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Clinical Study

Indices of Kidney Damage and Cardiovascular Disease Risk Factors in a Semiurban Community of Iloye, South-West Nigeria

J. O. Awobusuyi,[1] O. O. Kukoyi,[2] M. A. Ibrahim,[3] and M. Atiba[2]

[1] *Department of Medicine, Lagos State University College of Medicine, 1-5 Oba Akinjobi Street, Ikeja, Lagos, Nigeria*
[2] *Ace Medicare Clinics Limited, Km 4, Idiroko Road, Ota, Ogun State, Nigeria*
[3] *Mulib Hospital, No. 57, Ijoko Road, Sango-Ota, Ogun State, Nigeria*

Correspondence should be addressed to J. O. Awobusuyi, awojaco@yahoo.com

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Health screening exercises are important, as they enable early detection of diseases in individual subjects and also enable data collection, useful in estimating disease burden in the community. This paper describes the findings of a health screening exercise conducted in a semiurban population of Iloye, by the Rotary Club of Ota, Ogun State, Western Nigeria, as a part of its community-oriented services and projects. Three hundred and twenty six community members were screened during the exercise. There were 189 (57.97%) females and 137 (42.03%) males, with a mean age of 43.5 ± 14.88 yrs. Urinary abnormality and/or creatinine clearance less than 90 mls/min was detected in 147 (45.09%) participants. 99 (30.37%) participants had proteinuria, 16 (4.91%) had haematuria, and 5 (1.53%) participants had both haematuria and proteinuria. Eight (2.45%) participants had GFR less than 60 mls/min. Elevated blood pressure was found in 152 (46.63%), while 3 (0.9%) participants had diabetes, 71 (21.8%) were obese, 16 (4.9%) had hypercholesterolaemia, and 3 (0.9%) had hypertriglyceridaemia. Prevalence of both smoking and alcohol consumption was 6 (1.84%). It was concluded that the prevalence of indices of kidney damage and cardiovascular risk factors is high in Iloye community.

1. Introduction

In Nigeria, awareness of health problems is very low in many communities. This is due to factors such as ignorance, poverty, and lack of adequate data on community health problems. As a result, common communicable and noncommunicable diseases are not diagnosed early and mortality from these diseases is high in many communities in the country.

Health screening exercises are, therefore, important because of the potential benefits of such screening exercises to individuals within the community and the community at large. Screening exercises enable early detection of diseases in individual subjects, thus facilitating institution of medical treatment early in the course of the disease. Secondly, the prevalence and pattern of distribution of the disease in the community can be determined by screening exercises. Knowledge of these is useful for planning and designing of heath care facilities required by specific communities.

Chronic kidney disease (CKD) prevalence has been observed in many populations to be increasing [1–3]. In the developed world, this increase in prevalence has been attributed to an increase in predisposing factors such as diabetes and hypertension [4, 5]. This observation has also been noted in some developing countries [6, 7]. However, data on the prevalence of CKD in Nigeria is still emerging, and the relative contributions of predisposing factors such as diabetes and hypertension to the development of CKD in many communities is yet to be adequately elucidated. Thus, screening exercises for CKD in the community are relevant to enable epidemiological clarification of this important health problem.

Rotary Club of Ota, Ogun State, in South West Nigeria embarked on a community service project aimed at screening predetermined rural communities and organizations for Kidney diseases, associated risk factors and comorbidities. This paper describes the first screening exercise conducted by

the Club on the 30th of January 2010, in Iloye, a semiurban community in the South Western part of Nigeria.

The project's aims are the following:

(1) to educate the community on hypertension, diabetes and chronic kidney disease,

(2) to determine the prevalence of hypertension, diabetes and chronic kidney disease in the screened community,

(3) identify individuals with these diseases and offer professional counseling and referral to appropriate health facilities for treatment.

