Abstract

Introduction: The increasing prevalence of cardiovascular risk factors in South African rural communities is well reported. However, the prevalence of cardiovascular disease (CVD) leading to hospital admission and related in-hospital mortality in rural and semi-rural hospitals is unknown.

Methods: We conducted a retrospective review of hospital records for patients admitted to the Department of Internal Medicine at Dora Nginza Hospital in Port Elisabeth, South Africa between 1 April and 31 October 2016. The study focused on patients who received a primary diagnosis of CVD.

Results: During the seven-month study period, 4,884 patients were admitted to the unit, 1,325 of whom received a primary diagnosis of CVD, giving a prevalence of 27%. Patients with CVD had a mean (standard deviation) age of 60 (±15) years, 32% of this patient population was younger than 55 years and 65% were female. Furthermore, 94% had a background medical history of systemic hypertension and 30% of diabetes mellitus. The three leading cardiovascular causes of hospital admission were stroke (38%), hypertensive heart disease plus heart failure (33%), and hypertensive emergency/urgency (18%). In-hospital outcome: 12.4% of patients admitted for CVD died during the index hospitalisation and strokes were responsible for 70% of the deaths.

Conclusion: The prevalence of CVD in this cohort was high and accounted for significant morbidity and mortality. Systemic hypertension was a leading risk factor in our cohort and we need to intensify efforts to diagnose and treat systemic hypertension.

Keywords: cardiovascular disease, low-income country, in-hospital outcomes

Submitted 27/8/19, accepted 14/4/21
Cardiov J Afr 2021; 32: online publication www.cvja.co.za
DOI: 10.5830/CVJA-2021-016

South Africa is undergoing an epidemiological transition that is characterised by an increasing prevalence of cardiovascular risk factors and disease in urban, semi-urban and rural parts of the country.1,2 This increasing epidemic has led to growing calls for closer monitoring of non-communicable diseases (NCDs) and improved prevention and treatment strategies to be prioritised.3 The challenges that sub-Saharan nations will have to overcome to tackle this epidemic of NCDs are significant. The countries are characterised by widespread socio-economic disparities, and significant geographic differences in access to and availability of healthcare resources, such as diagnostic and therapeutic services.4,5 There is also a significant shortage of physicians and healthcare workers that is particularly pronounced in rural and semi-urban areas.

While there is a growing body of population-based data on the increasing burden of NCDs and cardiometabolic risk factors in South Africa, there is little published information on the impact of the epidemiological transition on the burden of cardiovascular disease-related hospital admissions and in-hospital case fatality rates in health facilities situated in rural and semi-urban under-resourced provinces such as the Eastern Cape, Free State and Limpopo.
Whereas a few recent studies from large urban tertiary-care centres in South Africa suggest that cardiovascular disease (CVD) is a growing cause for hospital admissions, similar data from the rest of the country are sparse. In a prospective study of admissions to one of Gauteng’s largest hospitals, 11% of the medicine in-patients at Baragwanath Hospital were admitted under the care of the Department of Cardiology, with 44% of them receiving a diagnosis of heart failure. Elsewhere, in a retrospective review and analysis of in-patient mortality at a large urban tertiary-care centre in the Western Cape, admissions to the cardiology ward constituted 12 to 16% of the hospital admissions at Groote Schuur Hospital over the five years under scrutiny.

It is not known whether information like this can be extrapolated to reflect the burden of CVD admissions in rural and semi-urban hospitals. Such information would be important to help with priority setting, healthcare resource allocation and health infrastructural planning. We therefore conducted a retrospective review of the hospital records at a district hospital in the semi-rural province of the Eastern Cape to assess the prevalence, spectrum and outcomes of CVD between 1 April and 31 October 2016.

Methods
A primary diagnosis is defined in the International Classification of Disease version 10 (ICD-10) as that condition established to be chiefly responsible for occasioning the admission of the patient to the hospital for care. CVD are defined by the World Health Organisation (WHO) and the Global Burden of Disease (GBD) as disorders of the heart and blood vessels and include coronary artery disease (CAD), cerebrovascular accidents (strokes), rheumatic heart disease, congenital heart disease, endocarditis, cardiomyopathies, myocarditis, hypertensive heart disease, atrial fibrillation and flutter, and non-rheumatic valvular heart diseases. For this study, we excluded peripheral vascular disease because access to records for patients with this diagnosis was limited.

Dora Nginza is a district hospital located in Zwide township in the Nelson Mandela Bay Municipality (Port Elizabeth), South Africa. Nelson Mandela Bay has a population of 1 152 115 and a 36.6% unemployment rate. The Department of Internal Medicine at Dora Nginza Hospital from 1 April to 31 October 2016.

The patients’ records, National Health Laboratory Services (NHLS) data, available imaging and death records of all patients admitted to the unit between 1 April and 31 October 2016 were reviewed. During the seven-month study period, Dora Nginza Hospital had four qualified specialist physicians responsible for the clinical assessments, diagnoses and management of patients. These physicians were responsible for making the ICD-10 diagnoses for all patients admitted to the Department of Medicine.

