

## **Resident doctors' knowledge and practice of chronic kidney disease: diagnosis and referral pattern**

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### **Abstract**

**Background:** The prevalence of chronic kidney disease (CKD) in Nigeria is on the increase. Most patients with CKD present first to non-nephrologists and later to nephrologists with complications or in end-stage renal disease (ESRD). To prevent early progression of CKD to ESRD, early diagnosis, optimal care and timely referral to nephrologists are crucial. The aim of this study is to assess the knowledge of CKD diagnosis, care and referral practices amongst resident doctors in Nigeria.

**Methods:** Self administered questionnaires were distributed to resident doctors in diverse sub-specialties attending an update course on medical ethics organized by the West African College of Physicians in August 2013 at the main auditorium in University College Hospital, Ibadan Nigeria. The questionnaires were designed to elicit their knowledge of CKD diagnosis, common causes of CKD, screening of patients at risk of CKD, target blood pressure control and referral pattern.

**Results:** Three hundred and forty (340) questionnaires were analyzed. Respondents were spread across the six geopolitical zones of Nigeria and different sub-specialties. These comprised of 24.4% in internal medicine 17.4% in paediatrics, 16.8%, 30% and 11.4%, in community medicine, family medicine and surgery respectively. Among the respondents, 280 (82.3%) would use glomerular filtration rate (GFR) as the main diagnostic criterion for CKD while its use as an indicator for assessing the severity of CKD was considered by 282 (82.9%). Up to 68.8% did not know the correct blood pressure targets in CKD management. Furthermore, 27.4% of the respondents would

use GFR in making decisions for referrals while 60.9% would use serum creatinine in taking such decisions. For referral to nephrologist, 40.6% would refer completely to the nephrologist, 55.4% would consider co-management while 4% did not intend to refer to the nephrologist at all. The mean scores of knowledge of the internal medicine residents was significantly higher than that of non-internal medicine residents ( $p < 0.01$ ).

**Conclusion:** Resident doctors in Nigeria have good knowledge of CKD diagnosis and criteria for referral to a nephrologist. Internal medicine residents have better knowledge of CKD diagnosis, screening and nephrology referral compared to residents in other specialties.

**Keywords;** Resident doctors, Chronic kidney disease, GFR, Proteinuria, Nephrologist, Nigeria.

### **Introduction**

Chronic kidney disease (CKD) is defined as kidney damage or glomerular filtration rate (GFR)  $< 60\text{ml}/\text{min}/1.73\text{m}^2$  for three or more months with implications for health.<sup>1</sup> It is an increasingly prevalent health problem worldwide that may lead to poor outcomes of end-stage renal disease (ESRD) and cardiovascular disease.<sup>2-3</sup> Data from around the world suggest that CKD prevalence is between 10-16%,<sup>1</sup> with an annual growth rate of 8%.<sup>4</sup> The exact prevalence of CKD in Nigeria is not known; while hospital based data indicate prevalence of 8-10%<sup>5-7</sup> community based studies showed prevalence of 11-27.3%.<sup>8-10</sup>

The cost of management of end stage kidney disease is exorbitant and far beyond the reach of an average patient in developing countries like

Nigeria.<sup>11</sup> The average monthly cost of three sessions per week haemodialysis (if consumables are not recycled) is about N300,000 (1,765USD). This is largely unaffordable by most Nigerians, as there is no social security system or health insurance scheme in place to assist the patient on renal replacement therapy. As such the burden is borne solely by the patient and relatives.<sup>12</sup> Meanwhile, 70% of Nigerians live below the poverty line.<sup>13</sup> Hence, most patients are under dialyzed, and only less than 2% of patients who commence dialysis are able to maintain it for more than 12 months.<sup>14</sup>

