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Predictors of rehospitalisation in patients admitted with heart failure in Abeokuta, Nigeria: Data from the Abeokuta Heart failure Registry

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Abstract

Purpose

We sought, for the first time, to examine the rate and predictors of hospital readmission in patients discharged after an episode of HF in Nigeria.

Methods

This was a hospital-based, prospective, observational study that used the data from the Abeokuta HF Registry.

Findings

Overall, 1.53% (95% CI, 0.58-4.02) and 12.2% (95%CI, 8.88-16.8) of patients, respectively, were re-hospitalized at least once within 30 days and 6 months (5.3% had multiple readmissions); the latter comprising 21/138 men (15.2%) and 11/124 (8.9%) women. A total of 11 (4.2%) also died (all of whom had been re-hospitalized). Worsening HF (24 cases, 75%) was the commonest reason for readmission. Among others, factors associated with rehospitalization include presence of mitral regurgitation (OR, 2.37; 95%CI, 1.26-4.46), age ≥ 60 years (OR, 2.04; 95%CI, 0.96-3.29), presence of tricuspid regurgitation (OR, 1.77; 95% CI, 0.86-3.61), and presence of atrial fibrillation (OR, 1.34; 95%CI, 0.59-3.03). However, on an adjusted basis, only female gender (adjusted OR 0.33, 95% CI 0.14-0.79; p=0.014 versus men) and body mass index <19kg/m^2 (adjusted OR 3.74, 95% CI 1.15-12.16; p=0.028 versus rest) were independent correlates of readmission during 6-months follow-up.

Conclusions

HF rehospitalization within 6-months follow-up occurs in about 12% of our cohort living an environment where HF etiology is predominately non-ischemic and the HF population is relatively younger. Higher rates of readmission were noted in those of older age, lower BMI, low literacy, lower serum sodium level, presence of atrial fibrillation, renal dysfunction and valvular dysfunction.

Keywords: Heart Failure, Rehospitalisation, Survival, Outcome, Predictors, Nigeria

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Introduction

Heart failure (HF) affects over 23 million people worldwide.(1) In the United States of America (USA) alone, about 5.8 million people are affected and up to 2.4 million hospital admissions can be attributed to HF as primary or secondary diagnoses.(2) In Europe, over 60% of economic cost of HF is related to hospital admissions.(3) This is because HF is associated with high rates of recurrent hospitalisations and frequent clinic visits. HF in Nigeria and in most parts of Sub-Saharan Africa commonly afflicts people in the prime of their life, mostly due to non-ischemic origin especially hypertensive heart disease and patients often present late with severe symptoms.(4-9)

Data from developed countries show that half of HF patients are rehospitalised within 6-months of discharge(10) and 70% of these are due to worsening of previously diagnosed HF.(11) In a recent report, Jencks et al(12) showed that HF is the number one reason for readmission in the USA. Predictably, HF readmission is associated with higher mortality compared to the index admission. Whether similar patterns of readmission occur in patients affected by HF in Sub-Saharan Africa and specifically West Africa is unknown.

We have previously re-confirmed via the Abeokuta HF Registry(4) that the risk factors and etiology of HF are not entirely same in sub-Saharan, compared to other parts of the world.(5) The aim of this study was for the first-time, therefore, to identify predictors of rehospitalisation in a Nigerian HF population using the data from the Abeokuta HF Registry.

Methods

Study design and clinical setting

As described previously (4), this is a hospital-based, prospective, observational study in which all patients with clinical diagnosis of HF were recruited from January 1, 2009 to December 31, 2010. Patients were enrolled if they met the Framingham(13) as well as the European Society of Cardiology(14) criteria for the diagnoses of HF.

The study was primarily conducted at the Federal Medical Centre (FMC), Abeokuta. The institution is the only tertiary health facility in the city.

Abeokuta is the capital city of Ogun state in Southwestern, Nigeria (one of the 36 states that make up the Federal Republic of Nigeria)

The entire state has an estimated population of 3.2 inhabitants based on the 2006 national population census, out of which a million are living in Abeokuta alone.(15)

Like in other parts of the country the state operates three-tier or level of healthcare: primary (health posts, health centers), secondary (Cottage, General or State hospitals) and tertiary health care (Federal medical centers and University of teaching hospitals) Primary health cares is constitutionally under the jurisdiction of the Local Government. The remaining two are under the State and Federal Governments respectively.

