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A predominance of hypertensive heart failure in the Abuja Heart Study cohort of urban Nigerians: a prospective clinical registry of 1515 *de novo* cases

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Aims Even though cardiovascular disease is gradually becoming the major cause of morbidity and mortality in sub-Saharan Africa, there are very few data on the pattern of heart disease in this part of the world. We therefore decided to determine the pattern of heart disease in Abuja, which is one of the fastest growing and most westernized cities in Nigeria, and compare our findings with those of the Heart of Soweto Study in South Africa.

Methods and results Detailed clinical data were consecutively captured from 1515 subjects of African descent, residing in Abuja, and equivalent Soweto data from 4626 subjects were available for comparison. In Abuja, male subjects were on average, ~2 years older than female subjects. Hypertension was the primary diagnosis in 45.8% of the cohort, comprising more women than men [odds ratio (OR) 1.96, 95% confidence interval (CI) 1.26–2.65], and hypertensive heart failure (HF) was the most common form of HF in 61% of cases. On an age- and sex-adjusted basis, compared with the Soweto cohort, the Abuja cohort were more likely to present with a primary diagnosis of hypertension (adjusted OR 2.10, 95% CI 1.85–2.42) or hypertensive heart disease/failure (OR 2.48, 95% CI 2.18–2.83); $P < 0.001$ for both. They were, however, far less likely to present with CAD (OR 0.04, 95% CI 0.02–0.11) and right heart failure (2.5% vs. 27%).

Conclusion As in Soweto, but more so, hypertension is the most common cause of *de novo* HF presentations in Abuja, Nigeria.

Keywords Abuja • Heart • Study • Cross-sectional • *De novo*

Introduction

With rapid westernization in sub-Saharan Africa, cardiovascular disease (CVD) is gradually becoming the major cause of morbidity and mortality in this part of the world. Changes in both demographic and epidemiological determinants of health, such as vaccination, use of antibiotics to treat infection, and ageing of the population, in addition to changes in lifestyle associated with urbanization, have resulted in the shift of the patterns of disease, with non-communicable diseases as a major cause of morbidity and mortality. These findings are similar to the changes in disease patterns that had earlier occurred in high-income countries.[1,2] It is suggested that age-specific rates of many CVD states are already higher in adults in sub-Saharan Africa than in populations in high-income countries.[3] For example, studies up to the 1970s showed a low prevalence of hypertension and no increase of blood pressure with age.[4–6] However, studies undertaken in the last 20 years demonstrate that this trend has changed dramatically.[7–10]

Unfortunately, given the size and diversity of the region and its population, there are still very few data on the pattern of heart

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disease in sub-Saharan Africa. There are two probable reasons for this; first, the looming threat posed by the emergence of CVD in sub-Saharan Africa is very much underestimated (indeed it has often been denied) and, secondly, there is so much emphasis on communicable diseases such as HIV/AIDS and malaria. The second factor is often to the detriment of tackling all forms of non-communicable diseases in terms of health priorities and funding.[11] In Nigeria, for example, the last published work on the pattern of heart disease, to the best of our knowledge, was in the 1970s.[12]

We therefore studied the pattern of heart disease in Abuja, Nigeria, which is one of the fastest growing and most westernized cities in Nigeria. We also set out to compare and contrast our findings formally with similar data derived from the Heart of Soweto Study in South Africa. The latter study also focused on a large urban population in South Africa undergoing epidemiological transition and represents the largest cardiovascular registry in sub-Saharan Africa to date.[13]

Methods

Study setting: Nigeria

The Nigerian component of this study was performed in the Cardiology Unit of the Department of Medicine of University of Abuja Teaching Hospital which is the largest hospital (360 beds) serving Abuja, which has a population of ~ 1 million people. The Cardiology Unit has the services of two cardiologists, three internists in training, three house physicians, and three trained nurses. This study conforms to the principles outlined in the Declaration of Helsinki.[14] Wherever possible, it also adheres to the STROBE guidelines[15] for an observational study of this kind. Ethics approval was obtained from the University of Abuja Teaching Hospital Ethical Committee. Informed consent was obtained from all patients.