In the light of the tendency of CKD to progress to ESRD, the economic burden of ESRD management and the excess morbidity and mortality associated with it, current clinical practice guideline emphasize the need for CKD prevention largely by screening of persons at increased risk of CKD. Examination of urine for markers of kidney damage (proteinuria, haematuria, urine sediment abnormalities) and estimation of kidney function from glomerular filtration rate (calculated from serum creatinine measurement) constitute the cornerstone of screening for CKD. These criteria for definition of CKD are objective and can be ascertained by means of simple laboratory tests without identification of the cause of disease, thereby enabling detection of CKD by non-nephrologist physicians and other health professionals

Most patients with CKD presenting to tertiary hospitals are likely to be seen by a non-nephrologist first. It has been reported that non-nephrologists are less likely than nephrologists to recognize CKD and to refer patients at the appropriate referral time.<sup>15</sup> A physician's insufficient awareness of CKD can cause late diagnosis of CKD, late or lack of referral to the nephrologist, and failure to apply established care guidelines, all of which may lead to poor outcomes for CKD patients, frequent hospitalization and the urgent need for dialysis.<sup>16</sup>

This study is therefore aimed at investigating the pattern of CKD screening, diagnostic tools employed, initial evaluation and treatment, and referral practices among non nephrologists in

Nigeria. We also sought to find out if there was any difference in the knowledge of resident doctors in internal medicine compared to those in other subspecialties with regards to the different domains of CKD evaluation. Findings from this study will help initiate concerted efforts towards educating the resident doctors on basics of CKD diagnosis, need for screening patients at first contact, especially at risk patients and the need and time for referral to the nephrologist. This will improve outcome of management of CKD in our hospitals.

### **Methodology**

This was a cross sectional study involving doctors in the residency training program for the award of the fellowship of the West African College of Physicians in their respective faculties. The study was conducted during a nationally organised continuing medical education workshop on medical ethics held between 8<sup>th</sup> and 9<sup>th</sup> August 2013 at the main auditorium of University College Hospital Ibadan, Nigeria. A previous study showed that 33% of specialist physicians in West African sub region have good knowledge of CKD diagnosis.<sup>17</sup> The sample size in this study was extrapolated from this value at 95% confidence level with a 5% margin of error using appropriate formula.<sup>18</sup> This gave a minimum sample size of 339. However, a total of 400 questionnaires were distributed to accommodate non-responders. The questionnaires were distributed consecutively to consenting participants.

### ***Questionnaire development and contents;***

Existing guidelines for detection and management of CKD were reviewed.<sup>1, 19, 20</sup> Themes pertinent to resident doctors who may be offering pre-ESRD care were identified. We designed questions testing for knowledge of definition, risk factors, screening of at risk patients, laboratory evaluation, initial management of CKD, identification of complications and indications for nephrology referral. Questions on hemodialysis adequacy, peritoneal dialysis, vascular access, transplantation, and management of dialysis patients were considered to be outside the realm of the doctors. A 44-item paper questionnaire

was developed consisting of clinical vignettes with multiple-choice questions. Face and content validity were evaluated by two nephrologists, one cardiologist, and two resident doctors. Approval for the study was obtained from the Health Research and Ethics Committee of Federal Medical Center (FMC) Umuahia, Abia State, Nigeria.

A pilot study was performed among doctors at the residency program in FMC Umuahia, Abia State, made up of internal medicine residents ( $n = 25$ ) and family medicine residents ( $n = 15$ ). These were excluded from the subsequent analysis. On the basis of the feedback obtained, one question on complications of CKD was added, the clarity of the questions improved, and the option "I don't know" was also added to few questions.

The questionnaires were self-administered consecutively to consenting participants and consisted of multiple choice questions organized into five sections. The questions on the first section bothered on awareness of practicing guidelines and diagnosis of CKD. The second section bothered on identification of risk factors for CKD and screening of at-risk subjects. The knowledge of laboratory evaluation necessary in the initial evaluation of CKD was assessed in the third section while the fourth section bothered on identification of potential complications of CKD and institution of measures necessary to slow progression of CKD. Finally, the fifth section evaluated the knowledge of the participants on indication for referral of patients to Nephrologist.