A significant proportion of health care delivery is carried out by private health institutions and mission hospitals.

The costs of healthcare in the city and in most parts of the country are generally borne by the patients through out of pocket expenses. Social health insurance coverage is low in the city and in most parts of the country. On the other hand strong family bonding exist in the city where rich and well-to-do individuals assist their poor family members

Referrals were received from private as well as public primary and secondary health care facilities within the city of Abeokuta who were informed of the existence and importance of the registry. Patients aged 18-years and above were enrolled and all gave written informed consent and the institution's ethics review board approved the study. The study was carried out according to international laid out guidelines as enshrined in the Declaration of Helsinki.(16)

Clinical evaluation

A standard case report form was used in data collection. Baseline clinical and demographic variables such as age, gender, contact addresses, telephone number of patients and their

relations, marital status, occupation, educational background, history of cardiovascular risk factors such as hypertension, family history, cigarette smoking etc. were collected.

Also collected were the signs and symptoms, clinical diagnoses, co-morbidities, medications, result of investigation, date of discharge and intra-hospital outcome.

Blood pressure was recorded according to standard guideline(17) with the use of Mercury Sphygmomanometer (Accosson, London). Systolic and diastolic blood pressures were measured at Korotkoff sound phases I and V respectively. An average of three readings was taken after 5 minutes of rest. Patients were weighed without shoes and in light clothing on a standard beam balance. An anthropometric plane was used for height measurement with patients not putting on shoes or headgear.

Body mass index (BMI) was calculated using the formula: BMI = Weight (kg) / [height (m)] $^{2.}$

A BMI of 24-29.9kg/m^2 and >=30kg/m^2 defined overweight and obesity respectively. Anemia was defined as hematocrit of less than 10g/dl. Glomerular filtration rate was estimated using the four variables- Modification of Diet in Renal Disease (MDRD) formula(18) Renal dysfunction was defined as eGFR of less than 60ml/min/1.73m^2 (same criteria used by Stewart et al(5)

12 lead ECG tracing was obtained with Schiller ECG electrocardiograph (Schiller AG, Switzerland) and the reports were analyzed by the authors blinded to the clinical history of the patients. M-mode, 2D and Doppler echocardiography were performed using an ALOKA 4000 SSD machine (ALOKA co. Ltd, Tokyo, Japan) according to standard criteria.(19)

The criteria employed for diagnoses of the different etiologies have been previously reported.(4)

Follow up

The patients were followed up for a period of six months. Information on readmission was assessed through: hospital case record, telephone contact of patients or their relatives (Cell phone coverage in Nigeria is quite extensive and remarkable), telephone calls to their private doctors (where necessary) and occasional home visits by research assistants.

Follow up was done at 1- and 6-months after the index admission. Information collected during follow up among other things included patients' wellbeing (subject's feeling about his or her general health which was graded from markedly improved to markedly worse), medications as well as information on rehospitalization. At the end of 6 months, 233 out of the 262 patients were known to be alive, 18 were lost to follow up and 11 patients were known to have died (all during hospital readmission). Thirty two patients were readmitted at least once, 13 patients twice and one was readmitted thrice within 6 months.

Data management and statistical analysis

Data management was with the use of EpiData data management software (The EpiData Association, att. Jens Lauritsen, Enghavevej 34, DK5230 Odense M, Denmark). Data analysis was with IBM SPSS version 20 (SPSS, Inc. Chicago Illinois) and STATA version 11 (Stata Corp LP 4905 Lakeway Drive College Station, Texas 77845-4512 USA) statistical softwares.

Continuous data are expressed as mean ± SD, (or median ± IQR where necessary) and 95% confidence interval. Categorical variables are expressed as proportions. The patients were grouped into two (group 1, those not rehospitalised; and group 2, those rehospitalised). They were compared accordingly. Univariate regression analysis was used to identify factors associated with rehospitalization. Forest plot was constructed for the result of the univariate analysis. Multiple logistic regression analysis was used to determine the independent predictors of readmission. The criteria for inclusion in the multiple logistic regression analysis was a p-value <0.15 in the univariate analysis.P<0.05 was adjudged statistically significant.

