Risk Factors for Chronic Kidney Disease: Report of a Preventive Screening Programme Conducted in an Unselected Urban Population in South West Nigeria

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ABSTRACT

Chronic kidney disease (CKD) is a major health problem worldwide with rising prevalence resulting in high morbidity and mortality and high cost of treatment. Diabetes and hypertension are the most common cause of CKD world wide. Therefore early detection and treatment of these conditions through community based prevention programmes will help in reducing the burden of CKD. The objective of this study was to determine the prevalence of CKD risk factors in an urban community in a developing country.

Free prevention screening programme was carried out in Lagos, a large urban community in South-west, Nigeria. Blood pressure, random blood sugar tests and urinalysis (urine dipstick) were carried out among the respondents. Hypertension was detected in 36.3% (514) of the population, 2.6% (37) were diabetic and 28.9% (338) had overt proteinuria; 287 (20.3%) had grade 1 and 227 (16%) grade 2 hypertension respectively. After age-adjustment, prevalence rate of hypertension was highest in the 45-54 year age group while diabetes was highest in the 75-84 years age stratum.Hypertension and proteinuria are prevalent in the community and this could account for the rising prevalence of CKD in the community. Our findings calls for the setting up of a comprehensive CKD screening prevention programme in the country like is done in other developing countries of the world.

Keywords: *Chronic kidney disease, prevention programme, risk factors*

INTRODUCTION

Chronic kidney disease (CKD) is a worldwide public health problem with rising incidence and prevalence and associated with increased risk for cardiovascular disease, hospitalizations, and mortality. [1]. The continued growth of the population with end-stage renal disease (ESRD) is partially related to the under recognition of earlier stages of CKD and risk factors for the development of CKD [1, 2]. Published estimates of the prevalence of CKD in the United States estimate that there are 6.2 million individuals with serum creatinine levels at or above 1.5 mg/dL, or 8.3 million individuals with decreased glomerular filtration rate (<60 mL/min/1.73 m^2 [3]. The worldwide rise in the number of patients with chronic kidney disease (CKD) and consequent ESRD necessitating renal replacement therapy is threatening to reach epidemic proportions over the next decade, and only a small number of countries have robust economies able to meet the challenges posed. To this end, the International Society of Nephrology (ISN) along with the International Federation of Kidney Foundations has called for the setting up of primary prevention programmes [4].

Studies have shown that early intervention and treatment of the risk factors can slow progression of the disease [1, 2, 5]. Hypertension and diabetes account for nearly 70% of all cases of CKD worldwide and these primary disease states also hasten the progression of kidney disease [6]. Both conditions are often poorly detected and inadequately

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treated. The objective of this study was to determine the prevalence of CKD risk factors in an urban community in a developing country, as a prelude to early intervention.

MATERIALS AND METHODS

The study was conducted from June 2004 to December 2006 in Lagos metropolis a large urban community with an estimated population of 10 million inhabitants (2006 census) in South West Nigeria. Screening centres were set up at two different private clinics located about 15km apart; Vantage Medical centre located in Victoria Island and Finnih Medical centre in Ikeja which are high income areas. Members of the public were offered free blood pressure, blood sugar and urinalysis screening tests every Wednesday at these centres from 10am to 12noon.

In addition to this, periodic kidney disease awareness talks followed by free screening exercise were given to members of the public at different locations in Ipaja and Ojodu-Isheri local government areas which are low to medium income areas. Information on age, gender and ethnicity were collected. The population studied was unselected.

The blood pressure of the respondents was measured twice 5 minutes apart with an Accoson's mercury sphygmomanometer using an appropriate cuff size in the right arm in the sitting position after 5 minutes rest by trained nurses [7]. Random blood sugar tests were done using Accu-chek active glucometers and urinalysis with Combi-Screen 3 urine dipstick (Biotechnologies AG Germany). Hypertension was classified using the Joint National Committee (JNC) VII criteria [7]. Individuals with blood pressure >140/90mmHg or current use of anti-hypertensive medications were regarded as being hypertensive. The diagnosis of diabetes was based on a random blood sugar > 200mg/dl, or current use of anti-diabetic agents according to WHO criteria [8]. Proteinuria was graded as 1+ (30mg/dl), 2+ (100mg/dl) and 3+ 500mg/dl. Individuals with overt proteinuria, hypertension, and diabetes were referred to the teaching hospital for further evaluation and treatment.