### **Statistical Analysis**

Statistical package for Social Science (SPSS) version 21.0 (IBM Corp, Armonk, NY, USA) was used in data analysis. Data were presented

as descriptive and inferential statistics. Chi-square test was employed to detect any differences in categorical data between the internal medicine and non-internal medicine residents for each question. Responses were evaluated against a panel of pre-defined ideal answers. A score of 22 out of 44 (50%) was used as cut-off for adequate knowledge. Independent sample t-test was used to compare the mean knowledge scores between the internal medicine resident doctors and the non internal medicine resident doctors. A  $p$  value  $< 0.05$  was considered statistically significant

### **Results**

Four hundred (400) questionnaires were distributed, 367 were returned (a response rate of 92%). Of the returned questionnaires, 340 were completely filled and thus used in the analysis. The characteristics of the respondents are shown in Table 1.

Ninety one (26.7%) of the respondents correctly identified existing Nigerian and international guideline for management of CKD while 249 (73.2%) were not aware of any practicing guideline. Estimated glomerular filtration rate from prediction equations, urinalysis/microscopy and renal imaging were correctly identified as parameters for diagnosis of / screening for CKD by 280 (82.3%), 160 (47%) and 142 (41.8%) of respondents respectively. There was a statistically significant difference between the different specialties in terms of use of urinalysis/urine microscopy (Int.Med-53%, Pead-40.7%, Comm.Med-22.8%, Fam.Med-46.1%, Surg-35.9%;  $X^2=14.10$ ,  $df=4$ ,  $p<0.01$ ) as a useful diagnostic tool. Furthermore, 282 (82.9%) would use GFR in monitoring severity of CKD, 5.8% and 4.5% would respectively use serum creatinine level and clinical features while 6.8% were not sure of which parameter to use in monitoring of CKD severity.

**Table 1 : Characteristics of the respondents**

Variable	Number	Frequency (%)
<b>Gender</b>		
Male	214	62.9
Female	126	37.1
<b>Mean age <math>\pm</math> SD (years) = 33.6<math>\pm</math>4.5</b>		
<b>Specialties</b>		
Internal Medicine (Int.Med)	83	24.4
Paediatrics (Paed)	59	17.4
Community Medicine (Com.Med)	57	16.8
Family Medicine (Fam.Med)	102	30.0
Surgery	39	11.4
<b>Geopolitical zone of practice</b>		
North-West	57	16.8
North-Central	72	21.2
North-East	45	13.2
South-West	42	12.4
South-South	54	15.9
South-East	70	20.6
<b>Number of years of experience post degree qualification</b>		
< 5 years	165	48.5
>5 years	175	51.5

Fifty three (15.6%) respondent would screen all patients they come in contact with for CKD, 279 (82%) would only screen for CKD in patients considered at risk of CKD while 7 (2%) would not screen patients at all for CKD.

Table 2 shows the positive responses of the respondents in terms of knowledge of risk factors, complications of CKD and measures that retard CKD progression. There was a

statistically significant difference between the different specialties across all the domains of knowledge assessed. The frequency of screening for CKD in “at risk” patients vary among the doctors. Using Diabetes mellitus as an example, only 146 (42.9%) and 148 (43.5%) would screen the patients for proteinuria every 6 months. Others will do so at other intervals like 3 monthly (29.7%), annually (20.3%) and every 2 years (1.2%).

**Table 2. Knowledge of respondents regarding risk factors, complications and measures that retard progression of CKD.**

Variable	All	Int. Medicine (%)	Pediatrics (%)	Family Medicine (%)	Community Medicine (%)	X <sup>2</sup> value	p-value
<b>Risk Factors for CKD</b>							
Hypertension	95.3	97.6	94.9	96.1	87.7	10.30	0.035
Diabetes	90.3	100	91.5	89.2	80.7	16.58	0.002
Herbal Medications	72.1	85.5	79.7	64.7	66.7	16.07	0.003
NSAIDS	44.1	61.4	41.8	36.3	33.3	15.56	0.004
Low Birth Weight	67.1	87.6	83.1	64.7	43.9	47.50	0.000
Age>60years	55.6	45.8	40.7	38.0	43.9	15.52	0.004
Family history	43.2	72.3	54.2	28.4	24.6	51.13	0.001