A standardised data-collection form was used to capture demographic data, dates of admission and discharge, primary diagnoses and background medical problems. This study focused on patients who received a primary diagnosis of CVD. Patients with missing information on the primary diagnosis and outcome or missing patient records were excluded from the analysis.

The study was approved by the Hospital Research Ethics Board (HREC 014/2018).

Statistical analysis
Results of normally distributed quantitative measurements are reported as means and standard deviations (SD) while skewed data are reported as median and interquartile range (IQR). Categorical variables are represented as number and percentage. Pearson’s chi-squared or Fisher’s exact tests were used for comparing the relative frequency of characteristics between the group with the primary diagnosis of CVD and the rest of

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cardiovascular disease (n = 1325)</th>
<th>Non-cardiovascular disease (n = 3559)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)*</td>
<td>60 (15)</td>
<td>43 (17)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Female, n (%)</td>
<td>867 (65.4)</td>
<td>1860 (52.3)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Hypertension, n (%)</td>
<td>1250 (94.3)</td>
<td>716 (20.1)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Diabetes mellitus, n (%)</td>
<td>408 (30.8)</td>
<td>441 (12.4)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>HIV infection, n (%)</td>
<td>138 (10.4)</td>
<td>1632 (45.9)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Duration of hospital stay*</td>
<td>3 (1–6)</td>
<td>3 (1–7)</td>
<td></td>
</tr>
</tbody>
</table>
the patient population admitted to the Internal Medicine Unit. Statistical significance was set at $p < 0.05$. For this analysis and comparisons, the group of participants admitted to hospital who did not have a primary diagnosis of CVD are referred to as the non-CVD group.

**Results**

Over the seven months under review, 4,884 patients were admitted to the hospital’s Internal Medicine Unit and 1,325 participants received a primary diagnosis of CVD, giving a prevalence of 27%. The mean age of the CVD group was 60 (± 15) years, 65.5% of whom were female (Table 1). The duration of hospital stay for a CVD admission was three (IQR 1–6) days.

Compared to the general non-CVD patient population, the CVD patient population was significantly older (60 ± 15 vs 43 ± 17 years, $p < 0.0001$), with a higher prevalence of hypertension (94.3 vs 20.1%, $p < 0.0001$) and diabetes mellitus (30.8 vs 12.4%, $p < 0.0001$) but a much lower prevalence of HIV (14.4 vs 53.9%, $p < 0.0001$).
The main CVD diagnosis, followed by stroke (27.5%) (Table 2). In this group, hypertensive heart disease with heart failure (34.8%) was infected, representing 10.4% of the CVD group (Table 1). In this disease and heart failure (23%) (Fig. 4).

Cardiovascular deaths (70.7%), followed by hypertensive heart disease and heart failure (23%) (Fig. 4).

One hundred and seventy-four of the 1,325 patients with a CVD diagnosis died before discharge, with an in-hospital mortality rate of 13.1%. This was comparable to the in-hospital mortality rate in the non-CVD group. Strokes accounted for the majority of cardiovascular deaths (70.7%), followed by hypertensive heart disease and heart failure (23%) (Fig. 4).

One hundred and thirty-eight of the CVD patients were HIV infected, representing 10.4% of the CVD group (Table 1). In this group, hypertensive heart disease with heart failure (34.8%) was the main CVD diagnosis, followed by stroke (27.5%) (Table 2).

Discussion

The major findings of this retrospective study are: (1) CVD accounted for a significant proportion of the hospital admissions at 27%; (2) strokes were the predominant manifestation of CVD, at 38% of the CVD admissions and 70% of the in-hospital mortality; (3) hypertensive heart disease-related heart failure and hypertensive emergency/urgency were the second and third most common primary reasons for admission.

Additional significant findings included the observations that 32.4% of the patient population with CVD was young (age < 55 years), 94% had hypertension and 30% had diabetes mellitus. Should these findings be representative of similar hospitals nationwide, they may have important clinical, socio-economic and public health implications for the country and the region.

Although the retrospective design of the study was not optimal, prior to this, few if any studies have been published to document the significant burden of CVD-related morbidity and mortality as experienced in semi-rural hospital settings. CVD are the largest contributor to global mortality, accounting for up to 45% of the 39.8 million deaths due to NCD. Most alarming, more than 75% of cardiovascular deaths occur in low- and middle-income countries including sub-Saharan Africa, and to date, there has not been a comprehensive effective programme or plan on the scale or magnitude required to change the trajectory of the growing burden of CVD in the country.

South Africa is rapidly undergoing epidemiological transition and is saddled with a quadruple burden of disease. This transition and burden are marked by increasing prevalence of NCD, and a persistent epidemic of infectious disease, trauma and high perinatal and maternal morbidity. It has been postulated that socio-economic and demographic development could have played a major role in this health transition. Additionally, a high prevalence of cardiovascular risk factors has historically been well reported in poor rural and township communities in South Africa. Cross-sectional studies in Limpopo, Free State and the Western Cape reported a prevalence of systemic hypertension of 14 to 41%, diabetes mellitus of 4.8 to 8.6%, tobacco smoking of 13 to 54%, and female obesity of up to 51%.