Results

Sociodemographic characteristics

Two hundred and sixty two patients, comprising 138 men (53%) and 124 (47%) women, who survived admission for de novo HF were followed up for six months. **Table 1** compares the socio-demographic and clinical profile of the cohort according to 6-month readmission status. The group readmitted were significantly older (mean age 61.7±14.0 vs.56.1±15.4,

p=0.026). Except for body mass index and serum sodium, which were significantly higher in the readmitted group (p=0.029 and 0.039 respectively), all the other parameters were similar between the two groups. **(Table 2)**

The overall mean length of hospital stay was 10.5 +- 6.1 days (range 2-61 days; median 9 days). Eleven (12.2%) of the 90 patients who were on admission for 7 days or less (short stay) compared to 21 (12.2%) of the 172 patients who had length of hospital admission (>7days) were rehospitalised.

Readmission rates

The readmission rates at 30- and 180-days were 1.53% (95% CI, 0.58-4.02) and 12.2% (95%CI, 8.88-16.8) respectively**. Figure 1** is a Kaplan-Meier survival curve for re-admission in our cohort.

Reasons for 6 month readmission

Twenty four (75%) of the 32 patients were admitted on account of worsening HF. Three were due to arrhythmias (atrial fibrillation) while one each was due to pneumonia, lower gastrointestinal bleeding, renal failure, angioedema and severe hypertension.

Clinical correlates of readmission

Those readmitted were older, more likely to be men and non-smokers, took less alcohol (59.4% vs. 61.7%), and had lower frequency of diabetes mellitus (DM)

(9.4% vs. 13.5%). They also tended to have more severe symptoms and signs of HF such as orthopnea (87.5 vs. 81.2%), paroxysmal, nocturnal dyspnoea (93.8 vs. 84.2%). virtually all the readmitted cases were in NYHA Class III or IV (100 vs. 91.4%). They also had lower body mass index (22.0 vs.24.3kg/sqm) – see **Table 1.** Total white cell count, lymphocyte count, serum sodium, total cholesterol, blood sugar were also higher in the readmitted group. Alternatively, serum potassium, creatinine, and packed cell volume levels were lower in rehospitalised patients. The frequency of atrial fibrillation was also higher in the readmitted group (18.8% vs. 11.7%)

Echocardiography

Accordingly to echocardiography, the left atrial diameter and left atrial area left ventricular diameter in systole were significantly higher in the readmitted group compared to the rest. Alternatively, LVEF was lower with 76.7% in those rehospitalised with those recording a LVEF <50% compared to 62.6% for the rest. Significantly the rehospitalised group also had higher rates of valvular dysfunction. **(Table 2)** In terms of prescribed pharmacotherapy the two groups were similar; with the notable exception of more digoxin prescribed in those rehospitalised (84.4% vs. 67%, p=0.046).

Predictors of rehospitalisation

According to univariate analysis (**Table 3**) Low BMI (OR, 2.95; 95%CI, 1.16-7.47; p=0.018), low literacy (none or less than 6-years of formal education), serum sodium <130mmol/L (OR, 4.11; 95%CI, 1.58-10.75; p=0.002), and presence of mitral regurgitation (OR, 4.64; 95%CI, 0.1.06-20.29; p=0.026) were significantly associated with higher risk of rehospitalization. Factors associated with lower risk of rehospitalisation include: female gender, history of smoking, presence of DM, higher random blood sugar, and higher packed cell volume**.** On an adjusted basis (see **Figure 3**), only female gender (adjusted OR 0.33, 95% CI 0.14-0.79; p=0.014 versus men) and body mass index <19kg/m^2 (adjusted OR 3.74, 95% CI 1.15-12.16; p=0.028 versus rest) were independent correlates of readmission during 6-months follow-up.

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Discussion

This represents one of the first-ever reports from the city of Abeokuta, Nigeria to prospectively determine medium-term outcomes in adults who survive a de novo hospitalisation for HF. Our sample represents a unique population of HF patients from the south-western zone of Nigeria.