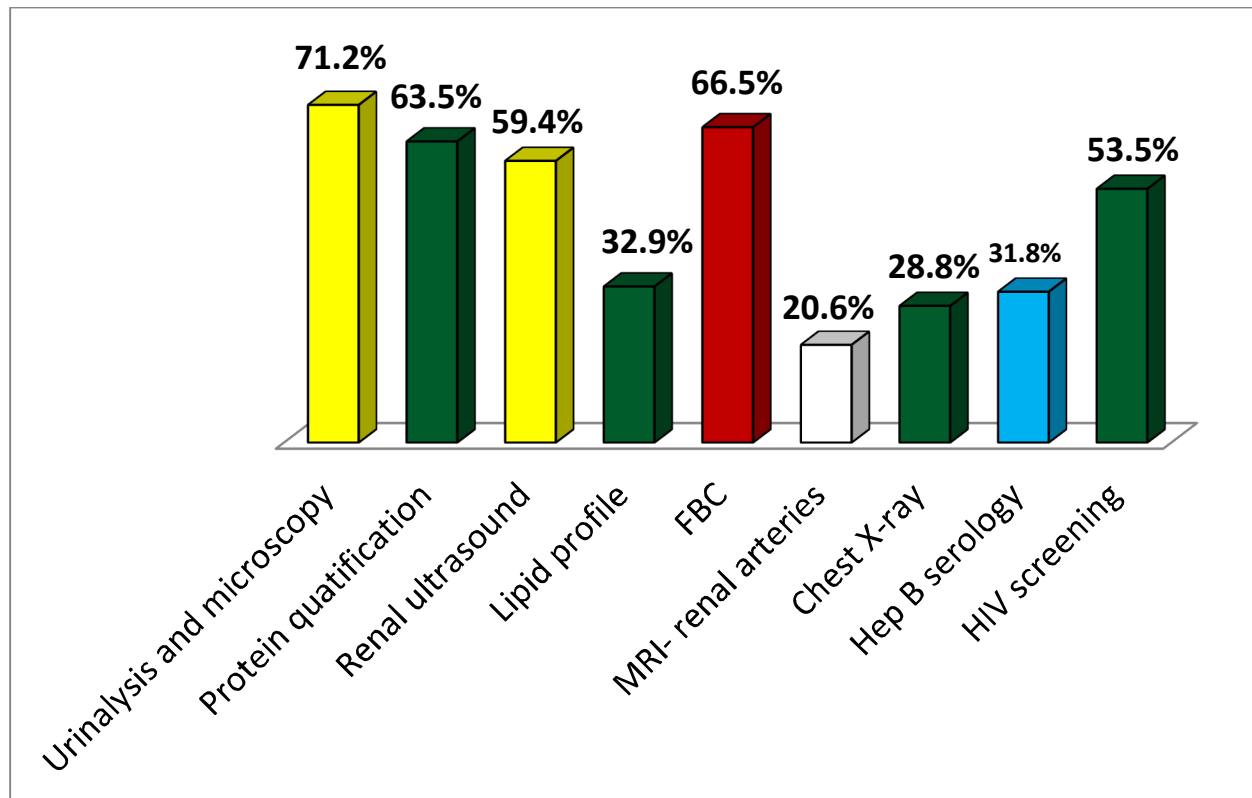
<b>Complications of CKD</b>							
Anaemia	76.8	98.8	74.6	66.7	71.9	31.55	0.000
Bone disease	65.6	86.7	76.3	53.9	57.9	33.62	0.000
Malnutrition	49.7	77.1	59.3	45.1	15.8	28.71	0.010
Neuropathy	67.4	92.8	67.8	55.9	59.6	37.24	0.001
Hypertension	71.8	96.4	71.8	59.8	57.9	39.16	0.001
Coronary artery disease	37.6	71.1	37.6	22.5	12.3	68.96	0.000
Stroke	38.8	79.5	38.8	22.5	14.0	85.93	0.020
Growth restriction	56.8	77.1	78.0	45.1	38.6	43.45	0.000
<b>Measures that retard CKD progression</b>							
Blood sugar control in DM	71.8	94.0	74.6	56.9	66.7	32.85	0.001
Control of blood pressure	69.4	92.8	76.3	55.9	63.2	36.93	0.000
Use of ACE/ARB	63.8	89.7	67.8	48.0	59.6	48.88	0.000
Ceasation of smoking	60.6	90.4	62.7	46.1	64.4	47.08	0.004
Weight management	67.4	89.8	67.8	55.9	59.6	35.27	0.001
Optimizing nutrition	72.9	96.4	71.2	64.7	63.2	32.04	0.000
Avoiding Nephrotoxins	70.3	92.8	61.7	55.9	58.6	35.08	0.000
Lipid control	69.4	92.8	67.8	62.7	59.6	30.55	0.001