2. Subjects and Methods

2.1. Study Design and Population. Prior to the health screening exercise, permission was obtained by the health screening committee members of the club from the community and religious leaders after detailed explanation of the purpose of the study. Mobilization of participants was achieved through distribution of fliers, house-to-house visitations, and announcements. Also, the information network of the community through dissemination of information by the various community and religious leaders was also employed to create awareness of the health screening exercise. Iloye community is estimated to have a population of about 8,000 inhabitants.

A primary school within the community with an assembly area of adequate capacity to accommodate 500 participants for the purpose of health talk, waiting area, adequate toilet facilities (12), and sufficient number of rooms for the screening points was selected for the screening exercise.

2.2. Registration and Health Talk. Participants were registered on the morning of the exercise and a forty-minute health talk was held in vernacular to address health implications of renal diseases, diabetes, and hypertension. The aims of the screening exercise, the procedures, and order of conduct were explained to the participants at the end of the health talk.

2.3. Specimen and Data Collection. A health screening form (in duplicate) capturing contact information, biodata, and medical history of participant was distributed at the health talk venue. This was filled by the participants with the assistance (if required) of Rotary and Rotaractor Club members present at the screening venue.

Participants were then directed to the screening investigation points. Weight, height, and blood pressure were taken at the first point. At the second point, five millilitres of blood was taken into heparinised sample bottles for evaluation of urea, creatinine, cholesterol, and triglyceride levels. This was centrifuged, and the separated plasma was stored in an on-site refrigerator. The centrifuged samples were subsequently transferred to the analysis laboratory for analysis immediately after the screening exercise.

Random blood glucose was done on site at this second point using Accuchek glucometer.

Participants were asked to collect urine samples at the on-site toilet facilities. These were taken to the third screening point, where urinalysis was performed using Combi-9 urinalysis strips. Menstruating women were instructed not to provide urine samples.

Participants were thereafter referred to the on-site doctors' consulting room for discussion of their test results and appropriate referral for treatment of any abnormality discovered during the screening exercise.

The results of all on-site measurements, investigations, and specific problems identified during the screening were reviewed by the doctors, recorded in duplicates and the original form where given to the participants for record purpose.

All participants were counselled appropriately. Participants needing referral were referred appropriately for further evaluation and management.

Blood chemistries were performed with a semiautoanalyzer (JETLYZER 950) which uses kinetic rate Jaffe method for creatinine estimation.

A comprehensive report which included laboratory results from the analysis laboratory was later given to each participant through a designated collection point at the screening venue.

2.4. Definitions. Elevated blood pressure was defined by a systolic blood pressure $\geq$140 mmHg or diastolic blood pressure $\geq$90 mmHg [8].

Hypertension was taken to be present if the participant reports prior diagnosis at a hospital and being on prescribed antihypertensive medication.

Diabetes was taken to be present if the participant reports prior diagnosis at a hospital and being on prescribed hypoglycaemic medication.

The body mass index (BMI) was calculated from the measured weight (in kilograms) and height (in metres). Obesity was defined according to the 1999 WHO criteria. Cutoff points for BMI were overweight (BMI 25.0–29.99 kg/m^2), and obesity (BMI 30 kg/m^2) [9].

GFR was calculated using Cockroft—Gaus formula [10] and the K/DOQI guidelines [11] for definition and classification of CKD were used to stage the patient into the various CKD categories.

Significant alcohol ingestion was defined as alcohol intake greater than 2 bottles of beer per day.

2.5. Statistical Analysis. All data were analysed using the SPSS version 17 statistics software. Results are presented as numbers and percentages or mean $\pm$ SD. Odds ratio (OR) and 95% confidence intervals were calculated to measure the degree of associations.

A P value $<.05$ is considered as being statistically significant.

3. Results

Three hundred and twenty six community members participated in the study. There were 189 (57.97%) females and 137

Table 1: Sex versus age groups of iloye screening participants.

		20–39	40–59	60–79	≥80	Total
Sex	Male	94	73	20	2	189
	Female	44	59	33	1	137
	Total	138	132	53	3	326

Mean age was 43.5 ± 14.88 yrs.