As in other parts of Africa (5, 6) and in contrast to reports from high income countries (20, 21) this was a relatively young cohort with HF of predominantly non-ischemic causes. With full follow-up in the majority of case, we found a low-rate of 6 month mortality (4.2%), as well as relatively low-rates of rehospitalisation (predominantly recurrent HF) at 30 days (1.53%) and 6 months (12.2%). In this Nigerian population and HF cohort, there were a number of characteristics that appeared to modulate the risk of rehospitalisation. Higher rates of rehospitalisation were observed in those of older age, lower BMI, low literacy , lower serum sodium level, presence of atrial fibrillation, renal dysfunction and valvular dysfunction were associated with higher likelihood of readmission. Conversely, women, being single, history of DM and lower packed cell volume were associated with lower rates of rehospitalisation. Given the size of the cohort and relatively low number of rehospitalised patients, it was difficult to determine independent predictors of such an event. However, further analyses did show that on an adjusted basis, women were two-thirds less likely to be readmitted compared to men, while those with a low BMI were almost four times more likely to be readmitted to their heavier, potentially more nourished counterparts.

The readmission rate of 12% in the present study is generally lower than the rates reported from North America and Europe. In a study by Krumholz et al(22), it was reported that about 50% of HF patients were readmitted within 6-months after the initial admission. Ross et al(23) showed from Medicare data, that all cause readmission ranges from 22.9% to 23.3% between 2004 and 2006 in the United States. However, consistent with other data from sub-

Saharan Africa (5, 6) this was a relatively young cohort with HF caused by predominantly non-ischaemic causes. In other parts of the world hospital readmission risk increases with age. Patients aged ≥65 years are far more likely to experience recurrent hospitalisation. A 4-fold increase in 30-day readmission rate was reported for elderly populations who were 80-years or older. Blackledge et al(24) and Koitabachi et al(25) observed a 24% increase per 10-year age increment in the annual readmission rate. The reported impact of gender on readmission rates in those with HF is inconsistent. While some authors reported higher rates in women (26), others reported higher rates in men similar to our finding.(27, 28)

Arrhythmias especially atrial fibrillation (AF) is common in HF and adversely affects hemodynamics in patients. Several studies have shown that this rhythm disorder is associated with higher risk of readmission in individuals with HF irrespective of ejection fraction or rhythm control.(29, 30) Recent findings from Africa suggest that AF occurs in 4.6% of cardiac cases(estimated 5.6 cases/100,000/year)(31) The mean age of occurrence is 57.2 ±18.8 years in Africa compared to70.1±13.4 years in North America.(32) Common risk factors include hypertension, heart failure and valvular heart disease.(31-34) Our finding of higher risk of readmission in patients with poor LV function is similar to the findings of many workers.(35, 36) However some recent reports indicate similar risk in HF with preserved ejection fraction.(37, 38) Our study also confirmed previous reports that presence of valvular dysfunction is associated with 4-fold higher risk of HF related readmission.(39)

Some plausible reasons for lower rate of readmission in our cohort compared with data from developed countries may be related to the younger age of our patients as well as the fact that majority of the patients had hypertensive heart failure related HF and other forms of non-ischemic related HF. Several studies have documented higher readmission rates with ischemic etiology.(24) Our patients also stayed longer on the ward (mean length of hospital stay was 9 days compared to 4 days in the USA) before discharge. This could have afforded them the opportunity of better stabilization. The fact that the study was carried out in a

cardiology unit/tertiary institution may account for our finding and may not reflect the situation in the general Nigerian population. The higher rate of readmission in lean patients may be related to cardiac cachexia and severe HF. It may also support the concept of obesity paradox in HF. Hyponatremia has been linked to frequent ventricular ectopics and sudden death. Hyponatremia in HF is due to activation of the renin-angiotensin-aldosterone axis, decreased sodium and water delivery to the collecting ducts of the nephron, coupled with resistance to the action of natriuretic peptides. Hyponatremia in HF is also linked to increased vasopressin levels in HF as a result of increase in number of aquaporin water channels in the collecting duct of the kidney(40). We also observed that the group rehospitalised had higher frequency of osteoarthritis. This may be related to age. It may also be due to concurrent use of non-steroidal anti-inflammatory drugs (NSAIDs) which can worsen their HF.