After a diagnosis of CKD, the laboratory investigations identified by the participants for initial evaluation of the patients are shown in figure 1. There was a statistically significant difference across the specialties with regards to evaluation for anaemia (Int.Med-81.7%, Paed-81.4%, Com.Med-63.2%, Fam.Med-54.9%, Surg-48.7%;  $X^2=26.40$ ,  $df=4$ ,  $p<0.01$ ) and dyslipidaemia (Int.Med-62.7%, Paed-45.8%, Com.Med-12.3%, Fam.Med-17.6%, Surg-20.5%;  $X^2=62.10$ ,  $df=4$ ,  $p=0.01$ ). Seventy participants would request for magnetic resonance angiogram of renal arteries in the initial evaluation of a patient identified with CKD. Among them, 18% were within 5 years

post qualification while 82% are above 5 years post qualification. This difference was statistically significant ( $X^2=15.62$ ,  $df=1$ ,  $p=0.02$ ).

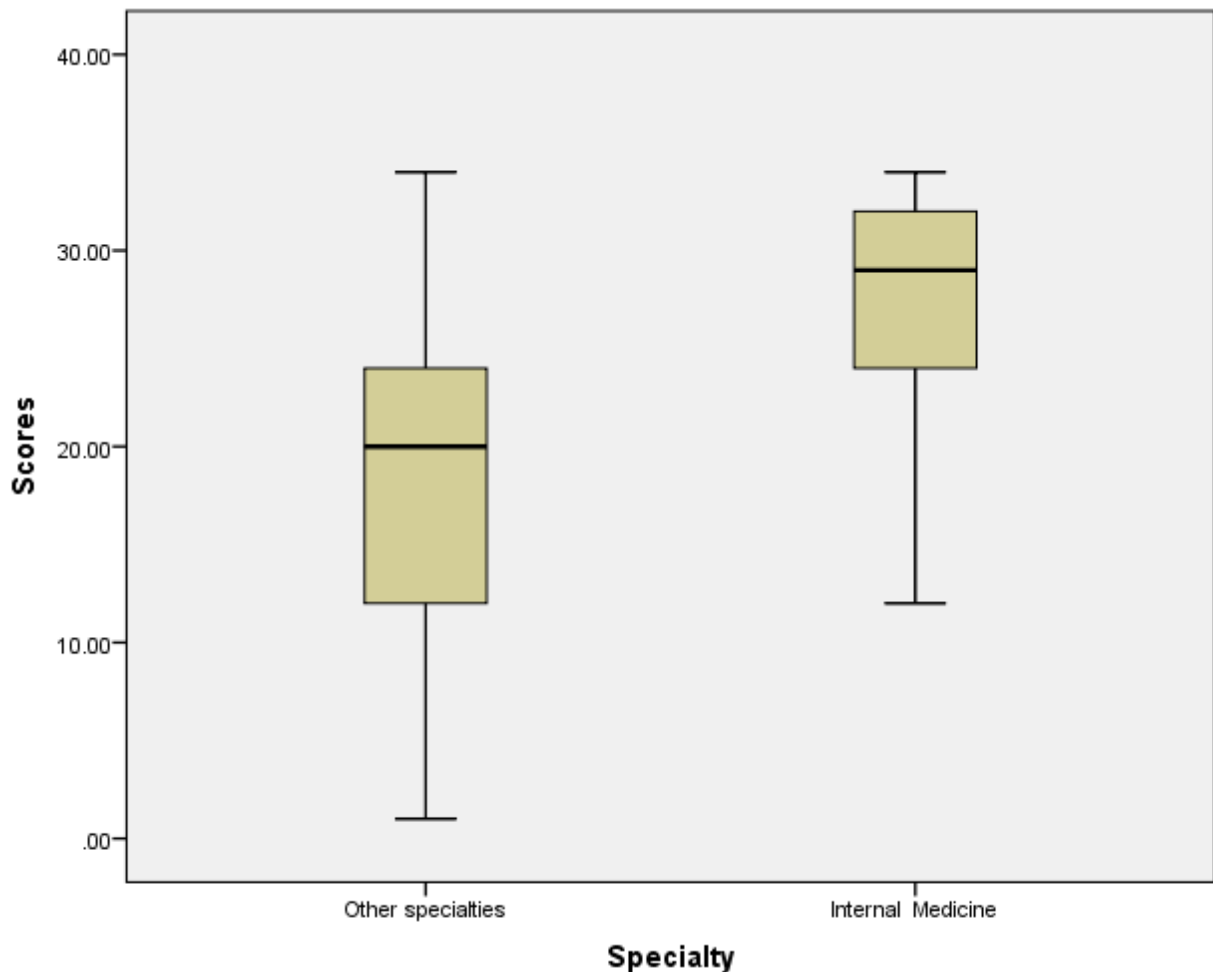
The target blood pressure control in patients with CKD was identified as less than 140/90mmHg in 68.8%, less than 130/80mmHg in 7.1%. There was no statistically significant difference between the internal medicine residents and their counterparts in other specialties on this knowledge ( $X^2= 0.72$ ,  $df=1$ ,  $p=0.52$ ). Number of years post MBBS degree qualification did not significantly influence this knowledge ( $X^2=0.67$ ,  $df=1$ ,  $p=0.41$ )

Values in percentage are percentages within specialty



**Figure 1. Laboratory evaluations employed by respondents in the initial evaluation of patients with CKD.**

*FBC- Full blood count; MRI- Magnetic resonance imaging; Hep- Hepatitis; HIV- Human immunodeficiency virus.*