Nigerian participants

We prospectively studied every consecutive patient referred for the first time to the Cardiology clinic of the University of Abuja Teaching Hospital during the period April 2006 to April 2010. These patients were typically referred by Family and General Physicians in primary and secondary healthcare including private facilities. Subjects were on average public servants, traders, businessmen, artisans, politicians, and retired public servants. A total of 1586 subjects were recruited for the study, with an average recruitment of 40 subjects per month. Of these, 71 (4.5%) were excluded as they had no cardiac-related diseases, leaving a study cohort of 1515 subjects. Patients excluded were those with musculoskeletal chest pain, and patients with hepatic and renal failure.

Nigerian study data

With dedicated personnel using a standardized questionnaire, baseline demographic and clinical characteristics of patients were obtained. Data were collected on a consecutive patient basis which was designed to keep selection bias to a minimum. Information obtained from the patients included age, gender, history of hypertension, history of diabetes mellitus, and family history of hypertension and diabetes mellitus. Other information collected was past or present history of angina pectoris, myocardial infarction, transient ischaemic attacks, cerebrovascular accident, heart failure, and renal failure. Each subject had a complete physical examination including weight and height measurements. Blood pressure was measured according to standard guidelines with a mercury sphygmomanometer (Accosson, London, UK). Systolic and diastolic blood pressurec was measured using Korotkof sounds I and V. Blood pressure was measured at the right arm three times, with a 5 min rest between each measurement. The diagnosis of hypertension was made when the average of three blood pressure measurements was $\geq$140/90 mmHg, or the subject was already on antihypertensive therapy.[16] A diagnosis of heart failure was made according to the guidelines of the European Society of Cardiology on the diagnosis and treatment of heart failure.[17,18] The diagnosis of hypertensive heart failure was also made according to the same guidelines.[17,18] Diastolic heart failure (heart failure with preserved EF) was said to occur when the LVEF was $\geq$ 50%.[19]

Right-sided heart failure was defined as heart failure secondary to right-sided pathology with increased jugular venous pressure and liver size, tricuspid regurgitation, and/or elevated right ventricular systolic pressure $>$35 mmHg.[19] The diagnosis of idiopathic dilated cardiomyopathy was that of exclusion in subjects presenting with features of heart failure without any obvious aetiological factor.[20] Myocardial infarction was diagnosed using history of angina pain, ECG changes, and cardiac enzymes (cardiac troponin I, with a cut-off value of 0.5 ng/mL).[21]

Subjects were weighed without shoes and in light clothing on a standard beam balance. Height was measured to the nearest centimetre using an anthropometric plane, with subjects not wearing shoes or headgear. Body mass index was calculated as kg/m^2. Laboratory investigations carried out on the subjects included fasting blood sugar, fasting lipid profile, electrolytes, urea, creatinine, and haematocrit. Dyslipidaemia was defined as total cholesterol $>$ 5.2 mmol/L. Subjects were said to have multiple risk factors when they had two or more of the following cardiovascular risk factors: dyslipidaemia, diabetes mellitus, hypertension, obesity, and smoking.

All subjects also had 12-lead ECG performed by a trained ECG technician with subsequent independent coding according to Minnesota criteria.[22] Echocardiography was performed using a commercially available ultrasound system (IVIS-60). Subjects were examined in the left lateral decubitus position using standard parasternal, short-axis, and apical views. Measurements were performed according to the guidelines of the American Society of Echocardiography.[23] The LV measurements taken included interventricular septal thickness at end-diastole (IVSd), the posterior wall thickness at end-diastole (PWTd), and the LV internal dimensions at end-diastole (LVIDd) and end-systole (LVIDs). The LV systolic function was calculated by Teichholz's formula and by volumetric analysis when a regional wall motion abnormality was detected. The LV flow velocities were measured using pulsed-wave Doppler from the apical four-chamber view with sample volume located between the tips of the mitral valve leaflet during ventricular diastole. Peak velocity of early rapid filling (E), peak velocity of late filling caused by atrial contraction (A), and the interval from peak E wave to its extrapolation to the baseline or decelaration time (DT) were measured. LV filling was classified into normal filling (E/A = 1–2 and DT = 130–220 ms), impaired relaxation (E/A $>$1 and DT $>$220 ms), restrictive filling (E/A $>$2 and DT $<$130 ms) and pseudonormal filling (E/A = 1–2 and DT $>$220 ms). The diagnosis of pseudnormal filling was further confirmed using tissue Doppler imaging.

