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Chapter

Lifestyle and Epidemiology: Poverty and Cardiovascular Diseases a Double Burden in African Populations

Franck Ngowa Nzali, Mazou Ngou Temgoua, Joel Noutakdie Tochie and Simeon Pierre Choukem

Abstract

Cardiovascular diseases (CVDs), ranked top non-communicable diseases (NCDs), are the second leading cause of mortality in Africa, especially in sub-Saharan Africa (SSA) where they account for 73·4% global deaths and 80% of all premature deaths yearly. The ill-health due to CVDs in SSA is equivalent to the combined burden due to communicable, maternal, neonatal and nutritional diseases. Un-addressed, it is extrapolated that the Sustainable Development Goal 3.4 which targets NCDs will not be achieved. The preponderance of CVDs in SSA is due to determinants such as the epidemiological transition of diseases, aging, stress, illiteracy, poor health systems and poverty. This is quite worrisome for SSA dubbed "one of the most poverty stricken region on the globe". As such, poverty in Africa may adversely affect CVDs, but this has been less examined. This chapter explores the impact of poverty on CVDs and healthcare systems related to CVDs in Africa.

Keywords: epidemiology, poverty, cardiovascular, disease, Africa

1. Introduction

Cardiovascular diseases (CVDs) such as heart failure, cerebrovascular diseases, and ischemic heart diseases are major plaques in Africa. The burden of CVDs is high in Africa and particularly in sub-Saharan Africa (SSA) where the magnitude of CVDs is equivalent to the combined magnitude due to communicable, maternal, neonatal and nutritional diseases. In Africa the burden of CVDs, is partly flued by poverty which is often overlooked. This chapter discusses the impact of poverty on CVDs and healthcare systems related to CVDs in Africa.

2. Epidemiological transition and cardiovascular diseases in Africa

Epidemiological transition can be defined as the transition, under the influence of socio-economic development and aging, from predominantly infectious diseases to mainly chronic non-communicable diseases [1]. This concept was first introduced in the 1971's by Omrad and Olshansky, and Ault later on refined

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its meaning [2]. The transition process according to Omrad was in three ages or phases [2]: The age of pestilence and famine, the age of receding pandemics, and the age of degenerative and man-made diseases.

The age of pestilence and famine is characterized by a period of high infant and child mortality with a low mean life expectancy of less than 30 years. This stemmed from the high rate of malnutrition and infectious diseases or communicable disease like tuberculosis, pneumonia, and diarrheal diseases in Africa; with less than 10% of the mortality rate due to cardiovascular diseases [2, 3]. The age of receding pandemics is characterized by an improvement in public health policies and nutrition patterns leading to a decrease in the rate of infant and child deaths from to malnutrition and infectious diseases. This decrease in mortality was accompanied by a rise in the life expectancy from 30 to 50 years or more [2, 3]. The age of degenerative and man-made diseases is marked by an excessive intake of fat and calories with a decrease in physical activity leading to the emergence of non-communicable diseases (NCDs) such as ischemic heart diseases and heart failure. An increase in life expectancy as a result of a reduction in the mortality rate of infectious or communicable diseases tremendously marked the age of degenerative and man-made diseases. On the other hand, there is a higher death rate shift in NCD, more specifically cardiovascular diseases (CVDs). The death rate due to CVDs varies between 35 and 65% of the overall mortality rate [2, 3]. The challenges entail strengthening the prevention and improvement of the management of CVD.

