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Investigating household catastrophic health expenditure and coping mechanisms in patients with Chronic Kidney Disease in Enugu, Nigeria: a single center experience

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Key words: kidney failure, household, catastrophic, health expenditure, payment, coping mechanism.

Authors' contributions: AE, AI; conceived the paper, oversaw data collection, conducted data analysis, initial manuscript draft, and critical editing of the manuscript; OI, participated in initial manuscript draft and critically reviewed the manuscript; OJ, OC, UI, IC, critically reviewed the manuscript. All the authors have read and approved the final version of the manuscript, and agreed to be held accountable for all aspects of the work.

Conflict of interest: the authors declare no potential conflict of interest.

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Ethics approval and consent to participate: ethical approval was obtained from the Ethics Committee of the UNTH. All participants were fully informed and their consent was obtained before participating in the study. This information included the fact that participation is voluntary and they were free to withdraw from the study at any point.

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The methods of financing healthcare expenditure for any country are vital in determining the health status of the country. To meet the rising costs of seeking health care, many poor households in managing chronic disease conditions like Chronic Kidney Disease (CKD) often resort to coping strategies that are further detrimental to their well-being. CKD is the 12th highest cause of death and 17th highest cause of disability worldwide. This study assessed the incidence of household catastrophic health expenditure and payment coping mechanism of patients with CKD.

It was a descriptive cross-sectional study involving 100 patients with various stages of CKD attending the Nephrology clinics of University of Nigeria Teaching Hospital Enugu, South eastern Nigeria. They were recruited using a systematic sampling technique. A questionnaire was used to collect data. Data were collected using pre-tested semi-structured questionnaires and analyzed using descriptive statistics of frequencies, percentages, mean, standard deviation and interquartile range. Chi-square was used to test for association between payment coping mechanisms used by patients across socioeconomic groups.

The study demonstrated uniformly high incidence of catastrophic expenditure for all the respondents both at 10% and 40% threshold (100% and 97%) respectively, with cost of treatment uniformly distributed among the various socioeconomic classes. Most of the patients assessed their treatment by paying out of pocket without reimbursement (88%), with money from personal bank savings being the commonest coping mechanism especially among the poorest Socioeconomic Status (SES) class, and borrowing among the least poor SES class.

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The study concluded that the prevalence of catastrophic expenditure was very high across all the socioeconomic status. It is recommended that the Nigerian Health Insurance program should be expanded to cover at least dialysis treatment of CKD, if not all aspects of CKD management in order to protect these patients and their household from ill-health mediated catastrophic expenditure.

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Chronic Kidney Disease (CKD) is the 12th highest cause of death and the 17th largest cause of disability worldwide.¹

Ten percent of the population all over the world is affected by CKD, and millions die every year because they cannot afford treatment.² Many countries in Africa are undergoing fast epidemiological transitions and are faced with increasing number of people with communicable and non-communicable diseases.³ This dual burden has led to a rise in the number of people affected by CKD on the continent.⁴

Community studies in Nigeria have shown the prevalence of CKD in adults to range between 19% and 30%, while in the pediatric population, it was estimated to be 15 per million population.⁵⁻⁷ Hospital prevalence studies showed that End Stage Renal Disease (ESRD) represents 6-12% of medical admissions.^{8,9} CKD in Nigeria commonly affects young people in their economically productive years and so constitutes a drain on the economy.^{10,11}

ESRD management is expensive. Healthcare resources and budgets are unable to meet the cost of treatment. Catastrophic Health Expenditure (CHE) occurs when households spend so much on healthcare needs that they find it difficult to meet their basic needs. Then income cannot meet expenditure on health needs. Health expenditure $\geq 10\%$ of total income indicate CHE.¹² By the World Health Organization (WHO) recommendation, a health expenditure equal to or exceeding 40% of non-subsistence income, is considered catastrophic.¹³ Subsistence needs are basic needs like food, clothing and shelter.