(42.03%) males. The mean age was 43.5 ± 14.88 yrs. The age and sex distributions are shown in Table 1.

The majority of the participants were low income earners. The six most common occupations being petty trading 136 (41.72%), artisan 38 (11.66%), Teaching (primary school) 28 (8.59%), hair dressing 13 (4%), small scale businesses 13 (4%) and tailoring 10 (3.08%). There were however 8 (2.45%) engineers, 4 (1.23%) accountants, 3 (.92) bankers and 1 (.31%) lawyer.

3.1. Indices of Kidney Damage. One hundred and seventy nine (54.91%) participants had no urinary abnormality with creatinine clearance greater than 90 mls/min, while 147 (45.09%) had abnormal urinalysis results or reduction in glomerular filtration rate less than 90 mls/min (Table 2).

Proteinuria was found in 99 (30.37%) of the participants, haematuria in 16 (4.91%), 5 (1.53%) participants had both haematuria and proteinuria. The mean serum urea level was 16.72 ± 9.22 mg/dL (range 2–97 mg/dL), while mean creatinine was 1.07 ± 0.52 (range 0.16–6.88 mg/dL). Eight (2.45%) participants had GFR less than 60 mls/min. CKD staging of the participants is shown in Table 2. Six of the 8 patients with GFR less than 60 mls/min had neither proteinuria nor haematuria, while the remaining 2 had proteinuria in addition to the reduced GFR.

Eighty five (26.07%) males had abnormal urinalysis results or reduction in GFR less than 90 mls/min compared with 62 (19.02%) females. The odds ratio of males being more affected than females is 1.89 (95% CI, 1.22, 2.29) $P < .05$.

One hundred and thirty eight (42.33%) participants were below 40 years of age compared with 187 (57.36%) were above 40 yrs. 87 (26.69%) participants above 40 yrs had kidney injury or reduction in GFR compared with 59 (18.09%) participants below 40 yrs of age. The odds ratio of being above 40 yrs and having kidney injury or reduction in GFR is 1.61 (95% CI, 0.75, 1.81) $P > .05$.

3.2. Cardiovascular Disease Risk Factors. Twenty one (6.4%) participants reported being hypertensive. However, elevated blood pressure was found in 152 (46.63%). Mean SBP was 137.69 ± 23.37 mmHg (range 75–230 mmHg), and mean DBP was 81.72 ± 13.05 mmHg (range 52–120 mmHg). The odds ratio (OR) of having abnormal indices of renal damage and having an elevated blood pressure in this community is 0.79 (95% CI, 0.51, 1.24) $P > .05$.

Mean RBS was 103.70 ± 19.29 mg/dL (range 63–201 mg/dL). 3 (0.9%) participants reported being on treatment for diabetes, and 1 (0.3%) of the diabetics had an abnormal random blood sugar result. None of the diabetic participants had proteinuria, and none had GFR less than 60 mls/min.

Mean BMI was 25.86 ± 5.46 kg/m^2 (range 16.3–44.1 kg/m^2). One hundred and forty four (44.1%) of the participants have BMI within the normal range, while 16 (4.9%) were underweight, 95 (29.1%) were overweight, and 71 (21.8%) were classified as obese. The odds ratio (OR) of having abnormal indices of renal damage and being overweighed or obese is 0.61 (95% CI, 0.39, 0.97) $P < .05$.

Mean cholesterol level was 145.41 ± 54.38 mg/dL (range 43–350 mg/dL); 280 (85.9%) participants had serum cholesterol below 200 mg/dL, and 30 (9.2%) had levels between 200 and 240 mg/dL, while 16 (4.9%) had levels above 240 mg/dL. 10 (3.07%) of the 16 participants with hypercholesterolaemia had abnormal urinalysis or reduction in GFR. Odds ratio of having hypercholesterolaemia and renal injury or reduction in GFR is 3.25 (95% CI, 1.29, 9.73) $P < .05$.