The impact of current smoking status on HF readmission is inconsistent. Similar to our finding, the “smoker’s paradox” has been demonstrated by other workers where a 23% lower risk of 90-day rehospitalization risk was reported in current cigarette smokers.(41) It has been postulated that current smoking has a preconditioning-like effect on HF patients, allowing a better outcome during acute decompensation. Furthermore sudden or recent cessation of smoking during hospitalization allow for more rapid stabilization and compensation among patients who were smoking up until the time of HF hospitalization. The paradox could also be explained by the beneficial or lower dimethyl arginine (ADMA- a potential nitric oxide synthase inhibitor) profile which has been documented in smokers by some authors.(42, 43) ADMA is increased in HF patients and it is associated with the severity of HF and also predicts adverse outcomes.(44)

Presence of DM or high blood glucose is an established predictor of readmission in HF patient. (45-48) This is due to the role of hyperglycemia and insulin resistance in the development of diabetic heart disease partly as a result of in-efficient myocardial fuel

metabolism.(49) Hyperglycemia could also induce shifts in the fluid and electrolytes that may affect the outcome of HF patients.

In the present study we observed that DM patients were less likely to be readmitted. This could be a statistical chance finding. It could also be due to the higher prevalence of HF with preserved EF in DM patients. These are generally less likely to be readmitted compared to those with reduced EF.

The implication of our finding is that simple socio-demographic and laboratory variables especially BMI, age , serum sodium ,presence of atrial fibrillation and valvular dysfunction could be used to predict patients who are at risk of rehospitalisation in our environment. It may be worthwhile to look at the impact of nutritional rehabilitation in our HF patients.
The process of care, access to health care, low literacy, poverty and cultural practices may also affect the timing of presentation of patients to health care facilities as well as adherence to clinic attendance and drug therapy
Because of ignorance coupled with poverty or lack of access to healthcare, patients in developing countries such as in Africa often present late to the hospital and when they do, catastrophic spending for care of chronic conditions such as HF is often a major challenge. This consequently affects adherence.

Cultural practices as well as superstitious beliefs also affect health seeking behavior in Africa. Patients often visit hospitals as a last option (after trying other alternatives including native or traditional medicine). For chronic conditions such as HF, they often move from one center to the other seeking for permanent cure. This also affects compliance**.**

It will be worthwhile to explore the impact of these factors in future outcome studies on HF or other chronic non-communicable diseases in our environment.

Limitations

As noted in a previous report (50), research is often problematic and challenging in a resource-poor environment and there are a number of limitations that require comment. The first of these is the sample size and fewer events which did not allow for the development of models of risk prediction for the population. A larger and multicentre study is therefore advocated to provide this information.

Heart rate variability and newer echocardiographic parameters such as tissue Doppler imaging were also not assessed. We also did not assess the impact of quality of life and psychosocial factors.

Finally, because our sample is limited to Abeokuta (south-western part of the country), our findings cannot be generalized to other parts of Nigeria.

Conclusions

HF rehospitalization within 6-months follow-up occurs in about 12% of patients in our cohort living an environment where HF etiology is predominately non-ischemic. Higher rates of readmission were noted in those of older age, lower BMI, low literacy, lower serum sodium level, presence of atrial fibrillation, renal dysfunction and valvular dysfunction.

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Figure Legends

Figure 1. Kaplan-Meier survival curve for re-admission

Figure 2. Shows univariate variables associated with readmission represented with forest plot. (Adjusted OR for women= 0.33 (95%CI, 0.14-0.79), Adjusted OR for BMI=3.74(95%CI, 1.15-12.16)

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Table 1: Baseline socio-demographic and clinical profile of the subjects