Heart of Soweto comparison data

As described in detail previously, the Heart of Soweto Study comprised a clinical registry that captured data on *de novo* presentations of hypertension and advanced forms of heart disease to the Chris Hani Baragwanath Hospital servicing the local townships of Soweto in South Africa. In Soweto, the Cardiology Unit at the institution remains the main pathway to a definitive diagnosis of heart disease. A community in epidemiological transition,[13] this community represents one of the largest urban enclaves of Africans in sub-Saharan Africa. Over a period of 3 years (2007–2009), a total of 4626 subjects of African descent were captured by the clinical registry. Importantly, the same methods (with

only small differences) for clinical profiling (including echocardiography and ECG) were applied across the two different studies (the Nigerian study being informed by the previously conducted Soweto study).

Statistical analysis

Data were analysed using SPSS version 13.0 (SPSS Inc., Chicago, IL, USA). Normally distributed continuous data are presented as the mean ± standard deviation, and non-Gaussian distributed variables as the median plus interquartile range. Categorical data are presented as percentages. Discrete variables were analysed via odds ratios (ORs) with 95% confidence intervals (CIs) or χ^2 analysis. A (two-sided) *P*-value <0.05 was considered statistically significant. Categorical variables from both studies were also compared using χ^2 analyses, and a *P*-value <0.05 was considered significant.

Results

Table 1 summarizes the clinical and demographic characteristics of the study subjects. There were slightly more women (50.7%) than men. Men were, on average, ~ 2 years older than women. Overall, hypertension was the primary diagnosis in around two-thirds of the study cohort, comprising more women than men (OR 1.96, 95% CI 1.26–2.65). However, men were significantly more likely to smoke (OR 1.95, 95% CI 1.83–2.65), be diabetic (OR 1.77, CI 1.25–2.37), and present with heart failure (OR 1.61, 95% CI 1.19–2.32) or a cerebrovascular accident (OR 1.62, 95% CI 1.18–2.20). In contrast to presenting with less advanced forms of CVD, and in addition to presenting with more hypertension, women were significantly more likely to present as obese (OR 1.78, 95% CI 1.20–2.34). A significant proportion of the subjects presented with symptoms indicative of underlying cardiac disease, with ~ 80.9% of heart failure subjects presenting with dyspnoea on exertion equivalent to NYHA class III and IV, and over two-thirds of our subjects presented with palpitations (with more women than men affected; OR 1.68, 95% CI 1.41–2.42).

The clinical spectrum of disease amongst the subjects studied is shown in *Figures 1* and *2*. Hypertension without echocardiographic LV hypertrophy was the most common primary diagnosis in 699 subjects, representing 45.8% of the study population, while hypertension