Statistics

All data were entered into excel spreadsheet and analysed using Epi-info 2002. Numerical data were reported as mean ± SD. Comparison of means of continuous variables was by student t test. Chi squared analysis was used in comparing proportions. The age-adjusted prevalence of hypertension and diabetes in the population were calculated using the USA population 2000 by the direct method [9]. This was done by multiplying the age-specific rate by the age-adjustment weight for the appropriate standard age group. Statistical significance was assumed at a P value < 0.05

RESULTS

A total of 1600 respondents were screened but only 1416 (88.5%) had complete data and were thus used for analysis. There were 847 (59.8%) male respondents and 569 (41.2%) female respondents. Majority of the respondents (63.9%) were in the 25-44 years age range (Figure 1). Five hundred and forty eight respondents (38.7%) were screened at the centres located at the two private clinics while 868 (61.3%) were screened at the other locations. The mean age overall of the respondents was 38.5 ± 10.9 years (age range was 15 – 87 years). The male respondents were older than the female respondents with a mean age of 39.9 ± 11years compared to 36.6 ± 10.7years, p = 0.000; (Table 1).

Hypertension

Hypertension was detected in 514 of the respondents giving a crude prevalence rate of 36.3%. Prevalence of hypertension was similar among subjects screened at the private clinics and at the field locations combined; 199 (36.3%) subjects at the clinic location versus 315 (36.3%) at the field locations combined X^2 0.00 p = 0.99). When the patients were classified according to BP class, 682 (48.2 %) had normal blood pressure, 220 (15.5 %) were in the pre-hypertension category, 287 (20.3%) had stage 1 hypertension while 227 (16%) stage 2. Men were twice more likely to have hypertension than women (OR = 2.26, 95% CI 1.78 - 2.87) table 1. The male participants had significantly higher systolic and diastolic BP compared with the female respondents (mean SBP 130.5 ± 22.3mmHg in male respondents versus 122.7 ± 19.7mmHg in females p = 0.000, mean diastolic BP of 81.2 ± 14 in male respondents compared to 78.2 ± 12.6 mmHg in women p = 0.000) table1.

Table 2 shows the age-specific crude prevalence and age adjusted prevalence of hypertension (%) among the respondents. The adjustments were made using the USA population 2000 (9). Prevalence of hypertension was highest in the 45-54 year age group (n =140; 9.1%) while 2.5% of patients in the 15-24 age group were hypertensive.

Table 1: Clinical characteristics of the study population

Parameter	Male *N=847*	Female *N=569*	Test statistics	P value
Mean age (years) ± SD	39. 9 ± 11	36.6 ± 10.7	t=5.60 (95% CI 2.14-4.46)	0.000
Mean SBP (mmHg) ± SD	130.5 ± 22.3	122.7 ± 19.7	t = 6.76 (95%CI 5.53-10.07)	0.000
Mean DBP (mmHg) ± SD	81. 2 ± 14	78.2 ± 12.6	t = 4.11 (95% CI 1.57 -- 4.43)	0.000
Hypertension	369 (43.6%)	145 (25.5%)	OR 2.26 (95% CI 1.78 - 2.87)	
0.000				
Diabetes	31 (3.7%)	6 (1.1%)	OR 3.56 (95% CI 1.41 - 9.57)	0.003
Proteinuria	202 (23.9%)	136 (23.(%)	OR 1.00 (95% CI 0.77 - 1.29	0.980

SBP = Systolic blood pressure
OR= Odds ratio
DBP = Diastolic blood pressure
Hypertension defined as BP > 140/90mmHg
Diabetes defined as random blood sugar > 200mg/dl ± glycosuria
Proteinuria defined as dipstick positive

Diabetes

Thirty-seven respondents were diabetic giving a crude prevalence of 2.6%, however after age –adjustment, the overall prevalence rate increased to 5.9%. Table 3 shows the age-specific crude and age-adjusted prevalence of diabetes. Highest prevalence was in the 75-84 years age stratum. Men were 3 times more likely to have diabetes than women (OR 3.56 95% CI 1.41 - 9.57) Table 1. Twenty-six respondents (1.8%) had comorbid diabetes and hypertension.

