PREVALENCE, CAUSES AND RISK FACTORS FOR LEFT VENTRICULAR DYSFUNCTION AND HEART FAILURE IN KENYAN POPULATION

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Declaration of conflicts of interest

NONE
Introduction

• Heart failure is a major and growing public health concern in terms of incidence, prevalence, morbidity, mortality, and economic burden even in Sub-Saharan Africa.

• The proportion of hospitalisations of patients with the principal diagnosis of heart disease and HF has increased for the past two decades.

• The disease is associated with poor quality of life and a poor prognosis, comparable with common malignant diseases in the region (e.g. breast and prostate cancer).

• Epidemiologic studies on risk factors and aetiology of heart failure in Sub-Saharan Africa are extremely few.

• Opportunities and strategies for prevention of development of heart failure in this population are likely to be different from those obtaining in current literature.
Background

• Ojiambó et al, HF admissions at KNH (East Afric. Med J. 1975) – 20% of all admissions at KNH, Nairobi.

• Stewart et al, Heart of Soweto (Circulation. 2008;118:2360-2367.). 163 cases per month

• Damasceno et al, THESUS HF Study (Eur Heart J 2010; 31 (abstr suppl); 599 ). Characteristics & early outcome of 1000 cases of ADHF.

• Hospital reports from various parts of SSA on heart diseases and risk factors increasing.

• Variations in prevalence & incidences reported in heart failure studies (hospital/population based, methods of ascertainment of HF, classifications, etc
Broad Objective

Pilot the feasibility of conducting population surveys on prevalence of heart failure in rural and urban Kenya using modern diagnostic investigative tools and explore the spectrum of risk factors and aetiology
Specific objectives

Determine:-

• Prevalence of LV dysfunction and heart failure
• Causes of LV dysfunction and heart failure
• Probable risk factors
Methods 1

• Cross-sectional survey of urban and rural adult males and females aged 50 yrs and above during Feb 2007-Oct 2009
• 784 random sample from 6 locations in Uplands area of rural Kiambu District and similar number in Langata area of Nairobi City. Monthly data collection visits at each of the 2 sites.
• Inclusion - all consenting males & females aged 50yrs & above
• Exclusion – inability to cooperate (dementia etc)
• Ethical approval from National Council for Science & technology and all participants gave informed consent
• All newly diagnosed cases referred for further evaluation and treatment.
Questionnaire

• Basic demographics & anthropometrics (BMI, rural, urban)
• History (smoking, DM, HTN, CAD, CHF, COPD, Hospitalisation for Heart failure, kidney disease, other)
• Symptoms of HF and other.
• Signs (BP, HR, RR, clinical signs of HF and other)
• Modified Framingham criteria for HF (2majors or 1 major and 2 minors)
• ECG, and Echocardiogram
• Medications (ACE-I,ARB, BB, digitals, diuretics, others)
Definitions 1

- *Sono-Heart Plus* (Sonosite USA Inc) handheld digital 2D (THI)- color and spectral Doppler. All echos were done by the principle investigator.

- portable digital Philips ECG machine, digital BP machines with different cuff sizes

Definitions

- LVH – PLAX M mode IVS/LVPW > 11mm
- LV systolic dysfunction – Teicholz M Mode LVEF < 50%
- Preserved LV systolic function – LVEF ≥ 50%
- Clinical HF – Modified Framingham Criteria
- ECG – standard analysis criteria:- Normal or abnormal (LBBB, LVH, MI, AF, etc)
Definitions 2

- **IHD** - discharge diagnosis of myocardial infarction (MI) or (2) self reported MI and the following ECG changes: Q waves in two or more contiguous leads or T wave inversion > 3 mm in two or more contiguous leads or left bundle branch block or (3) angina pectoris (AP) discharge diagnosis/coronary artery disease (CAD) discharge diagnosis/self reported exertional chest pains and ST depressions > 1 mm in two or more contiguous leads.

- **Hypertension** - (1) self reported hypertension and blood pressure more than 140 mm Hg systolic or 90 mm Hg diastolic or antihypertensive medication or (2) blood pressure exceeding 140/90 mm Hg and current treatment or (3) blood pressure exceeding 160 mmHg systolic or 110 mm Hg diastolic.