**Figure 2. Parallel box plots comparing the distribution of scores of overall knowledge of CKD among resident doctors in internal medicine with resident doctors in other specialties**

After a diagnosis of CKD, 103 (30.3%) will carry out further investigations to determine the severity of CKD and presence of complications, 56 (16.5%) will institute measures to retard CKD progression, while 181 (53.2%) will refer immediately to the nephrologist, whatever the stage of CKD. While 93 (27.4%) would use GFR in making decision for referral, 207 (60.9%) would use the level of serum creatinine increase alone in taking such a decisions, 20 (6%) were not sure of which criteria to use while 19 (5.7%) would use other criteria apart from GFR and creatinine level. There was a significant different among the specialties in the use of GFR ( $X^2=9.94$ ,  $df=4$ ,  $p=0.04$ ); more resident doctors in internal medicine (59.5%) would use this parameter for referral to the

Nephrologist than their counterparts in other specialties (paediatrics-31%, community medicine-16%, surgery 39%), No statistically significant difference was obtained in the use of serum creatinine for referral decision between the different groups ( $X^2=6.45$ ,  $df=4$ ,  $p=0.50$ ).

For referral to nephrologist, 138 (40.6%) would refer completely to the nephrologist, 188 (55.4%) would consider co-management while 14 (4%) did not intend to refer to the nephrologist at all; reasons being lack of nephrologist in the respondents' centre, personal preference of the doctor managing the problem and patient's preference.