Table 1 Demographic and clinical profile of subjects

Variable	All patients (*n* = 1515)	Males (*n* = 747)	Females (*n* = 768)	*P*-value
Mean age, years	49.0 ± 13.7	49.9 ± 13.0	48.1 ± 14.2	0.009
Family history of CVD	76 (5.0%)	43 (5.8%)	33 (4.3%)	0.25
History of smoking	115 (7.6%)	106 (14.2%)	9 (1.1%)	0.001
Dyslipidaemia	205/913 (22.5%)	96/476 (20.2%)	108/445 (24.3%)	0.55
LDL cholesterol:HDL cholesterol	3.1 ± 2.3	3.1 ± 2.0	3.2 ± 2.7	0.66
Total cholesterol, mmol/L	4.7 ± 1.3	4.6 ± 1.3	4.7 ± 1.3	0.78
BMI, kg/ m^2	27.5 ± 6.0	26.6 ± 5.1	28.4 ± 6.7	0.000
BMI >30 kg/m^2	409 (27.0%)	136 (18.2%)	263 (34.2%)	0.000
Multiple risk factors	182 (12.0%)	110 (14.7%)	72 (9.4%)	0.005
NYHA class II/III–IV	57/168	27/76	30/92	0.72
Mean heart rate, b.p.m.	82.9 ± 18.3	80.2 ± 17.2	85.5 ± 18.3	0.000
Systolic blood pressure, mmHg	137.1 ± 27.9	138.1 ± 28.5	136.1 ± 27.2	0.155
Diastolic blood pressure, mmHg	87.9 ± 17.0	89.3 ± 17.6	86.5 ± 16.3	0.002
Palpitations	533 (35.2%)	219 (29.3%)	314 (40.9%)	0.000
Chest pain/angina	300 (19.8%)	147 (19.7%)	153 (19.9%)	0.166
Oedema (pulmonary/peripheral)	766 (50.6%)	377 (50.5%)	389 (50.7%)	0.256
eGFR (mL/min/1.73 m^2)	85.5 ± 50.1	84.9 ± 46.3	86.9 ± 53.8	0.70
Mean fasting blood sugar	5.6 ± 2.6	5.7 ± 2.7	5.5 ± 2.6	0.44
Hypertension as a primary diagnosis	983 (64.9%)	397 (53.1%)	586 (76.3%)	0.000
Heart failure	475 (31.4%)	214 (28.6%)	261 (34.0%)	0.031
Structural valvular disease	55 (3.6%)	33 (4.4%)	22 (2.9%)	0.138
Coronary artery disease	3 (0.2%)	3 (0.4%)	0 (0%)	0.120
Cerebrovascular accident	72 (4.8%)	50 (6.7%)	22 (2.9%)	0.001
Renal disease (mild-moderate/severe)	657 (43.4%)	328 (43.9%)	329 (42.8%)	0.97
Anaemia	81 (5.3%)	30 (4.0%)	51 (6.6%)	0.02
Diabetes mellitus	113 (7.5%)	73 (9.8%)	40 (5.2%)	0.002
HIV infection	17 (1.1%)	10 (1.3%)	7 (0.91)	0.47

Data are the number (%) and mean ± standard deviation.
Hypercholesterolaemia was defined as a serum concentration of fasting total cholesterol >5.5 mmol/L (clinical data were collected in 914 subjects).
Mild renal dysfunction was defined as an estimated glomerular filtration rate (eGFR) of 60–90 mL/min/1.73 m^2, and moderate to severe renal impairment as eGFR of <60 mL/min/1.73 m^2.
BMI, body mass index; CVD, cardiovascular disease; HIV, human immunodefiency virus.