- **Diabetes** - (1) self reported diabetes and anti-diabetic treatment or (2) documented random blood glucose > 11 mmol/L or haemoglobin A1c >7.5%.
Statistical analysis

- Normal or log normal distribution of continuous data verified with the use of histograms and normal plots.
- Pearson $\chi^2$ test was used to compare independent groups with categorical data.
- Mantel-Haenszel common odds ratio (OR) estimates were used on each variable.
- Logistic regression analysis used for the multivariate model to analyse independent variables in relation to systolic dysfunction and HF.
- Probability values of $p < 0.05$ were considered significant.
- Tests were computed with SPSS software.
Prevalence of LVD and LVF (%)

<table>
<thead>
<tr>
<th></th>
<th>RURAL</th>
<th>URBAN</th>
<th>TOTAL</th>
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</thead>
<tbody>
<tr>
<td>LVD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LVF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
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LVD and LVF on RX

<table>
<thead>
<tr>
<th>% on RX</th>
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<th>% on RX</th>
<th>NO RX</th>
<th>% on RX</th>
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</thead>
<tbody>
<tr>
<td>FEMALE</td>
<td></td>
<td>MALE</td>
<td></td>
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<tr>
<td>LVD</td>
<td></td>
<td>LVF</td>
<td></td>
<td>LVD</td>
<td></td>
</tr>
</tbody>
</table>

Legend:
- LVD
- LVF
Causes of Heart Failure (%)

- HTN: 64%
- VHD: 11%
- CMP: 5%
- IHD: 3%
- Others: 5%

Legend:
- Blue: HTN
- Red: VHD
- Green: CMP
- Purple: IHD
- Teal: Others
Heart Failure with Preserved Systolic function

<table>
<thead>
<tr>
<th>Condition</th>
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<th>FEMALES</th>
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</thead>
<tbody>
<tr>
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<tr>
<td>High LVEDD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VHD</td>
<td></td>
<td></td>
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<tr>
<td>Others</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
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</tbody>
</table>

Legend:
- MALES
- FEMALES
### Predictors of LV Dysfunction - Univariate Analysis

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Females</th>
<th>Males</th>
<th>OR (95% CI)</th>
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<tbody>
<tr>
<td></td>
<td>LVEF &gt; 50%</td>
<td>LVEF &lt; 50%</td>
<td>LVEF &gt; 50%</td>
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<tr>
<td>Hx HTN</td>
<td>22.4</td>
<td>18.6</td>
<td>24.4</td>
</tr>
<tr>
<td>Hx DIABETES</td>
<td>4.4</td>
<td>8.9</td>
<td>7.4</td>
</tr>
<tr>
<td>ABN ECG</td>
<td>25.0</td>
<td>92.7</td>
<td>30.4</td>
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<tr>
<td>ECHO LVH</td>
<td>20.7</td>
<td>19.8</td>
<td>25.9</td>
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</tbody>
</table>
Prevalence & causes of LVD and LVF

• Prevalence of at risk for heart failure (stage A) is 26.7% (at least on risk factor)
• Prevalence of asymptomatic LVD (stage B) is 3.6% (higher in urban & females)
• Prevalence of symptomatic LV heart failure (at least stage C) is 1.9% (similar both rural and urban, male and female)
• Prevalence of stage B and C heart failure is 5.5%
• Hypertension is the cause of heart failure in 64% and Valve heart disease in 11% of HF in population
Predictors of LV dysfunction

• Hypertension, diabetes, abnormal ECG and echo LVH are strong predictors of LV dysfunction.

• Multivariate analysis model - identification of independent predictors-
Conclusions

- Left ventricular dysfunction and heart failure are significantly prevalent in this population in Sub-Saharan Africa.
- The causes and risk factors are different from those commonly reported from the north and western continents.
- They are largely preventable cost-effectively.
- Larger scale surveys and interventions are indicated.
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• Astra Zeneca, and Servier in Kenya.