Variable	All (n= 262)	Rehospitalised (n=32)	Rest (n=230)	p-value
Socio-demography				
Gender (n/%) Men	138(52.7)	21(65.6)	117(50.9)	0.133
Age (years)	56.1(15.4)	61.7(14.0)	55.3±15.5	0.026
Single marital status (n/%)	45(21.5)	5(17.9)	40(22.1)	0.735
Urban residence (n/%)	201(76.7)	21(65.6)	180(78.3)	0.122
CV risk factors/co-morbidities (n/%)				
Never Smoked	214(81.7)	26(81.2)	188(81.7)	0.800
Current alcohol user	161(61.5)	19(59.4)	142(61.7)	0.305
Diabetes mellitus (Yes)	34(13.0)	3(9.4)	31(13.5)	0.779
Hypertension (Yes)	213(81.3)	27(84.4)	181(80.9)	0.810
Atrial fibrillation (%)	33(12.6)	6(18.8)	27(11.7)	0.263
COPD (Yes)	19(7.3)	4(12.5)	15(6.5)	0.265
Arthritis (Yes)	67(25.6)	12(37.5)	55(23.9)	0.128
Family history of heart disease	23(8.8)	4(12.5)	19(8.3)	0.500
Symptoms and signs (n/%)				
Cough	232(88.5)	27(84.4)	205(89.1)	0.385
Dyspnoea	253(97.3)	30(93.8)	223(97.8)	0.388
Orthopnoea	214(82.0)	28(87.5)	186(81.2)	0.470
Paroxysmal nocturnal dyspnoea	222(85.4)	30(93.8)	192(84.2)	0.189
Leg oedema	209(80.1)	26(81.2)	183(79.9)	0.859
Basal crepitation	218(83.2)	29(90.6)	189(82.2)	0.315
Elevated Jugular venous pressure	209(79.8)	28(87.5)	181(78.7)	0.348
Third heart sound	189(72.1)	24(75.0)	165(71.7)	0.834
Systolic murmur	123(46.9)	15(46.9)	108(47.0)	0.993
Hepatomegaly	186(71.0)	23(71.9)	163(70.9)	0.907
Ascites	59(22.5)	8(25.0)	51(22.2)	0.821
NYHA III or IV on admission	242(92.4)	32(100)	210(91.4)	0.325
Body mass index (kg/m^2)	24.0(5.2)	22.0±4.2	24.3±5.3	0.029
Temperature	36.4(0.8)	36.2±0.5	36.4±0.9	0.186
Respiratory rate	28.7(6.6)	29.7±8.8	28.5±6.3	0.335
Pulse rate	96.3(18.0)	96.1±18.1	96.4±18.0	0.942
Systolic blood pressure (mmHg)	136.2(29.7)	87.8±21.8	134.0±18.3	0.678
Diastolic blood pressure (mmHg)	87.6(18.8)	87.8±21.8	87.5±18.3	0.935
Pulse pressure	48.7(18.3)	50.5±16.0	48.5±18.6	0.568
Packed cell volume (%)	37,1(7.3)	37.6(6.8)	37.1(7.3)	0.719
White cell count	7.5(3.7)	7.6(3.9)	7.6(3.9)	0.194
Lymphocytes (%)	35.6(12.8)	35.1(11.4)	35.6(13.0)	0.833

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Serum Sodium (mmol/L)*	136.0(6.5)	133.4(6.2)	136.5(6.5)	0.039
Serum Potassium (mmol/L)	3.65(0.8)	4.0(0.9)	3.6(0.7)	0.102
Total Cholesterol (mg/dl)	166.0(80.4)	139.4(49.7)	169.5(83.4)	0.437
Blood Glucose (mg/dl)	115.9(55.9)	116.8(65.2)	116.0(54.5)	0.990
Blood Urea(mg/dl)+	43.7(4.1)	56.2(8.4)	42.0(3.1)	0.105
Blood creatinine(mg/dl)+	1.50(0.11)	1.36(0.15)	1.53(0.16)	0.683
QRS duration (msec)	109.7(29.5)	100.3(21.0)	112.2(31.1)	0.220
QT Interval (msec)	358.9(37.6)	355.3(37.1)	359.8(38.1)	0.716
QTc (msec)	453.3(35.8)	449.9(30.4)	454.1(37.3)	0.720
Etiology of Heart failure (n/%)				
Hypertensive heart disease	199(76.0)	24(75.0)	175(76.1)	0.866
Dilated Cardiomyopathy	22(8.4)	2(6.2)	20(8.7)	
Right heart failure	15(5.7)	3(9.4)	12(5.2)	
Pericardial diseases	8(3.1)	2(6.2)	6(2.6)	
Rheumatic heart disease	7(2.7)	0(0.0)	7(3.0)	
Others	11(4.2)	1(3.1)	10(4.3)	