Adequate knowledge of CKD was demonstrated in 54% of the doctors. Resident doctors in internal medicine had a higher mean score of knowledge of CKD than their colleagues (29.6±5.42 vs 18.67±7.84). This difference was statistically significant ( $t = 9.08$ ,  $df=337$ ,  $p<0.01$ ). There was no statistically significant difference between the mean knowledge scores of resident doctors less than 5 years experience post MBBS qualification and those more than 5 years (20.6 ±8.4 vs 21.1 ± 8.2 respectively;  $t=0.619$ ,  $df=337$ ,  $p=0.54$ ).

### **Discussion**

This survey was conducted to investigate the pattern of CKD screening, diagnostic tools employed, initial evaluation and treatment, and referral practices among non nephrologists in Nigeria. Majority of the participants were not aware of practicing guidelines in CKD. Despite this, most have a good knowledge of parameters for CKD diagnosis. Majority (82%) will screen patients considered at risk for CKD if they come in contact with them. In addition to most participants (68.8%) not knowing the target BP in the management of patients with CKD, the knowledge of- and evaluation for cardiovascular complications of CKD was poor. Furthermore, more than half of the participants (53.2%) will refer to the nephrologists once the diagnosis of CKD is established regardless of the grade of disease; serum creatinine serving as a guide in making such decisions in most instances.

Clinical practice guidelines published in 2002 by the National Kidney Foundation Kidney Disease Outcome and Quality Initiative (NKF/KDOQI) and revised in 2012, serve as a resource to guide physicians' delivery of appropriate care for patients with CKD all over the world.<sup>19</sup> Nigeria Association of Nephrology detailed a schema of this guideline in 2011 with some modifications that reflect the realities of managing CKD in resource constrained settings.<sup>20</sup> These guidelines prescribed a core set of clinical tests for the diagnosis and ongoing management of CKD. Low awareness level of these guidelines in the management of CKD among doctors was recorded in this study. This finding corroborates with earlier studies in Taiwan<sup>21</sup> and in USA<sup>22</sup> where less than half of the participating

physicians were unaware of any existing guidelines in CKD.

Adequate overall knowledge was recorded in 52% of our participants. This is comparable to 54% reported by Charles et al<sup>22</sup> amongst family physicians and 54.7% by Agrawal et al<sup>23</sup> amongst internal medicine resident doctors in USA. It is, however, higher than 10% reported by Agaba et al among Nigerian resident doctors in family medicine,<sup>24</sup> and 37.7%<sup>17</sup> among non nephrology specialists and family physicians in West Africa sub region; In this, study a lower cut-off of 50% for adequate knowledge was used as compared to 70% used in the latter study. We used a lower cut-off because we studied doctors that are within the first 2-3 years of their training and from diverse specialties. So expectations from them may not be comparable to that from specialist physicians.

Practicing guideline recommends that persons at increased risk for developing chronic kidney disease should undergo testing to identify markers of kidney damage and to estimate the GFR.<sup>20</sup> In this study 82% of the respondents would screen for CKD in patients that are at risk. Using diabetes as a case scenario, nearly 100% of the participants will investigate for proteinuria within a year. This is in contrast to an earlier finding among 76 family physician residents in Nigeria where 80% never screened for proteinuria in DM patients.<sup>24</sup>

Although more in-depth evaluation when warranted is supported by guidelines, obtaining some additional tests as part of the initial evaluation is not explicitly recommended and could increase cost of management of CKD especially in our environment (Figure 1). In this study, 20.6% of the respondents would request for a magnetic resonance angiography of the renal arteries as part of initial evaluation (Figure 1). Years of experience post qualification influenced this knowledge; only 18% of doctors within the first 5 years of practice would utilize this investigation. This compares with the finding by Charles et al among physicians in United States of America<sup>22</sup> in which physicians with less than 10 years experience were more adherent to practicing guidelines in terms of



laboratory investigations needed in initial evaluation of a patient with CKD than those more than 10 years of practice. This investigation is not cost effective and, together with other additional tests, have been shown to increase the aggregate cost of investigations by 58%.<sup>22</sup>

