial treatment, it becomes very difficult and almost impossible for them and their families to meet up with these bills. Furthermore, since the majority of these patients would have to be on maintenance HD to sustain life after the initial inpatient care, they become impoverished over time.

A substantial part of the cost of care of these patients was from RRT and ward expenses during their stay in the hospital. This financial cost is avoidable if these patients are seen early by nephrologists and other members of the renal team who plan the management such that the patient who progresses to ESRD is well prepared psychologically for his or her treatment. Such well-prepared patients are more likely to have optimal hematocrit, BP control and functional vascular access at the time of initiating RRT and may only require outpatient care.

The median hospital stay of patients in this study was 14 days. The time spent by these patients on admission would have adverse effects on their families and the overall nation’s economic activities because about 77% of these CKD patients were actively employed. All the patients in this study who required dialysis used temporary vascular access due to their poor clinical state at the time of presentation and emergency requirement of dialysis. This is more expensive compared to the use of native arteriovenous fistula that should have been created earlier in the course of their disease. Initiating HD with temporary vascular access is associated with infection, repeated hospitalizations, poor patient survival, increased cost, and mortality in CKD patients compared to arteriovenous fistula.

**Limitation of the Study**

This study was retrospective; hence, we depended on the accuracy of previous documentations in the patients’ case notes and other records. We did not use the actual income earned by these patients to compare with the total amount spent on their care because the information was not available in the retrieved records. However, the strength of this study lies in the fact that it is first study in Nigeria to the best of our knowledge that determined the cost implication of inpatient care of CKD patients.
In conclusion, cost of inpatient care of CKD is beyond the reach of Nigerians who mostly pay out of pocket for health service. There is an urgent need for the government to include CKD care under the national insurance scheme.

References

1. Alebiosu CO, Ayodele OE. The global burden of chronic kidney disease and the way forward. Ethn Dis 2005;15:418-23.
2. Levey AS, Atkins R, Coresh J, et al. Chronic kidney disease as a global public health problem: Approaches and initiatives – A position statement from kidney disease improving global outcomes. Kidney Int 2007;72:247-59.
3. Ulasi II, Ijoma CK. The enormity of chronic kidney disease in Nigeria: The situation in a teaching hospital in South-East Nigeria. J Trop Med 2010;2010:501957.
4. Jha V, Garcia-Garcia G, Iseki K, et al. Chronic kidney disease: Global dimension and perspectives. Lancet 2013;382:260-72.
5. Ijoma CK, Ulasi II, Kalu AO. Cost implications of treatment of end-stage renal disease in Nigeria. J Coll Med 1998;3:95-6.
6. Smart NA, Titus TT. Outcomes of early versus late nephrology referral in chronic kidney disease: A systematic review. Am J Med 2011;124:1073-80.
7. Cass A, Cunningham J, Arnold PC, Snelling P, Wang Z, Hoy W. Delayed referral to a nephrologist: Outcomes among patients who survive at least one year on dialysis. Med J Aust 2002; 177:135-8.
8. Kinchen KS, Sadler J, Fink N, et al. The timing of specialist evaluation in chronic kidney disease and mortality. Ann Intern Med 2002;137:479-86.
9. Abefe SA, Abiola AF, Olubunmi AA, Adewale A. Utility of predicted creatinine clearance using MDRD formula compared with other predictive formulas in Nigerian patients. Saudi J Kidney Dis Transpl 2009;20:86-90.
10. National Kidney Foundation. K/DOQI clinical practice guidelines for chronic kidney disease: Evaluation, classification, and stratification. Am J Kidney Dis 2002;39 2 Suppl 1:S1-266.
11. Report: Income Inequality Skewed Wealth, Resources to Pockets of 20% of Nigerians. This Day Business Newspaper of 22 June 2016. Available from: https://www.thisdaylive.com/index.php/2016/06/22/report-income-inequality-skewed-wealth-resources-to-pockets-of-20-of-nigerians/. [Last accessed on the 2018 Apr 02].
12. Riman HB, Akpan ES. Healthcare financing and health outcomes in Nigeria: A state level study using multivariate analysis. Int J Hum Soc Sci 2012;15:296-309.
13. World Health Organization. Global Health Observatory Data Repository. World Health Organization; 2015. [Last accessed on 2019 Apr 02].
14. Orubuloye IO, Oni JB. Health transition research in Nigeria in the era of the structural adjustment programme. Health Transit Rev 1996;6 Suppl:301-24.
15. Ogunbekun I. Which direction for health care in Nigeria? Health Policy Plan 1991;6:254-61.
16. Onwujekwe O, Hanson K, Uzochukwu B. Examining inequities in incidence of catastrophic health expenditures on different health-care services and health facilities in Nigeria. PLoS One 2012;7:e40811.
17. Dhingra RK, Young EW, Hulbert-Shearon TE, Leavey SF, Port FK. Type of vascular access and mortality in U.S. hemodialysis patients. Kidney Int 2001;60:1443-51.
18. Krzanowski M, Janda K, Chowaniec E, Suloiwicz W. Hemodialysis vascular access infection and mortality in maintenance hemodialysis patients. Przegl Lek 2011;68:1157-61.
19. Zhang JC, Al-Jaishi AA, Na Y, de Sa E, Moist LM. Association between vascular access type and patient mortality among elderly patients on hemodialysis in Canada. Hemodial Int 2014; 18:616-24.

Date of manuscript receipt: 18 May 2019.
Date of revised copy receipt: 15 August 2019.
Date of final acceptance: 16 August 2019.