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In Nigeria, there are two types of healthcare payment systems: single and multiple payers' system.¹⁴ The country has no universal healthcare plan. In the single payers' system, one body collects the taxes and use them to pay for specific health services. The government does this in Nigeria. In the multiple payers' system, many approved organizations are involved. They collect revenue, pool them together, and use them for health insurance of segments of the society.

The total expenditure for health is provided by 70% of households in Nigeria and 95% of these private payments are by Out-Of-Pocket (OOP) payments. Thus, OOP payment is the major healthcare financing method in the country.¹⁵ As a result of this, inequities occur in healthcare access affecting the poor masses more, resulting in catastrophic financial burden on the poor.¹⁶

Payment coping strategies have been defined as “actions intended to maintain household economic viability in the face of an economic shock”.¹⁷ Coping mechanisms can be positive.¹⁸ There are, however, negative aspects. These include borrowing, selling of assets, mortgaging, minimizing essential consumption, and seeking financial help from relations.¹⁸⁻²⁰ These reduce the households' socioeconomic status. Wherever negative coping mechanisms abound, CHE will be present there.²¹

The objective of our study was to determine the level of CHE of CKD treatment and assess coping mechanisms of CKD patients in our renal unit. To the knowledge of the authors, there are few studies on these in sub-Saharan Africa, hence this attempt.

Materials and Methods

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This was a descriptive cross-sectional study carried out at the renal unit of the University of Nigeria Teaching Hospital Ituku/Ozalla, Enugu. One hundred patients were recruited using a systematic sampling technique, aged 18 years and above, and diagnosed with CKD for at least one month. This unit is the premier dialysis center in southeast Nigeria and cares for patients from Enugu, Anambra, Imo, Abia and Ebonyi states and other surrounding states.

Sample size

The minimum sample size was determined using the formula: $n = Z^2 pq/d^2$,²² where n = minimum sample size required, Z = the standard normal deviation set at 1.96, which corresponds to the 95% confidence level, p = prevalence rate of Chronic Kidney Disease from a previous study - 6%.²³ A minimum sample size of 93 was calculated after correcting for a population of less than 10,000 and adjusting for attrition (10%). To make room for more robustness, a sample size of one hundred (100) respondents was used for the study.

Instruments for data collection

A self-constructed questionnaire was administered to collect information from the respondents. The instrument was developed from literature on CKD patients' household catastrophic expenditure and payment coping mechanisms. The instrument was divided into six sections. Section A was designed to obtain information on the demographic and social characteristics of

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the respondents. Section B consisted of information on the household assets, while section C obtained information on direct costs of CKD management. Section D was used to collect information on the indirect costs of CKD treatment, Section E obtained information on the catastrophic expenditure of CKD while Section F consisted of information on payment coping mechanisms.

The validity of the test instrument was determined through the judgement of two experts (a professor and senior lecturer) in the Department of Health Economics, Management and Policy of the Faculty of Health Sciences and Technology, University of Nigeria, Enugu Campus, who evaluated the questionnaire. Their suggestions were used to modify the questionnaire.

A reliability test was conducted by administering the questionnaire to ten patients in the Nephrology outpatient clinic and the renal unit using test-retest method. The data collected was analysed using Spearman-Brown coefficient. A reliability score of 0.82 was obtained showing that the test instrument was reliable.