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Table 2: Echocardiographic profile of the subjects

Variable	All subjects (n= 262)	Readmitted (n=32)	Rest (n= 230)	p-value
Left atrial diameter (cm)	4.62(1.0)	4.8(0.7)	4.60(1.0)	<0.001
Left atrial area (sqcm)	26.9(8.4)	27.1(8.0)	26.8(8.5)	0.006
Septal wall thickness in diastole(cm)	1.31(0.69)	1.72(0.67)	1.26(0.37)	0.050
Posterior wall thickness in diastole(cm)	1.20(0.82)	1.21(0.21)	1.20(0.87)	0.803
LV internal diameter in diastole (cm)	5.63(3.01)	5.68(0.88)	5.63(0.61)	0.490
LV internal diameter in systole (cm)	4.45(1.57)	4.74(0.93)	4.41(0.64)	0.004
Fractional shortening (%)	19.2(11.0)	17.3(10.4)	19.6(11.2)	0.099
Ejection fraction (%)	39.7(18.5)	36.8(18.1)	40.1(18.6)	0.020
Mitral 'E' wave velocity (m/sec)	0.81(0.29)	0.87(0.32)	0.80(0.30)	0.880
Mitral 'A' wave velocity	0.53(0.26)	0.53(0.25)	0.53(0.26)	0.905
E/A ratio	1.94(1.35)	1.96(1.20)	1.93(1.37)	0.088
Systolic dysfunction (%) (n=236)	152(64.4)	23(76.7)	129(62.6)	0.156
Mitral regurgitation (n=219)	165(75.8)	25(92.6)	140(72.9)	0.056
Tricuspid regurgitation (n=219)	152(69.4)	23(85.2)	129(67.2)	0.232

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Table 3. Univariate correlates of readmission in the 262 denovo HF subjects

Variable	OR	95% CI	P-value
Age >60years	2.04	0.96 – 4.29	0.058
Female gender	0.54	0.25 – 1.18	0.117
Body mass index <19	2.95	1.16 – 7.47	0.018
No education	1.47	0.62 – 3.46	0.376
Not married	0.73	0.30 – 1.75	0.481
History of smoking	1.06	0.41 – 2.74	0.907
Alcohol use	1.10	0.52 – 2.35	0.796
History of diabetes mellitus	0.66	0.19 – 2.31	0.518
Serum Sodium (<130mmol/l)	4.11	1.58 – 10.75	0.002
Random blood glucose (>140mmHg)	0.67	0.22 - 2.02	0.459
Packed cell volume (<=30%)	0.53	0.15 – 1.85	0.313
Serum Cr (> 2mg/dl)	1.20	0.43 – 3.39	0.729
Presence of atrial fibrillation	1.74	0.65 – 4.59	0.263
Ejection fraction<35%	1.36	0.61 – 3.04	0.459
Presence of mitral regurgitation	4.64	1.06 – 20.29	0.026
Presence of tricuspid regurgitation	2.81	0.93 – 8.45	0.057

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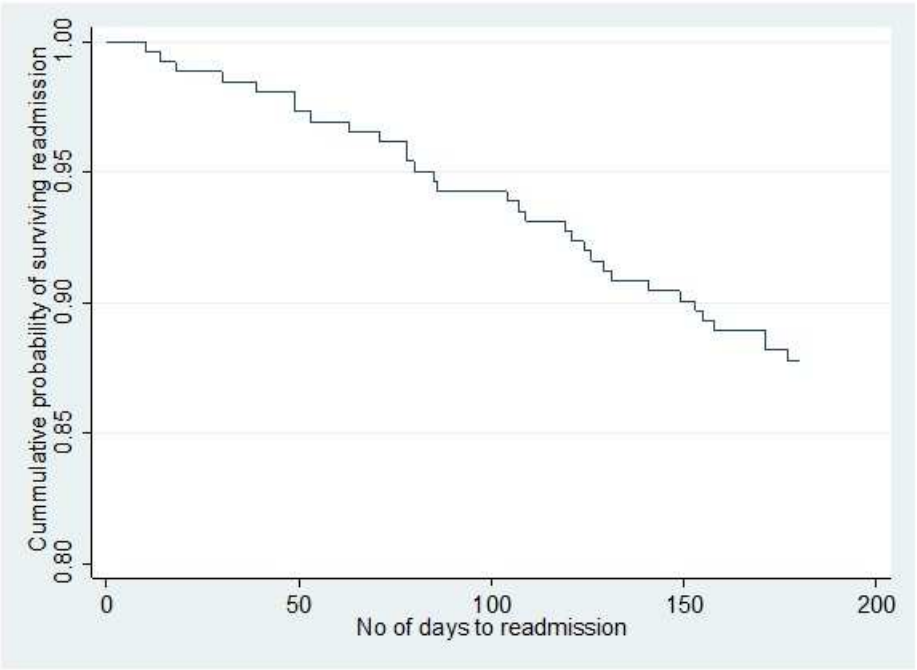