Low- to middle-income countries (LMICs) in Sub-Saharan Africa (SSA) are of the epidemiological transition process [4]. A 20-year assessment of the disease burden in SSA between 1990 to 2010 shows a decline in premature mortality and disability attributable to neonatal, nutritional and maternal communicable diseases, including lower respiratory infections and diarrhoeal diseases [4]. It is worth mentioning that there were communicable diseases that occur permanently with the same high mortality rate over these 20 years-periods [4]. With only 12% of the world's population in Africa, Africa bears a considerable proportion of the global burden of tuberculosis, HIV/AIDS and malaria with rates of 31%, 62% and 70% respectively [5]. Besides communicable diseases, the disease burden due to NCDs is not trivial. Between 1990 to 2010, the disease burden from several NCDs increased, particularly stroke, depression, diabetes, and ischemic heart disease [4]. An assessment made in SSA from 1990 to 2017 shows a 67% growth in the total number of disability-adjusted lives (DALYS) due to NCDs (90.6 million in 1990 and 151.3 million in 2017) [6]. The increment in NCDs in SSA was mainly flued by CVDs, ranked as the second leading cause of the NCD burden in 2017, resulting in 22.9 (21.5–24.3) million DALYs (15.1% of the total NCD burden), after the group of disorders categorized as other NCDs (28.8 million [25.1–33.0] DALYs, 19.1%) [6]. This data show the progressive and increasing installation of NCDs in Africa and their impact on morbidity and mortality.

3. Poverty in Africa

Poverty is a multidimensional concept. According to the United Nations Development Programme (UNDP), poverty is not only the lack of income necessary to meet food and non-food needs (clothing, energy, housing) but also a lack of basic human capabilities (illiteracy, malnutrition, reduced life expectancy, poor maternal health, illness) [7]. Therefore poverty should not be considered only under the spectrum of financial income; as a result, the concept of poverty is difficult to quantify. But for a global assessment of poverty, a monetary scale has been developed as a common denominator between the different regions of the world in

order to be able to assess poverty. According to the World Bank, the poverty line is considered to be 1.90 dollars per day per inhabitant since 2011 [8]. In 2015, the rate of the world's population living in poverty was 10%, representing 736 million people, more than half of whom live in SSA, on less than US$1 a day [8, 9]. The advent of industrialization in China and India tremendously decreased the poverty rate unlike in SSA where progress in poverty has been limited. Of these 736 million poverty stricken population living on earth in 2015, 80% resided in SSA [10]. According to the World Bank's estimates, the global poverty rate slightly dipped to 8.6% in 2018. No isolated figure was reported for SSA. But since 2018, the World Bank has repeatedly reported that SSA will consistently record a poverty rate of at least two figures till the year 2030 unless very drastic interventions are put into place to address the problem of poverty in SSA [10].

In several SSA countries, the direct care costs, are high in relation to household income, a major factor in poverty. The cost of HIV/AIDS treatment for an adult, combined with the loss of income due to absence from work, can push an entire household below the poverty line. Therefore, just as good health can stimulate economic growth, poor health can lead to poverty from which it is very difficult to escape. The vicious cycle of poverty and poor health is observed in many African countries. About 76% of people in SSA have an income of less than US$2 per day and 46.5% have an income of less than US$1.08 per day [9]. While poverty has been declining in other parts of the world such as East and South Asia over the two decades the trend is clearly reversed in SSA. Between 1981 and 2001, the domestic product of SSA countries fell by 13% and the number of people in this region living on less than US$1 per day doubled from 164 million to 314 million. While Africans accounted for only 16% of the world's poor population in the year 1985, the proportion rose to 31% by 1998, and this trend is expected to continue [9].

4. Cost of management of cardiovascular disease in Africa

In Africa, the cost of management is variable. With regard to hypertension, the overall average daily cost of drug treatment for uncomplicated hypertension is estimated at 368 ± 234.6 FCFA, i.e. 0.68 ± 0.44 dollars, representing more than a third of the daily income (1.90 dollars) [11]. In view of the cost of treatment, the absence of symptoms associated with hypertension is often the cause of non-adherence to treatment. Also, some patients who often reach the stages of complications of CVDs often experience the cost of treatment increased by the additional cost of treating the associated complications [12].

In Africa, 60–70% of health expenditure is paid by households directly to health facilities, compared to a global average of 46%. This may be due to the preponderance of the informal sector (farmers, craftsmen,...) which groups together more than 70% of the African population who are not covered by health insurance. Contrary to those in the informal sector, some African governments are setting up compulsory health insurance systems for the formal sector, civil servants or employees of private companies, financed through employee and employer contributions [13].