Data analysis

Categorical variables were summarized as frequencies and percentages. Numeric variables were summarized as mean and standard deviations for normally distributed data. Chi-square statistics was used to determine the association between categorical variables. The socio-economic status of the respondents was assessed based on their household assets. Obtained responses were analyzed using Principal Component Analysis (PCA) and different weights were attached to each

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of the household items. Thereafter each household was classified into 5 quintiles: poorest, very poor, poor, fairly poor, and least poor based on their household amenities. The socio-economic status was coded as Q1= quintiles 1, Q2 = quintiles 2, Q3 = quintiles 3, Q4 = quintiles 4, and Q5 = quintiles 5. The quintiles were then used to analyze the differences in the payment and payment coping mechanisms. The ratio Q1 to Q5 was used as the measure of equity²⁴ and shows the gap that has to be covered to ensure equity. A value of 1 signifies perfect equity, and a value above 1 signifies that the variable occurs more among the poorest quintile. A value less than 1 signifies that the variable occurs less among the poorest quintile.²⁵

Data were analyzed using the Statistical Package For Social Sciences (SPSS) version 22.0 (IBM Corp., Armonk, USA) and STATA (STATA Corp., College Station, USA). STATA was used for the PCA. The level of significance was determined as $p < 0.05$.

Ethical clearance

Ethical approval was obtained from the ethics committee of the UNTH. All participants were fully informed and their consent was obtained before participating in the study.

This information included the fact that participation is voluntary and they were free to withdraw from the study at any point.

Results

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Table 1 shows the socio-economic and demographic characteristics of the study participants. The majority (52%) were of the age group 41-62 years with a mean age of 49.6 ± 16.5 years. There were more males (53%) than females, and the majority (73%) of the participants were married. Only a few (9%) had no formal education. The sources of income for many (23%) were government work, followed by petty trading (22%) and private-sector work (11%). Sixteen percent (16%) of the parents and spouses of the participants were unemployed. Many (44%) live within the Enugu metropolis. Sixty (60%) of the participants were from lower socioeconomic groups (Q1-Q3).

The prevalence of catastrophic spending due to CKD at the household level was shown in Table 2. Out of the 100 households with CKD, all (100%) reported that direct costs due to their illness exceeded 10% of their household non-food expenditure. Increasing the threshold to 40% showed the prevalence of catastrophic expenditure dropped to 87.5% in the highest socioeconomic status group (5th quintile). Overall, at this 40% level, 97 respondents (97%) experienced catastrophic expenditure. The prevalence of catastrophic spending was however not statistically different across SES quintiles with the poorest households as likely as the least poor to incur catastrophic spending due to CKD; $\chi^2=5.031$, $p=0.284$.

Table 3 depicts the socioeconomic differences in payment and payment coping mechanisms of patients with CKD. It shows that Out-Of-Pocket Spending (OOPS) without reimbursement was the predominant mechanism used by most people (88 %). The richest *i.e.* least poor (Q5) used OOPS more than any of the other quintiles, with an equity ratio of 0.6, though the differences were not statistically significant, $p=0.663$. Other mechanisms like OOPS with partial

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reimbursement and health insurance were not used much (8% and 4% respectively). Use of own money (bank savings) was the main coping mechanism used by most of the respondents, especially the poorest (Q1), with an equity ratio of 1.83, and the differences among the SES quintiles were statistically significant ($p=0.018$). This was followed by borrowing and assistance from relatives and friends especially among the least poor SES quintiles with equity ratios of 0.44 and 0.57 respectively. The differences for borrowing as a coping mechanism were significant across the SES quintiles with ($p=0.015$). Borrowing from money lenders as a coping mechanism showed a statistically significant difference across the five SES quintiles ($p=0.001$). This occurred more among higher SES quintiles with an equity ratio of <1 .

Discussion

The aim of this study was to assess household catastrophic health expenditure and coping mechanisms of patients suffering from chronic kidney disease in the Renal Unit of the University of Nigeria Teaching Hospital.

The mean age of the respondents, 49.6 years, showed that the majority of the patients were in their middle age. This has been a consistent finding in sub-Saharan Africa, while in Europe, North America, and Asia, older age groups were most affected.³ This is of economic significance as this is the most active, and productive age group who are usually the breadwinners of families.