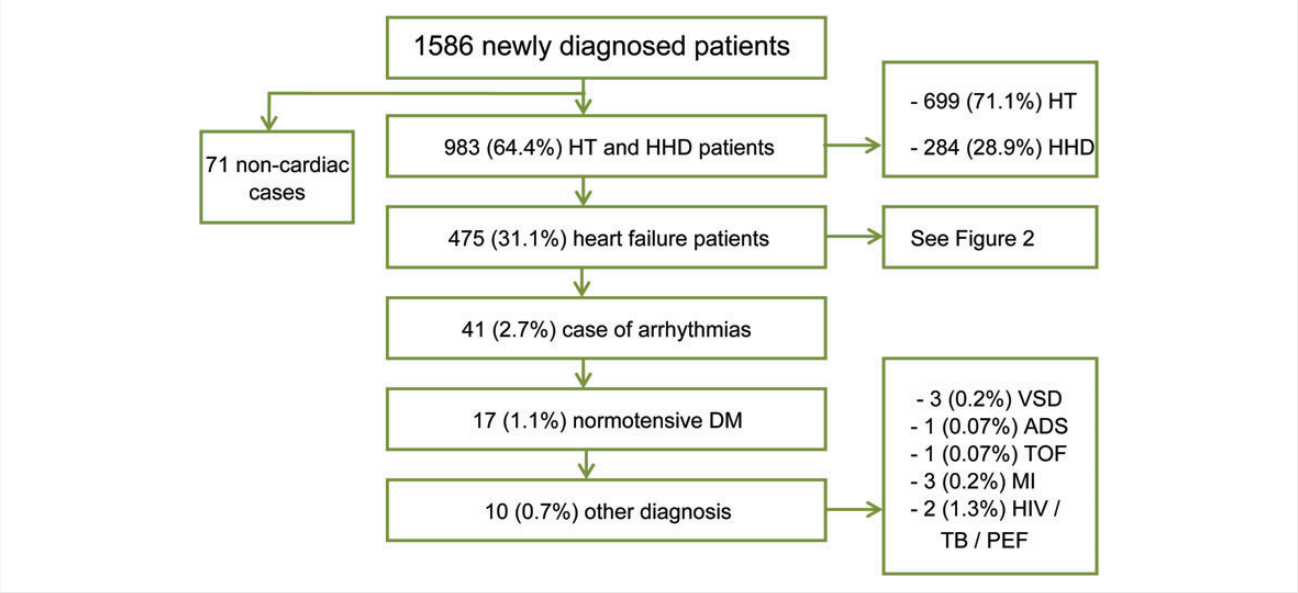

Figure 1 Clinical spectrum of disease. ASD, atrial septal defect; DM, diabetes mellitus; HHD, hypertensive heart disease; HIV, human immunodeficiency virus; HT, hypertension; MI, myocardial infarction; PE, pericardial effusion; TB, tuberculosis; TOF, tetralogy of Fallot; VSD, ventricular septal defect. Non-cardiac cases comprise chest pain of musculoskeletal origin, hepatic failure, and renal failure.

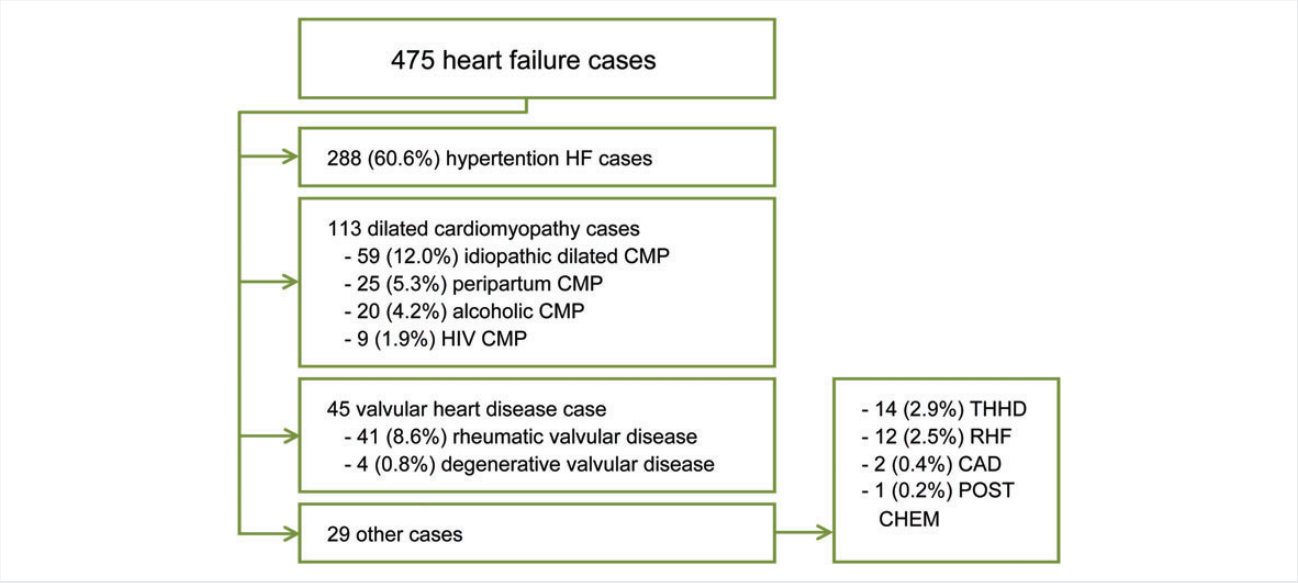

Figure 2 Pattern of heart failure (HF). CHEM, chemotherapy; CMP, cardiomyopathy; HIV, human immunodeficiency virus; THHD, thyrotoxic heart disease.

with LV hypertrophy occurred in 284 subjects, representing 18.6% of the subjects studied. Heart failure occurred in 475 subjects, representing 31.1% of the study population. Hypertension was the most common cause of heart failure, accounting for heart failure in 60.6% of cases. The other two common causes of heart failure were idiopathic dilated cardiomyopathy in 59 cases, representing 12.0%, and rheumatic heart disease in 41 cases, representing 8.6%. CAD was seen in just three cases, representing 0.2% of cases.

