Original Article

Insidious chronic kidney disease among elderly people in the University of Port Harcourt Teaching Hospital

Ochuko Otokunefor, Adekemi Kiyesi

Department of Chemical Pathology, University of Port Harcourt, Port Harcourt, Nigeria

Abstract

Background: Renal function reduces with age. The early stages of chronic kidney disease (CKD) often go unnoticed, preventing timely intervention and thereby increasing morbidity and mortality. It is, therefore, imperative to assess the renal clearance which detects the early stages of kidney disease.

Aim: This study aimed to assess the glomerular filtration rate (GFR) in elderly people in the University of Port Harcourt Teaching Hospital (UPTH), Port Harcourt, Nigeria, using the Cockcroft–Gault formula, and to evaluate the associated risk factors.

Methods: This is a descriptive cross-sectional study. Participants were recruited from the Orthopaedic Clinic of the UPTH. Fifty patients aged between 60 and 85 years were recruited. Venous blood was obtained for creatinine assessment; weight, height and resting blood pressure measurements were taken and the body mass index and creatinine clearance were calculated. Microsoft Excel and SPSS software version 18 were used for the statistical analysis. Pearson's correlation was used to assess statistical significance with $P = 0.05$.

Results: There were 17 males and 33 females. Fourteen percent of the total patients had Stage 3 CKD (GFR: 30–59) and just half of the patients (14%) had a plasma creatinine value above the reference range. Ninety percent of the patients were overweight, 10% were obese and 51% were hypertensive. There was a weak but insignificant positive correlation between obesity, hypertension and kidney dysfunction. There was no obvious clinical feature among those with Stage 3 CKD, a stage when critical medical decisions need to be made.

Conclusions: Most patients had different degrees of renal impairment with normal plasma creatinine values. Routine renal function assessment and estimated GFR should be done for any elderly person presenting to the hospital with at least one cardiovascular risk.

Keywords: Chronic kidney disease, creatinine clearance, elderly

Address for correspondence: Dr. Ochuko Otokunefor, Department of Chemical Pathology, University of Port Harcourt, Port Harcourt, Nigeria.
E-mail: mayslady@hotmail.com

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INTRODUCTION

Elderly people are a special group of people in every community. They have unique challenges. A good majority of them are retired and have reduced mobility and an increased prevalence of many chronic illnesses such as hypertension, renal diseases and malnutrition.[1,2]

Generally, the World Health Organization regards elderly people in developed nations as those above 65 years of age

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and 60 years in Africa.[3,4] In Nigeria, the United Nations accepts 60 years as the cut-off.[5-7] The population of elderly people in the world and in developing countries is increasing,[7,8] hence necessitating the need for more experienced care. Interestingly, specialised in-hospital care for the elderly is <10 years in Nigeria.[7]

Ageing is a normal unavoidable process.[9] Renal function diminishes with age,[10] and chronic renal disease is a risk for cardiovascular disease (CVD) and therefore plays a role in increasing morbidity and mortality. Sometimes, distinguishing between the changes expected in ageing and those that arise from chronic diseases is difficult.[9] The prevalence of chronic renal disease has increased worldwide,[5,11] and often the features are not so obvious at the onset of the illness.[12] Effective management can slow the progress of the disease. Chronic kidney disease (CKD) is a disease of the elderly. In the USA, 10% of the elderly people were found to have early stages of renal dysfunction.[13] All forms of disease including chronic renal disease would negatively affect the quality of life of the elderly. Increasing age is a strong predictor of renal disease,[10] and Africans have been found to have a higher progression and risk of kidney disease when compared to Caucasians.[14,15]

Standard methods of assessing glomerular dysfunction are cumbersome and not practicable in day-to-day clinical practice; therefore, formulas were introduced. These standard methods involve the collection of 24-h urine specimen. Use of plasma creatinine value alone has been found to be unreliable, especially in old age, when the muscle mass may decrease. Creatinine values can be normal with minimal or no clinical features, with loss of kidney function of over 50%.[16] It is, therefore, imperative to find a way to accurately detect dysfunction. Early intervention may delay or prevent unfavourable outcomes, such as end-stage renal disease (ESRD) and cardiovascular events. Among the proposed formulae, the Modification of Diet in Renal Disease and the Cockcroft–Gault (CG) formulae are the most reliable,[17] with CG having a great correlation.[17] More recently, the CKD Epidemiology Collaboration group came up with a new formula that has a higher efficacy because it reduces the overestimation of CKD in patients who have a GFR >60/ml/min/1.73 m^2.[18]

In our environment, people do not have health-seeking behaviours and may not go to the hospital for routine check-ups. Therefore, early stages of CKD may go unnoticed and add to the overall morbidity and mortality. This study sought to find out the glomerular filtration rate (GFR), using the CG formula in elderly people, at the Orthopaedic Clinic in the University of Port Harcourt Teaching Hospital (UPTH), Port Harcourt, Nigeria, and to evaluate some of the associated risk factors.