Proteinuria

Overt proteinuria was detected in 23.9% (338) of the respondents. In terms of distribution; 22.5% (319) had 30mg/dl (1+) proteinuria 0.8 % (11) 100mg/dl (2+), 0.6% 500mg/dl (3+) proteinuria. One hundred and forty eight patients (28.8%) with hypertension had overt proteinuria while 37.8% of diabetics had proteinuria $X^2 = 1.18$, p = 0.28. There was no difference in the prevalence of proteinuria among the male and female subjects (table 1).

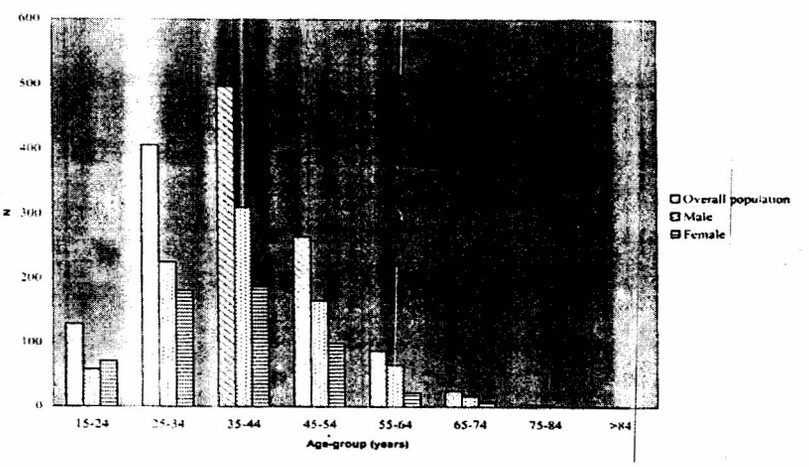

Fig. 1: Showing the age distribution of the study population by gender

TABLE 2: Age adjusted prevalence of diabetes with adjustments to USA population 2000

Age group (years)	Population Size	Number of Diabetic	Age-specific Prevalence %	Age-adjustment weight (2000 standard population)	Age-adjusted prevalence %
15-24	129	0	0	0.176552	0
25-34	407	2	0.5	0.172639	0.1
35-44	498	7	1.4	0.207071	0.3
45-54	265	14	5.3	0.171698	0.9
55-64	87	11	12.6	0.111100	1.4
65-74	25	1	4	0.084091	0.3
75-84	4	2	50	0.057101	2.9
> 85	1	0	0	0.019748	0
Overall	1416	37	2.6	1	5.9

TABLE 3: Age adjusted prevalence of hypertension with adjustments to USA population 2000

Age group (years)	Population Size	Number of hypertensive	Age-specific Prevalence %	Age-adjustment weight (2000 standard population)	Age-adjusted prevalence %
15-24	129	18	14.0	0.176552	2.3
25-34	407	92	22.6	0.172639	3 .9
35-44	498	186	37.3	0.207071	7.7
45-54	265	140	52.8	0.171698	9.1
55-64	87	58	66.7	0.111100	7.4
65-74	25	16	64	0.084091	5.4
75-84	4	4	100	0.057101	5.7
> 85	1	0	0.0	0.019748	0.0
Overall	1416	514	36.3	1	41.7

DISCUSSION

In this study we report on the prevalence of hypertension, diabetes and proteinuria which are common

risk factors for the development of CKD world wide [6]. Prevalence of hypertension was quite high among our respondents Our figure is much higher than values reported from other screening programmes both within the country and from other parts of the world [10-12] but similar to results of screening programme among the Australian Aborigines [13]. The demography of the population studied may partly explain the high prevalence of hypertension in our study. We studied a predominantly black population residing in an urban region. Hypertension is common in black population of Africa, occurring in 21-25% of the adult population in South Africa and Nigeria [14, 15]. Hypertension is also more prevalent in the urban than in the rural communities in Nigeria and this could explain the high prevalence in our study [15]. The lower prevalence rate reported during a screening programme by the Nigerian Association of Nephrology (NAN) could be due to the relatively younger age group (mean age of 27years) and also the small number of subjects screened [10]. Male respondents had a higher risk of developing hypertension in our study and this is similar to reports in the literature [16]. Hypertension and diabetes account for nearly 70% of all cases of CKD worldwide and these primary disease states also hasten the progression of kidney disease [2, 6]. Hypertension is reported to be the major cause of CKD in Nigeria and in other parts of tropical Africa [14, 17]. The high prevalence of hypertension in our study lends credence to the risk factor role of hypertension in causing CKD in the community and justifies the screening of the population for early detection and treatment of hypertension as was case with the Australian aborigines [13].