Table 2 shows the summary of 12-lead ECG and echocardiographic findings of the study population. There were no gender

Table 2 Electrocardiographic and echocardiographic findings in subjects

	All	Males	Females	*P*-value
Echocardiographic findings	$n = 1506$	$n = 751$	$n = 753$	
Mean LVEF, %	64.8 ± 20.6	62.7 ± 21.1	67.1 ± 19.6	0.000
Moderate-severe LV systolic dysfunction, %	225 (14.9%)	132 (17.6%)	92 (12.2%)	0.27
LV end-diastolic diameter, mm	4.73 ± 1.7	4.90 ± 2.2	4.57 ± 0.89	0.000
LV end-systolic diameter, mm	3.13 ± 1.2	3.27 ± 1.2	3.00 ± 1.25	0.000
Interventricular septal diameter >13 mm	301 (20.0%)	194 (25.8%)	105 (13.9%)	0.05
Diastolic dysfunction	501 (33.3%)	274 (36.5%)	227 (30.1%)	0.39
Valvular abnormality				
Mitral regurgitation	41 (2.7%)	14 (1.9%)	27 (3.6%)	0.04
Tricuspid regurgitation	6 (0.40%)	2 (0.27%)	4 (0.53%)	0.41
Aortic stenosis	22 (1.5%)	7 (0.93%)	15 (2.0%)	0.09
12-lead ECG	$n = 1330$	$n = 658$	$n = 672$	
Sinus rhythm	1185 (89.1%)	576 (87.5%)	609 (90.6%)	0.82
Atrial fibrillation	52 (3.9%)	28 (3.7%)	24 (3.2%)	0.70
LV strain pattern	76 (5.7%)	40 (5.3%)	36 (4.8%)	0.65
Axis deviation (left or right)	84 (6.3%)	44 (5.9%)	40 (5.3%)	0.76
Bundle branch block	68 (5.1)	48 (6.4%)	40 (5.3%)	0.75

Moderate-severe LV systolic dysfunction was defined as LVEF <45%.

differences according to ECG presentation. However, echocardiography showed that men have larger ventricles overall and they presented with a significantly lower mean LVEF.

Comparisons to the Heart of Soweto cohort

Table 3 compares the key results from the Nigerian study subjects and those of African origin from the Heart of Soweto Study. There was an even greater preponderance of women in Soweto (62%), with slightly older (2–3 years) subjects overall. In addition to a far more frequently reported family history of CVD, the pattern of modifiable risk was markedly greater in Soweto in some aspects, with markedly higher rates of smoking and elevated fasting cholesterol and blood sugar levels in both sexes, indicative of a less healthy dietary intake. On the other hand, the anthropometric profile of both cohorts was similar, with markedly more obesity in women (around one-third) compared with men. Most notably, there were higher levels of hypertension (any diagnosis) in the Abuja study subjects (both sexes), with a notable difference in the proportion of males with a diagnosis of type 2 diabetes (almost double in Abuja). Overall, there were both similar and differential patterns of presentation, with high levels of dyspnoea on exertion (similar proportions), oedema (slightly more in Abuja), palpitations (more in Soweto), and chest pain (proportionately more men but fewer women in Abuja). These similarities and differences were reflected in the overall case mix of presentation according to the primary diagnosis. On an age- and sex-adjusted basis, the Abuja subjects were more likely to present with a primary diagnosis of hypertension (adjusted OR 2.10, 95% CI 1.85–2.42) or hypertensive heart disease/failure (OR 2.48, 95% CI 2.18–2.83); $P < 0.001$ for both comparisons, and represented more than two-thirds of presentations in Abuja. On the other hand, they were far less likely to present with CAD (OR 0.04, 95% CI 0.02–0.11), dilated cardiomyopathy (OR 0.35, 95% CI 0.26–0.46), right heart failure (OR 0.09, 95% CI 0.05–0.17), and valve disease (predominantly on the right side in both sites; OR 0.21, 95% CI 0.16–0.28); $P < 0.001$ for all comparisons. However, despite more impaired systolic function (>10% absolute difference in mean LVEF) overall, the two groups had similar rates of underlying heart failure (OR 0.98, 95% CI 0.87–1.10).