MATERIALS AND METHODS

This is a descriptive cross-sectional study carried out in UPTH. Patients were recruited from the Orthopaedic Clinic by purposive sampling method.

Fifty elderly people were recruited ranging in age from 60 to 85 years. Participants with known renal disease or any signs and symptoms suggestive of renal disease such as pedal and facial oedema, oliguria, haematuria and foamy urine were excluded from the study. Informed consent was obtained from them, and an investigator-administered questionnaire was filled. Weight, height and resting blood pressure were measured, body mass index (BMI) was calculated and 5 ml of venous blood specimen was obtained as well in a lithium heparin bottle. The plasma was separated from the cells. A creatinine assay was done using the modified Jaffe method. GFR was calculated using the following CG equation:

Creatinine clearance =

$$\frac{(140 - \text{age}\,[\text{years}]) \times \text{weight}\,(\text{kg})}{72 \times \text{plasma creatinine}\,(\mu\text{mol / L})}\ (\times 0.85 \text{ in women})$$

The presence of kidney disease was staged 0–5 using glomerular filtration rate [Table 1].[19] This was reported in ml/min/1.73 m^2.

The presence of obesity and overweight was established using the standard BMI classification.[20] It was reported in kg/m^2 [Table 2].

Ethical clearance was obtained from the Ethical Committee of UPTH.

Data obtained from the questionnaire and laboratory analysis parameters were entered into an Excel sheet. Statistical analysis was done with MS Excel and Statistical Package for Social Sciences SPSS software version 18 (SPSS Inc., Chicago, IL, USA). Pearson's correlation and linear regression analyses were used to assess significant relationship.

RESULTS

A total of fifty elderly people were recruited for the study. Thirty-three of them were female and 17 were male. The female/male ratio was 1.9:1. The age range was 60–85 years

with a mean of 67 years. Ninety percent of them were obese with the remaining 10% being overweight. Only 8% of them had a plasma creatinine value above the upper limit of the reference range and 92% were normal. Of the 8%, there were six females and 2 males. GFR was normal in 24%; 20% were classified as Stage 1, 42% as Stage 2, 14% as Stage 3, with no one falling into the Stage 4 and 5 categories. (There was a female-to-male ratio of 6:1 in the Stage 3 category.) None of them had a history of dysuria, foaming urine and facial or leg swelling. Fifty-one percent of them were hypertensive, with 80% of them having a systolic blood pressure above 150 mmHg. Any blood pressure above 140/80 mmHg was considered to be hypertension. There was a significant relationship between increasing age and decline in renal function [Table 3].

The result showed a weak negative correlation of −0.176, which means that an increase in BMI leads to a decrease in GFR and *vice versa* although it was not statistically significant at 0.222 [Table 4].

There was a weak insignificant relationship between increasing blood pressure and reduced kidney function.

DISCUSSION

Renal disease which often goes unnoticed in the early stages influences the quality of life in the elderly. This study calculated GFR among elderly people attending the Orthopaedic Clinic in UPTH. Renal disease has been classified using estimated GFR (e-GFR) into five main classes. Most of the patients in this study had Stage 2 CKD. This is a mild impairment of renal function. Interestingly, among those with Stage 2 CKD, 51% of them had a raised blood pressure. This finding is not surprising because the prevalence of hypertension has been found to be higher among those with CKD than in those without.[15] Some of our patients with raised blood pressure denied knowing that they were hypertensive. Most of those who were known hypertensives on treatment were very poorly controlled. Hypertension has been implicated in the evolution of renal disease. It increases the risk by up to three times more than in the normotensive population.[4] This, therefore, means that, if these sets of patients with Stage 2 CKD are not effectively managed, the kidney dysfunction will progress. Ideally, hypertensive patients on treatment should have their renal function assessed regularly, at least once a year. It has also been proposed that, especially among the elderly, the gravity of early stage of renal dysfunction (Stages 1 and 2) should be interpreted based on cardiovascular and not renal risk alone, as some elderly people in this stage may die from CVD before the progression to ESRD occurs. This buttresses the need for early intervention.

Most of the patients had a plasma creatinine value within the reference range. All those with a value above the upper limit of the reference range had Stage 3 CKD. They made up 8 of the 14% of those with Stage 3 CKD. This, therefore, implies that a routine plasma creatinine assessment would detect some patients with Class 3 CKD. The remaining 6% had a creatinine value within the normal limit. CKD is classified as an e-GFR of <60 ml/min/1.73 m^2 for at least 3 months (or on two separate occasions 90 days apart) regardless of the cause.[4,15] Odenigbo *et al*. found that all the retired people in their study with CKD had Stage 3 disease.[1] A study in America also established that Stage 3 CKD is increasing.[15] Our study had a lower incidence of Stage 3 CKD than that reported by other studies.[1,15] However, the risk remains the same.