Mean triglyceride level was 72.75 ± 37.04 mg/dL (range 12–283 mg/dL); 317 (97.2%) participants had triglyceride levels less than 150 mg/dL, and 6 (1.8%) had values between 150 to 199 mg/dL, while 3 (0.9%) had triglyceride values between 200 to 499 mg/dL. No participant had values above 500 mg/dL. Odds ratio of having hypertriglyceridaemia and renal injury or reduction in GFR is 0.62 (95% CI, 0.06, 6.07) $P > .05$.

The two participants with stages 4 and 5 CKD out of the 8 participants with GFR < 60 mls/min had hypercholesterolaemia.

3.3. Smoking and Alcohol Intake. Six (1.84%) participants were current smokers, and all smoked less than six sticks/day. None smoked heavily. Odds ratio of smoking and having renal injury or reduction in GFR is 0.62 (95% CI, 0.06, 6.07) $P > .05$.

Fifty seven (17.48%) participants took alcohol. 36 (11.04%) took 1 bottle per day, 15 (4.60%) took 2/day, 5 (1.53%) took 3/day and only one (0.31%) participant took more than 4 bottles per day. Odds ratio of significant alcohol consumption and having renal injury or reduction in GFR is 1.22 (95% CI, 0.24, 6.18) $P > .05$.

4. Discussion

This study presents the findings of a health screening exercise conducted in a semiurban community in the South Western part of Nigeria, by the Rotary Club of Ota, as part of its community service program. The decision to conduct a health screening exercise in the community was motivated by the

Table 2: Frequencies of participants with abnormal urinalysis and cardiovascular disease risk factors in relationship with chronic kidney disease staging.

		No CKD	Stage 1 CKD	Stage 2 CKD	Stage 3 CKD	Stage 4 CKD	Stage 5 CKD	Total
	No. of participants	179 (54.91%)	93 (28.53%)	46 (14.11%)	6 (1.86%)	1 (0.31%)	1 (0.31%)	326 (100.00%)
Urine abnormality	Proteinuria	NA	84 (25.77%)	13 (3.99%)	1 (0.31%)	1 (0.31%)	0 (0.0%)	99 (30.37%)
	Haematuria	NA	13 (3.99%)	2 (0.62%)	1 (0.31%)	0 (0.0%)	0 (0.0%)	16 (4.91%)
Traditional CVD risk factors	Hypertension	88 (26.99%)	46 (14.11%)	16 (4.91%)	1 (0.31%)	1 (0.31%)	0 (0.0%)	152 (46.63%)
	Diabetes mellitus	2 (0.62%)	0 (0.0%)	1 (0.31%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	3 (0.93%)
	Hypercholesterolaemia	4 (1.24%)	6 (1.86%)	4 (1.24%)	0 (0.0%)	1 (0.31%)	1 (0.31%)	16 (4.91%)
	Hypertriglyceridaemia	2 (0.62%)	0 (0.0%)	1 (0.31%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	3 (0.93%)
	Overweighed/obese	95 (29.14%)	57 (17.48%)	11 (3.37%)	1 (0.31%)	1 (0.31%)	1 (0.31%)	166 (50.92%)
	Smoking	4 (1.24%)	1 (0.31%)	1 (0.31%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	6 (1.86%)
	Alcohol > 3 bottles/day	3 (0.93%)	2 (0.62%)	1 (0.31%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	6 (1.86%)

N.B. Percentages were based on the total number of participants
NA: not applicable, CKD: chronic kidney disease, CVD: cardiovascular disease.

observation by members that kidney failure is increasingly becoming a major health issue in the country, and data on the local communities in Ota is nonexisting. Therefore, the screening exercise was conducted in an attempt to fill this gap in knowledge and also to assist the individual participants with abnormal test results by referring appropriately to the general hospitals for adequate management of their disease.