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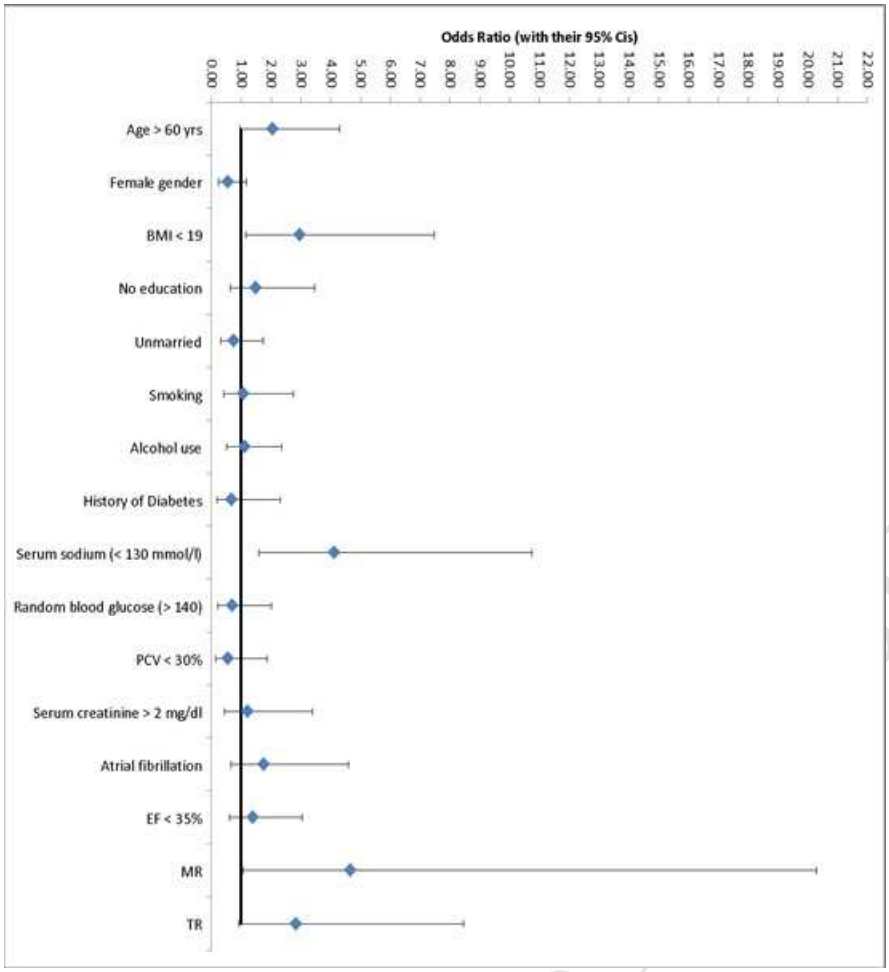

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Highlights

- We sought, for the first time, to examine the rate and predictors of hospital readmission after an episode of HF in a Nigerian city.
- HF rehospitalization within 6-months follow-up occurs in about 12% of subjects in our cohort.
- Higher rates of readmission were noted in those of older age, lower BMI, illiteracy, lower serum sodium level, presence of atrial fibrillation, renal dysfunction and valvular dysfunction.
- Gender and body mass were independent correlates of readmission during 6-months follow-up.

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