A high number of the respondents (60%) were from the lower SES quintiles (Q1-Q3). This collaborates the fact that socioeconomically disadvantaged populations across the globe exhibit a disproportionate burden of CKD.^{4,26}

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A session of hemodialysis in our center, a government-owned hospital in Nigeria, is between 30,000-35,000 Naira (\$83-\$97). The frequency of hemodialysis treatment is about three times weekly amounting to 90,000-105,000 Naira (\$249-\$291). This treatment is for life, unless the person gets a kidney transplant. This is exorbitant and not within the reach of the majority of patients. This does not even include the cost of medications and laboratory investigations! Transplant is hardly available, and those who can afford it (very few) have to travel abroad most of the time. This leads to capital flight and loss of foreign exchange from the country, inflicting untold damage to the poor economy. The prevalence of catastrophic health expenditure was therefore uniformly high. All the patients experienced levels of health expenditure that exceeded 10% of their non-food expenditure, while 97% experienced levels that exceeded 40% of their non-food expenditure. Both the rich and poor were equally affected. This shows the economically devastating effect of CKD treatment in our environment.²⁷⁻²⁹ In a study conducted in Iran, with a better health insurance scheme for chronic illnesses, the percentage of CHEs for households with multiple sclerosis, dialysis, and kidney transplant patient was 20.6%, 18.7%, and 13.8%, respectively.³⁰ The incidence of CHE for kidney failure was obviously lower than in our findings. The minimum yearly income needed to sustain a living that provides the basic needs in Nigeria stands at \$1016 per year in urban areas (₦29,633 per month) and \$758 per year in rural areas (₦22,108 per month).³¹ However, 74% of Nigerians live below this income level.¹⁶ Out of this, about 40% live under the poverty line, *i.e.*, live on less than \$1.25 per day (₦13,125 per month, and ₦157,500 per annum).³¹ What the average Nigerian is expected to earn to cater to his basic needs is far below what he earns. For Nigerians with CKD who require an average sum of ₦150,770 (\$431) monthly for initial treatment,³² it becomes very difficult and almost

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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 hemodialysis to sustain life after the initial inpatient care, they become impoverished over time. The importance of some form of governmental and non-governmental intervention cannot be overemphasized. Access to health care remains low among the poor of Africa.²⁹ Affordability and accessibility determine health-service utilization in Africa. These people abstain from using essential health services, due to the increasing demand for health expenditure.³³ Expenditure becomes financially catastrophic when it endangers a family's ability to maintain its standard of living.³⁴ Households also often face income loss if affected members are working adults.³⁵ As a result, many households are pushed into poverty due to catastrophic health expenditures.¹⁵

Almost all the patients assessed their treatment by paying out of pocket without reimbursement (88%). Money from personal bank savings was the most common coping mechanism especially among the poorest SES class, and borrowing among the least poor. This is in keeping with what obtains in Africa and most low-income countries.^{36,37} In a study appraising the payment coping mechanism of households affected by cancer in Jos Nigeria; a non-communicable disease like CKD, the payment coping mechanism utilized by a majority (78%) of the respondents was their own money (salary, earnings, savings), followed by family members (46.6%), gifts from friends and neighbors (29.6%), borrowed money/loan (27.4%) and sale of lands (12.3%). Few respondents (14%) utilized payment coping mechanisms from sale of household assets, community-based support, cancer association, temporary stoppage of children's education and social welfare/social worker.³⁸ In another study in Oyo State, Nigeria, 13 (6.5%)

obtained free services via the National Health Insurance Scheme (NHIS) and 187 (93.2%) paid

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out of pocket for service. To cope with health bills, 115 (62.2%) paid from savings, 34 (18.4%) borrowed money, and 58 (31.4%) sold property. Those with formal education were more likely to pay through NHIS.³⁹ In yet another study looking at the payment coping mechanisms among diabetics attending clinics in UNTH, the most common coping strategy utilized was household savings (99.0%) followed by support from family members (85.3%).⁴⁰ Borrowing, skipping appointments, and stopping children's education were significant coping strategies.⁴⁰ All these studies confirmed that the commonest way of coping with health challenges is by OOP payments. OOPs have severe consequences for health care access and utilization and are catastrophic, especially for the poorest households.¹⁶

Limitations

The ratio measuring the gap to be covered to ensure equity (Q1:Q5) is limited by the fact that it fails to measure the experiences of the intermediate quintiles.