Three hundred and twenty six subjects comprising 189 (57.97%) females and 137 (42.03%) males were screened for indices of kidney damage and cardiovascular risk factors for CKD after a health talk. Majority of the participants were petty traders 136 (41.72%) and artisans 38 (11.66%) reflecting the low socioeconomic status of the community in view of the low income capabilities of these occupations.

4.1. Indices of Kidney Damage. One hundred and forty seven (45.09%) participants had abnormal urinalysis results or reduction in glomerular filtration rate less than 90 mls/min (Table 2). When compared with a similar studies, the prevalence of kidney injury in Iloye is higher than 19.9% reported by Abioye-Kuteyi et al. [12] in a rural population in South West Nigeria and the 26.6% reported by Ulasi et al. [13] in South Eastern part of the country. Most other published works on epidemiology of CKD in Nigeria have reported prevalence rates between 3.6%–45.5% [13, 14]. However, these studies are hospital-based studies and may not reflect the true prevalence of CKD in the community [14–16].

The odds of having abnormal indices of kidney damage or a reduction in GFR is higher in male participants compared with females, 26.07% versus 19.02% OR 1.89 (95% CI, 1.22, 2.29); this is statistically significant $P < .05$. Participants above 40 yrs also have a higher risk of having kidney injury compared with those below 40 yrs. 26.69% versus 18.09% OR 1.61 (95% CI, 0.75, 1.81). $P > .05$. This is, however, not statistically significant although it may be clinically relevant as age is a known risk factor for chronic kidney disease.

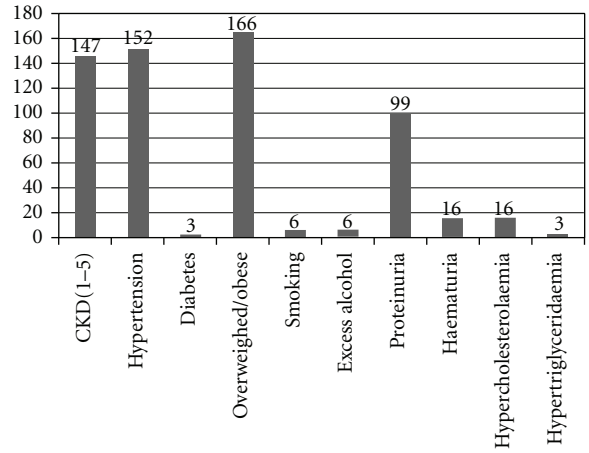

Figure 1: Frequencies of occurrence of CKD, urinary abnormalities and cardiovascular risk factors in the studied participants.

A high prevalence of urinary abnormality was found in the community with prevalence of proteinuria being 30.37%, haematuria 4.91%, and 1.53% of the participants had combination of both abnormalities. These findings may indicate a high background prevalence of nephritis in the community. A search for possible aetiologies of abnormal urinary findings in the participants is required for clarification of the aetiological characteristics of these abnormalities in the community.

The mean serum urea level was 16.72 ± 9.22 mg/dL (Range 2–97 mg/dL), while mean creatinine was 1.07 ± 0.52 (Range 0.16–6.88 mg/dL). Eight (2.45%) participants had GFR less than 60 mls/min (Figure 1). The proportion of individuals in the different CKD stages shows some similarity to that seen studies conducted in more advanced societies as there is a very sharp decline in prevalence rates of the more severe stages of CKD (stages 3, 4, and 5) when compared with the early stages(stages 1 and 2) of the disease [1, 2].

4.2. Cardiovascular Disease Risk Factors. Twenty one (6.4%) participants reported being hypertensive. However, elevated blood pressure was found in 152 (46.63%). Although a single blood pressure reading is not sufficient to make a diagnosis of hypertension, the high frequency of elevated blood pressure observed in this survey may be a reflection of high prevalence of hypertension in the community. The large disparity between self report of being hypertensive and the far higher prevalence rate of elevated blood pressure observed in the community is probably due to low health problem awareness in the community. This observation has been a consistent finding in many communities in Nigeria [17, 18]. Thus, screening exercises of this nature may serve the purpose of bringing community health problems into focus, by providing data on the extent of the disease and its characteristic distribution in the community.