Discussion

This study has shown that hypertension with or without LV hypertrophy was the primary diagnosis in almost two-thirds of those presenting to a cardiology clinic within a teaching hospital in Nigeria. This diagnosis was more frequently observed in women compared with men. In the Heart of Soweto Study, hypertension was present in just over half of 1593 newly diagnosed CVD cases and also occurred more in women than in men (64% vs. 36%). It is not surprising that hypertension and hypertensive LV hypertrophy are the most common primary diagnoses in our study as it is it is well known that hypertension and its complications are more common in those of African descent compared with other races. Several studies have shown a higher prevalence of LV wall thickness, congestive cardiac failure, chronic kidney disease, and cerebrovascular accident in African-Americans than in white hypertensive subjects.[16,24] Apart from our female subjects presenting more with a primary diagnosis of hypertension and hypertensive LV hypertrophy, they were more obese, presented more with palpitations, and were more anaemic when compared with the male subjects. On the other hand, males subjects smoke more, and presented with more advanced forms of CVD, including type 2 diabetes, cerebrovacular accident, and heart failure. They also presented more with a larger left ventricle and worse LV systolic function.

Table 3 Comparison of demographic and clinical parameters in Abuja and Soweto subjects

Variables	Abuja subjects ($n = 1515$)	Soweto subjects ($n = 1593$)
Age, years	49.0 ± 13.7	52.8 ± 17.1
Positive family history	76 (5.0%)	405 (25%)
Smoking habits	115 (7.6%)	661 (41%)
Hypercholesterolaemia	205 (22.5%)	159 (22%)
Multiple risk factors	182 (12.0%)	933 (59%)
NYHA class III or IV	168 (11.1%)	486 (31%)
Heart rate, b.p.m.	82.9 ± 18.3	86.0 ± 21.8
Systolic blood pressure, mmHg	137.1 ± 27.9	130.0 ± 27.1
Diastolic blood pressure, mmHg	87.9 ± 17.0	73.0 ± 16.6
Angina/chest pain	300 (19.8%)	451 (28.0%)
Oedema (pulmonary and peripheral)	766 (50.6%)	494 (31.0%)
Renal dysfunction	90 (5.9%)	115 (10.0%)
Anaemia	81 (5.3%)	156 (13.0%)
Diabetes mellitus	113 (7.5%)	165 (10.0%)
HIV positivity	17 (1.1%)	74 (5.0%)
Sinus rhythm	1185 (89.1%)	1321 (92.0%)
Atrial fibrillation	52 (3.9%)	102 (7.0%)
Bundle branch block	68 (5.1%)	127 (9%)
Mean LVEF	64.8 ± 20.6	53.0 ± 17.4
Systolic HF	266 (17.6)	415 (29.0%)
HF with preserved EF	87 (5.7%)	373 (26.0%)

Renal dysfunction was defined here as serum creatinine concentration >160 μmol/L.
HIV, human immunodeficiency virus.

In comparing data from Abuja with those from Soweto, it is first worth considering whether data from these two comparable registries are truly representative of the spectrum of heart disease in their respective communities. Both sites were selected for the fact that they represent the predominant clinical setting for advanced investigations of suspected heart disease cases in Abuja and Soweto. While there were undoubted differences in how individuals were referred to the two clinics, and the studies are not as rigorous as population cohort and surveillance studies (with greater detection of milder cases), they do provide consistent indicators of more advanced cases of heart disease in the two communities. On a like for like basis, therefore, the Abuja subjects, when compared with the Heart of Soweto subjects, have higher systolic and diastolic blood pressures and are also more oedematous. The higher level of oedema in the Abuja subjects, when compared with the Heart of Soweto subjects, can be partly explained by the fact that the former were all black Africans, while the Heart of Soweto subjects comprised a mixed population of different races and ethnic groups (although black African was the predominant group). It has been previously reported that those of African descent with CVD tend to retain more fluid when compared with Caucasians and Asians, and this has been attributed to differences in salt-sensitive activation of the renin–angiotensin system.[25] The reported prevalence of CAD was much higher in the Soweto subjects, compared with the Abuja subjects, and this can be attributable to a higher prevalence of risk factors such as smoking (41% vs. 7.5%), diabetes mellitus (10.0% vs. 7.5%), and retroviral disease (5.0% vs. 1.1%), when compared with the Abuja subjects. In addition, a higher number of subjects of the Heart of Soweto Study presented with multiple risk factors compared with the Abuja subjects.