Conclusions

This study demonstrated a high prevalence of catastrophic expenditure involving all social classes. Almost all the patients assessed their treatment by paying out of pocket without reimbursement, with money from personal bank savings being the most common coping mechanism, especially among the poorest and borrowing among the least poor.

Recommendations

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Efforts should be made by policymakers to subsidize hemodialysis. This will go a long way in reducing the burden of CKD treatment and prevent many people from poverty due to expenses on managing their health. It is hereby suggested that dialysis should at least be free for Acute Kidney Injury (AKI) patients whose renal function is expected to pick up after a few sessions. The government can then subsidize hemodialysis for CKD and ESRD patients or pay for dialysis for the first few months.

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Table 1. Socio-economic and demographic characteristics of the study participants.

Variables	Measurements frequency, N=100 (%)
Mean age \pm SD years	49.6 \pm 16.54
Age group	%
19-29	13
30-40	17
41-51	24
52-62	28
63-73	9
\geq 74	9
Sex	
Male	53
Female	47
Marital status	
Married	73
Single	19
Widowed	7
Divorced	1
Educational status	
Primary	26
Secondary	21
Tertiary	44
None	9
Source of income	
Government work	23
Private sector	11
Subsistent farming	9
Petty trader	22
Big business	7
Artisan	9
Unemployed/Pensioner	19
Occupation of parent or spouse	
Government work	32
Petty trader	29

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Unemployed	20
Private sector	16
Artisan	3
Residence	
Enugu metropolis	44
Other communities in Enugu State	31
Other states	25
Socio-Economic Status (SES)	
Q1 (lowest SES, poorest)	14
Q2 (very poor)	17
Q3 (poor)	29
Q4 (fairly poor)	16
Q5 (highest SES, least poor)	24

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Table 2. Prevalence of household catastrophic expenditure.

	10%	40%
	N=100	N=97
1 st Quintile (lowest SES) (n=14)	100%	14 (100%)
2 nd Quintile (n=17)	100%	17 (100%)
3 rd Quintile (n=29)	100%	29 (100%)
4 th Quintile (n=16)	100%	16 (100%)
5 th Quintile (highest SES) (n=24)	100%	21 (87.5%)
Total	100%	97 (97%)
Chi-square	5.031	
df	4	
p value	0.284	

SES, Socio-Economic Status

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Table 3. Socioeconomic differences in payment and payment coping mechanisms of patients with chronic kidney disease.

Variable	Q1 (N%)	Q2 (N%)	Q3 (N%)	Q4 (N%)	Q5 (N%)
Method of payment					
Health insurance	0	1 (1)	1 (1)	0	2 (2)
OOP with partial reimbursement	1 (1)	2 (2)	3 (3)	1 (1)	1 (1)
OOP without reimbursement	13 (13)	14 (14)	25 (25)	15 (15)	21 (21)
Payment coping mechanism by SES (%)					
Bank loan	4 (4)	0	5 (5)	3 (3)	2 (2)
Bank savings	11 (11)	11 (11)	13 (13)	6 (6)	6 (6)
Money lender	0	2 (2)	1 (1)	3 (3)	15 (15)
Borrowed	4 (4)	8 (8)	4 (4)	11 (11)	9 (9)
Assistance	4 (4)	8 (8)	10 (10)	7 (7)	7 (7)
Sold assets	4 (4)	3 (3)	1 (1)	4 (4)	6 (6)
National remittances	1 (1)	0	1 (1)	0	0
Other	0	1 (1)	0	0	1 (1)

X² 13.17, df 16, *p value

SES, Socio-Economic Status

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