Meticulous control of blood pressure to target is perhaps the most important single measure in retarding the progression of CKD.<sup>25</sup> Blood pressure targets in CKD depends on the level of proteinuria but levels less than 130/80 mmHg is acceptable generally.<sup>26</sup> Only 27% of our participants are aware of the correct BP target in CKD patients in contrast to 50.7% reported by Agaba et al<sup>17</sup> and 90% by Agrawal et al.<sup>23</sup> There is need for concerted efforts to increase the knowledge of practising doctors on the peculiarities of BP target in CKD population.

Only few participants (37.6%) identified coronary artery disease as a complication of CKD and a fewer number (32.9%) would order for a lipid profile for a patient with CKD. This highlights the ignorance of the need for cardiovascular assessment in the light of the fact that CKD adds to the cardiovascular burden in patients. As most patients with CKD die of cardiovascular disease long before reaching end stage kidney disease, it is pertinent to identify and treat cardiovascular disease in CKD.

Proteinuria has been shown to be a risk factor for CKD progression, and its amelioration shown to retard progression of CKD.<sup>27-28</sup> Over 60% of our respondents identified the anti-proteinuric effect of angiotensin-converting enzyme inhibitors/angiotensin II receptor blockers. This is similar to the rates reported previously by Agrawal et al.<sup>23</sup> Agaba et al,<sup>17</sup> and Israni et al.<sup>29</sup> Use of angiotensin-converting enzyme inhibitors/angiotensin II receptor blockers forms the cornerstone of retarding progression of CKD. This is a management strategy that can be employed at all levels of care to effectively reduce progression of CKD.

After detecting CKD, existing guidelines recommend staging the disease and taking

appropriate measures depending on the stage. Referral to nephrologist should be considered from stage 3-5 of CKD. Special circumstances exist when referral to nephrologist is acceptable irrespective of the stage e.g. stage 1 CKD when the cause is unknown, CKD with nephrotic range proteinuria, CKD with polycystic kidney disease or ectopic kidney, CKD in pregnancy, children, or with haematuria where a urological or other cause is not evident. More than half of the participants in this study will refer immediately to the nephrologist on detecting CKD whichever stage it may be. Considering the number of nephrologists available in Nigeria and their spread across the country, this practice may lead to overcrowding of nephrology clinics. On the other hand, late referral to nephrologist, have been noted to result to worse outcome of CKD management including increased morbidity.<sup>16</sup> Hence, non-nephrologists need to be acquainted with guideline recommendation through continual medical education on referring patients with CKD to the nephrologist.

### **Conclusion**

This study showed that there is improvement in the knowledge of CKD diagnosis and care among non nephrologists in Nigeria compared to previous studies. However, knowledge of complications, especially cardiovascular complications, blood pressure targets and their referral practices is still an outcry. Doctors within the first 5 years of their practice post MBBS qualification were found to request for cost-effective investigations more than those more than 5 years of practice. Resident doctors in internal medicine had better overall knowledge of CKD and more likely to offer better pre-ESRD care than their colleagues in other specialties. Also, years of experience post qualification did not influence the knowledge level significantly

### **Recommendations**

There is need for more education of the resident doctors on screening of individuals at risk of CKD, initial laboratory evaluation, detection of complications, measures that retard progression of CKD and referral of individuals with CKD to

nephrologists. This can be achieved through inclusion in the postgraduate training curriculum and widespread distribution of practice guidelines. The laboratory personnel may have a role to play in this by way of automated reporting of eGFR. This will facilitate early recognition of CKD and institution of appropriate care. Finally, despite the constraints of few specialists compared to the teeming population of patients with CKD in Nigeria, we recommend referral to the nephrologist as early as possible to maximize care for patient with a diagnosis of CKD.

### **Limitation of the study**

We surveyed only doctors in the junior residency training. Senior residents and specialists were not involved. Hence, we did not evaluate the impact of training of the doctors on knowledge and practices patterns of CKD in this study.

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