Although the odds ratio of having abnormal indices of renal function and having an elevated blood pressure did not show a statistically significant strong relationship between the two illnesses in this community OR 0.8 (95% CI, 0.51, 1.24) $P > .05$, the high background prevalence of elevated blood pressure of 46.63% found in the community is a cause of concern. The young average age (43.5 ± 14.88 yrs) of the participants raises suspicion of elevated blood pressures possibly from secondary causes of hypertension. The relative contributions of renal diseases such as chronic glomerulonephritis from tropical nephropathies and other secondary causes of hypertension need further evaluation.

All participants with elevated blood pressures were referred appropriately for evaluation and management.

Prevalence of diabetes mellitus is low in this community with 0.9% of participants reporting prior diagnosis and being on treatment for diabetes. This prevalence rate of 0.9% is lower than 1.65%–6.8% that has been generally reported by other investigators [19, 20]. Although prevalence of diabetes is perceived to be increasing in the country [19], its contribution to ESRD in the country is low when compared with chronic glomerulonephritis and hypertension [16, 21]. None of the diabetic participants had proteinuria, and none had GFR less than 60 mls/min.

Obesity appears to be a health problem in this low-income community with 29.1% being overweight and 21.8% obese. There is a significant association between obesity and having abnormal indices of renal damage and being overweighed or obese in this community. Odds ratio (OR) 0.61 (95% CI, 0.39, 0.97) $P < .05$. Although Nigeria is one of the economically disadvantaged countries, obesity has been found to be prevalent in many communities in the country [22, 23]. There is no adequate explanation for this observation. Obesity has important public health implications as various studies have shown an increased predisposition to hypertension and diabetes in obese individuals [24, 25]. Both hypertension and diabetes are known risk factors for the development of chronic kidney disease.

Lipid abnormalities appear not to be a major community health problem in this community. Prevalence of hypercholesterolaemia was 4.9%, and hypertrigliceridaemia 0.9%. The two participants with stages 4 and 5 CKD had hypercholesterolaemia. A significant association between hypercholestrolaemia and renal injury in the participants OR 3.25 (95% CI, 1.29, 9.73) $P < .05$ was also found. Lipid abnormality is one of the risk factors associated with accelerated atherosclerosis that occurs in chronic kidney disease patients [26, 27]. Therefore, it may be worthwhile to screening for lipid abnormalities in this community, considering its clinical importance.

4.3. Smoking and Alcohol Intake. Cigarette smoking and excessive alcohol intake are two social habits that have been associated with increased risk of atherosclerotic cardiovascular diseases in the general population [28–30]. Cigarette smoking has been associated with the risk of the development of CKD. Both cigarette smoking and heavy alcohol consumption increase the risk of cardiovascular diseases and mortality in the CKD population [31–33]. In the community studied, the rate of cigarette smoking and alcohol intake appears not to be high, as only six (1.84%) participants were current smokers, and all smoked less than six sticks/day. Three of the smokers, however, had proteinuria. Although 17.48% participants took alcohol, severe alcoholism appears not to be a significant health problem in the community, as less than 2% of the participants took more than three bottles of alcohol/day. However, participants with kidney damage have a slightly increased odd taking more than 3 bottles of alcohol/day compared with those without kidney injury OR 1.22 (95% CI, 0.24, 6.18) $P > .05$.

5. Conclusion

Estimated prevalence of indices of kidney damage is very high in Iloye community. This may in part be responsible for the observed high background prevalence of elevated blood pressure in the community.

Both hypertension and obesity appear to be major community health problems in addition to kidney damage. There is need for continual surveillance of this community in order to insure early detection and management of these community health problems.

Community awareness of health-related problems was also found to be very low. Regular health education and preventive screening exercises are required for early detection and treatment of diseases in this community.

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