The crude prevalence of diabetes in this study was 2.6% and this is similar to the prevalence rate of 2.8% reported in the Non-Communicable Disease Survey (NCDS) [15]. According to World Health Organisation (WHO) estimates, there are currently 177million people with diabetes worldwide, this estimate will rise to 300 million by 2025, and the burden will fall on the developing countries [17]. In America and many countries of Western Europe, diabetes is the leading cause of ESRD [6]; a similar trend of increasing prevalence of diabetes as a cause of ESRD has also been reported in Nigeria and this is due to both rising prevalence of diabetes among the population and improvement in survival [18]. The low prevalence reported in our study could be because of the criteria used for diagnosis. We used glycosuria and random blood sugar test rather than a fasting plasma sugar test. The latter is more likely to pick up more individuals at risk of DM. It is a known that the blood sugar could be elevated for years before it appears in the urine [8]. Increasing evidence suggests that life style modification such as weight reduction, exercise and dietary manipulations can reduce the incidence of diabetes [14, 19].

The prevalence of proteinuria among the respondents is much higher than reports from other similar screening programmes from other parts of the world. The Screening for Hong Kong Asymptomatic Renal Population and Evaluation (SHARE) programme reported a prevalence of 3.2% [11], 2.4% in the Ausdiab Kidney Study [12], 0.3% in the Third National Health and Nutrition Examination Survey (NHANES III) [3] and 1.1% in the National Kidney Foundation Singapore (NKFS) programme [20]. However, our prevalence was similar to reports from the NAN screening [10] and reports from studies on Australian Aborigines [13]. This may be a reflection of the high prevalence of CKD in these communities. There was also a high prevalence of proteinuria among diabetics and hypertensives in this study and both conditions contribute to rising global burden of morbidity and mortality associated with cardiovascular diseases [6]. Albuminuria is not only an early marker of CKD but also of cardiovascular disease in those with CKD, hypertension, diabetes, as well as in the general population [21]. Albuminuria is also a risk factor for progression of CKD [2, 21]. The Prevention of End-Stage Renal and Endpoints (PREVEND) study has shown that urinary albumin excretion is associated with the risk of significant renal abnormalities in the non-diabetic population [21].

The global burden of CKD is worse in the developing countries where there is limited access to renal replacement therapy and therefore there is need for preventive programmes on CKD. The high prevalence of hypertension and proteinuria among the participants is rather worrisome and calls for concerted efforts at screening for hypertension and effective treatment strategies put in place to manage the disease. CKD is known to have significant impact on the affected individual physically, financially and psychologically and on health budget expenditure. The early stage is asymptomatic and symptoms only appear when the disease is advanced therefore emphasis should be on early detection and institution of therapies that can slow progression of the disease [1, 2, 6].

There are some limitations in our study; first, the study population was unselected so selection bias cannot be entirely eliminated. Secondly, we did not measure the body mass index, and serum creatinine

levels of the participants. Obesity is a known risk factor for CKD [6]. We propose the setting up of comprehensive screening programmes for detection, and treatment of CKD and its risk factors in the country since such programmes have been carried out successfully in other developing countries of the world [22-25].

CONCLUSION

Reports from this screening programme have shown that hypertension and proteinuria are prevalent in the community and this could account for the rising prevalence of CKD seen in the community. It calls for the setting up of preventive screening programmes and facilities for follow up evaluation and treatment for all who have CKD and its risk factors. Apart from nephrologists, primary care physicians need to be educated on the care of patients with CKD. The public must also bear responsibility in taking care of their health by regular health checks, especially those who are hypertensive, diabetic or have a family history of renal disease to stem the rising tide of CKD in the community.

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Competing Interests

The authors declare that they have no competing interests.

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