Systemic hypertension is a significant risk factor for CVD in black people. At least 56% of patients presenting for the first time with heart disease in the Heart of Soweto study had systemic hypertension. Of major concern, the age-standardised prevalence of systemic hypertension increased by 7.7% in low-income countries, compared to a decrease of 2.6% in high-income countries. Furthermore, there are lower rates of hypertension awareness and receipt or use of therapies in low-compared to high-income countries. Our study findings of 94% prevalence of systemic hypertension among admitted patients highlight the potential importance of prioritising NCD prevention and treatment at the scale of the very successful government HIV anti-retroviral programme.

It is of interest that the contribution of coronary heart disease-related complications to the burden of admissions and in-hospital mortality was as low as 4.5%. This corroborates information from global bodies such as the WHO, that sub-Saharan Africa remains the only region of the world where CAD is not the major manifestation of CVD globally. However, risk factors for atherosclerotic disease in South African black people are increasing.

In the Agricout cross-sectional study, 12% of the individuals had an ankle brachial index less than 0.9, suggestive of occult atherosclerosis. Additionally, the INTERHEART study identified five risk factors for myocardial infarction in an African population presenting for the first time with acute myocardial infarction (history of smoking, diabetes and hypertension, abdominal obesity, and ratio of apolipoprotein B to apolipoprotein A-1).

Interestingly, there was a socio-economic disparity in the prevalence of risk factors for CVD between South African ethnic groups; a higher socio-economic class and education level was associated with increased prevalence of acute myocardial infarction.

Fig. 4. Frequency of CVD as a cause of death at Dora Nginza Hospital for 1 April 2016 to 31 October 2016. TB, tuberculosis; RHD, rheumatic heart disease; ACS, acute coronary syndrome.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke</td>
<td>38</td>
<td>27.5</td>
</tr>
<tr>
<td>Acute coronary syndrome</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>Rheumatic heart disease</td>
<td>8</td>
<td>5.8</td>
</tr>
<tr>
<td>Hypertensive urgency or emergency</td>
<td>22</td>
<td>15.9</td>
</tr>
<tr>
<td>Hypertensive heart disease in heart failure</td>
<td>48</td>
<td>34.8</td>
</tr>
<tr>
<td>TB pericarditis</td>
<td>14</td>
<td>10.1</td>
</tr>
<tr>
<td>Peripartum cardiomyopathy</td>
<td>4</td>
<td>2.9</td>
</tr>
<tr>
<td>Pulmonary hypertension</td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td>Congenital heart defects</td>
<td>1</td>
<td>0.7</td>
</tr>
</tbody>
</table>
in South African blacks. The opposite was true for the European or other African samples of the INTERHEART study.21,22

Only 10.4% of those with a primary diagnosis of CVD were HIV infected. Hypertensive heart disease with heart failure and strokes were the predominant causes of hospital admission in the HIV-infected CVD cohort. Although HIV infection has emerged as an important risk factor for CAD, with a two-fold greater risk of acute coronary syndromes compared to HIV-uninfected individuals,23 it is notable that in sub-Saharan Africa, heart failure has been the more dominant and important CVD manifestation.24-26 Our study suggests that these observations have not changed and are generalisable to semi-rural regions of the country.

The relatively low prevalence of CAD in both the CVD and HIV-CVD groups in our study despite the high prevalence of CAD risk factors suggests that there may still be an opportunity to interrupt the impending CAD epidemic with a more aggressive primary preventative strategy targeting lifestyle and behavioural changes, and risk-factor modification.27,28 Screening and management of the traditional risk factors for CAD would go a long way in decreasing the morbidity and mortality associated with CAD in this patient population.

Finally, up to 32.4% of the CVD patient population in this study was younger than 55 years, highlighting the far-reaching impact of CVD beyond ill health to potential loss of productivity (Fig. 5). Nelson Mandela Bay has high unemployment rates and poverty and the role of these upstream modifiable factors on CVD is unknown. Additionally, community screening for and treating hypertension could have a tremendous impact on reducing CVD mortality rates. Therefore, community screening and treating modifiable risk factors for CVD instead of dealing with target-organ damage is a viable strategy for reducing CVD mortality in this particular population.

Study limitations

Our study has several limitations. First, this is a single-centre retrospective study, therefore not generalisable to the broad South African community. Second, we did not have clinical and echocardiographic data to classify heart failure in a contemporary manner. We also did not have data on other cardiovascular risk factors such as smoking history or dyslipidaemia. We did not offer screening testing for dyslipidaemia or diabetes mellitus and therefore missed the opportunity to diagnose and treat undiagnosed diabetes mellitus or dyslipidaemia.

Conclusion

In this study, carried out in a semi-rural South African district hospital, we found that CVD were responsible for a third of hospital admissions, and a third of CVD patients were younger than 55 years of age. Hypertension-related CVD was the leading cause of hospital admissions in both HIV-infected and uninfected patients. In addition, strokes were the leading cause of CVD in-hospital death.

References