The three most common forms of heart failure in our study were hypertensive heart failure, heart failure due to idiopathic dilated cardiomyopathy, and heart failure due to rheumatic heart disease. A similar pattern has been reported previously in this population group,[26] and this is also similar to the findings in the Heart of Soweto Study, except that right-sided heart failure secondary to cor pulmonale was the third most common form of heart failure in the Heart of Soweto Study.[13] Right-sided heart failure occurred in 2.5% of our heart failure patients, but in 27% in the Heart of Soweto Study.[13] A more recent report of the Heart of Soweto Study[27] in a larger population of heart failure cases (2505) showed that 28% were diagnosed with right heart failure, with this being the primary diagnosis in 50% of the cases. The lower prevalence of right-sided heart failure and cor pulmonale is probably due to the fact that our subjects smoked less (7.5% vs. 41%), are less exposed to industrial pollutants, and live at a lower altitude than Soweto subjects. Hypertension was responsible for heart failure in 61% of the heart failure cases, which is similar to previous findings in Nigeria and some studies in sub-Saharan Africa.[25,28] In the Heart of Soweto Study, hypertension accounted for heart failure in 53% of newly presenting cases.[16,24]

Myocardial infarction accounted for 3 (0.2%) cases out of all the 1515 subjects studied and 2 (0.42%) cases of the 475 heart failure subjects studied. This supports previous findings that the prevalence

CAD is still low in this population group.[29] In the Heart of Soweto Study, the prevalence of CAD of 6% in Blacks is much higher than that in our subjects. However, it must be emphasized that since the diagnosis of myocardial infarction was made in the Abuja subjects with only ECG and cardiac enzymes, with no myocardial perfusion imaging or coronary angiography performed, there may be some underestimation of the prevalence of CAD in this population.

In addition, even though the prevalence rates of risk factors such as diabetes mellitus, smoking, and hypercholesterolaemia of 7.5, 7.6, and 22.5%, respectively, in our subjects are not as high as those in western countries, these prevalence rates cannot be overlooked, and might be an indicator of the much talked about transition in disease pattern in our population group.

Finally, a significant proportion of our heart failure subjects were symptomatic on presentation, with 78.9% presenting with dyspnoea on exertion equivalent to NYHA class III and IV. This late presentation of our heart failure subjects portends a bad trend, as it has the potential to worsen prognosis, with increased levels of morbidity and mortality, thereby undermining national productivity as a consequence of the number of active life years lost by the most active workforce of the population.

Our study has a number of limitations. First, since we focused on patients being managed by a tertiary centre to describe the pattern of heart disease within this area, we acknowledge the fact that we might not have captured some subjects who have milder forms or subclinical CVD, and also subjects with other symptoms of CVD such as chronic kidney disease and cerebrovascular disease who will not present first to the cardiologist but to other disciplines. Finally, it is a well known fact in our environment that people seek treatment from alternative medical sources, making it quite difficult to capture such patients. However, our ability to provide comprehensive 12-lead ECG and echocardiographic data for most of our subjects is a major strength of this study and, wherever possible, we have adhered strictly to the STROBE guidelines[14] relating to the reporting of a study of this nature.

Conclusions

We have been able to show that as in Soweto, but more so, hypertension is the most common cause of *de novo* heart failure presentations in Abuja, Nigeria. Therefore, the need for preventive cardiology to be stepped up in this population group for the treatment and control of hypertension cannot be overemphasized.

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Conflict of interest: none declared

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