A systematic review found out that the 10-year risk of death in Stage 3 CKD could be as high as 51% in the general population.[2] Although this risk is decreased in older people because there are other confounding factors, it, therefore, becomes imperative that risk assessment should be done when necessary.

From our study, more women than men had Stage 3 kidney disease. Some researchers have found that women have a higher rate of renal decline than men.[21]

Most of the participants had different classes of obesity. Obesity has been found to be a risk factor for renal disease. First, it predisposes to other disease conditions such as hypertension and diabetes, which are in themselves risk factors for kidney disease. It has also been associated independently with other pathologies such as proteinuria without kidney disease and focal segmental glomerulosclerosis secondary to obesity-related glomerulopathy nephrolithiasis.[22,23] Our study found a weak insignificant correlation between obesity and kidney disease. Afolabi *et al*. found out that obesity is not significantly related to CKD.[14]

In patients with Stage 3 CKD, critical evaluations and decisions need to be made. More assessment should be done to effectively determine the extent of kidney damage. Patient groups, i.e., those who are likely to progress to ESRD and those who are unlikely to, need to be distinguished. The mainstay of treatment is to reduce the overall risk and prepare for renal replacement. Cardiovascular risk should be reduced. At this stage, anaemia and renal bone disease may have set in. Basic interventions should be put in place.[24] These include

Table 1: Stage of chronic renal disease using GRF

Stages	e-GFR	Terms
1	>90	Normal or increased GFR
2	60-89	Mild reduction in GFR
3	30-59	Moderate reduction in GFR
4	15-29	Severe reduction in GFR
5	<15	ESRD

GFR: Glomerular filtration rate, ESRD: End-stage renal disease

Table 2: Classification of obesity using body mass index

Parameter	BMI
Underweight	<18
Normal weight	18-24.9
Overweight	25-29.9
Class 1: Obesity	30-34.9
Class 2: Obesity	35-39.9
Class 3: Morbid obesity	≥40

BMI: Body mass index

Table 3: Correlation between age and creatinine clearance

Correlations	Age	GFR
Age		
Pearson's correlation	1	−0.068
Significant (two tailed)		0.640
n	50	50
GFR		
Pearson's correlation	−0.068	1
Significant (two tailed)	0.640	
n	50	50

GFR: Glomerular filtration rate

Table 4: Relationship between obesity and glomerular filtration rate

Correlations	GFR	BMI
GFR		
Pearson's correlation	1	−0.176
Significant (two tailed)		0.222
n	50	50
BMI		
Pearson's correlation	−0.176	1
Significant (two tailed)	0.222	
n	50	50

GFR: Glomerular filtration rate, BMI: Body mass index

choice of antihypertensive drugs[15] (angiotensin-converting enzyme inhibitors, angiotensin II receptor blockers and statins have been found to be beneficial), weight reduction and effective control of blood pressure. These can slow the progression of the disease.

None of the patients had CKD Stages 4 and 5. This is not unusual. It is expected that, in Stages 4 and 5, clinical features would be more pronounced and symptomatic clients will be excluded.

The management of ESRD is expensive and, in our environment where health insurance is at its formative stages, prevention plays a key role in reducing morbidity and mortality.

Interestingly, some people do not generally have a health-seeking behaviour and only go to the hospital when they feel really sick. In the academic community here in Port Harcourt, staff have been advised to have a routine blood chemistry done yearly on their birthdays as a reminder to stay health conscious.

It is imperative that, whenever an elderly patient comes to the hospital for any reason, the opportunity be maximised. A baseline renal function test comprising plasma urea, creatinine and electrolyte should be done and the e-GFR should be calculated.

Limitations of the study

Measurement of blood pressure and e-GFR was done only once. Another measurement is necessary to make an official diagnosis, which would be 3 months later for CKD.

CONCLUSIONS

Most of the patients had a creatinine value within the normal range though the e-GFR showed various degrees of renal impairment. Most participants had mild renal dysfunction with at least one risk factor for CVD (obesity and hypertension), and these risk factors can be managed effectively. Less than a fifth (14%) had Stage 3 CKD, a stage when a clinical decision is imminent, and did not recognise their disease state. All patients with increased plasma creatinine had Stage 3 CKD.

We recommend that all elderly patients be encouraged to have a routine biochemistry profile done at least once a year, preferably twice. Those that are at risk should have their GFR estimated even with a creatinine value within the reference range.

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Conflicts of interest

There are no conflicts of interest.

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