5. Poverty, malnutrition and cardiovascular disease: a vicious cycle

Poverty is one of the socio-economic factors at the root of malnutrition in Africa. The prevalence of malnutrition in SSA rose from 181 million in 2010 to 222 million in 2016 [14]. Poverty and malnutrition are part of a vicious circle. Poverty

leads to malnutrition, especially maternal malnutrition, which causes low birth weight, stunted infants and adolescents. These individuals will be disadvantaged later in life because they may show a reduction in physical and mental development leading to low skills and reduced human capital. Competence is one of the faculties developed through adequate nutrition of children and adolescents. Wachs has defined competence as the ability to adapt and interact with one's environment [15]. Human capital refers to well-nourished, healthy, educated, skilled and alert individuals - an improved human condition - resulting in a workforce that could be the most productive asset of any country. However, the absence of this productivity, particularly economic productivity, perpetuates poverty [16]. Alongside poverty, we also have a trend towards the Westernization of the African lifestyle, which is not the least compounding factor for the emergence of CVDs in Africa.

The African population is experiencing an increasing rate of urbanization, with a shift in migration from rural to urban areas, with changes in lifestyle habits in particular, as the traditional diet rich in fruits and vegetables is gradually being replaced by a diet rich in calories densed foods from snacks, sweetened beverages, animal fats and low in complex carbohydrates. This change in diet is accompanied by weight gain (overweight and obesity) and a decrease in physical activity due to the abolishment of traditional agriculture for sedentary work [9]. This change in lifestyle is contributing to an increase in the prevalence of cardiovascular risk factors in Africa, with a tendency to equalize the prevalence in high-income countries. The prevalences of some cardiovascular risk factors in SSA are given below in comparison with high-income countries (HICs): Smoking rates are 10% in SSA versus 30% in HIC; hypertension prevalence in individuals ≥18 years old is 30% in SSA (40% in urban and 20% in rural populations) versus 20% in HIC; diabetes mellitus prevalence in persons aged above 17 years is 7.1% in adult males and females in SSA compared with up to 8% in males and up to 6% in women in HIC. Also, dyslipidemia prevalence in adults is 25% in SSA versus 40–60% in HICs; physical inactivity prevalence is 22% in SSA versus 29–40% in HIC; and obesity whose prevalence rates are variable in SSA and higher among women (2–40%) compared with men (1–15%) versus 18–35% in women and 12–30% among men in HIC [17]. Poverty has several consequences, including the development of communicable and non-communicable diseases.

In the 1980s, a real revolution in the understanding of chronic diseases in adults was initiated with the pioneering work of an English epidemiologist named David Barker. During an observational study, he found that regions of UK that had a high rate of cardiovascular mortality, also had a high infant mortality rate [18]. Then a meticulous study of patients with NCDs [18], allowed him to put forward a hypothesis on the "origin of the development of health and disease" or early origin of adult diseases based on the premise that environmental factors during foetal life have a considerable impact on the susceptibility to various pathologies later in life of these exposed persons [18]. More precisely; malnutrition occuring in utero permanently changes the body's structure and function in ways that "programme" the appearance of disease in childhood, adolescenthood or adulthood [18].

At present it has been recognized that malnutrition during pregnancy is the cause of an alteration in the fetus in the short term of the programmed metabolism of carbohydrates and lipids and of the functions of the genes. In the long term, these changes will lead to reduced cognitive development, decreased educational performance, compromised immunity, lower physical capacity and an increased risk of several NCDs [18–21]. The physiopathological mechanisms by which foetal malnutrition can lead to NCDs are better elucidated to date. Gluckman and collaborators have shown that malnutrition is responsible for a modification of gene expression via epigenetic modification by methylation of foetal DNA. They

hypothesized that the changed genetic expression may change physiological set points that will eventually change the way individuals respond to environmental exposures later on their lives [22]. The management of CVDs management leads to direct and indirect costs, thus perpetuating the vicious circle of poverty.

Direct costs are related to chronic diseases and these costs entail the direct payment by patients for cardiovascular healthcare services, cardiovascular investigation tests (12-led electrocardiogram, Holter electrocardiogram, stress electrocardiogram, heart ultrasound, transesophageal ultrasound) and medications for CVDs. Patients with CVDs are often confronted with a dilemma: to suffer and possibly die without treatment, or to seek treatment and drag their families into poverty. The situation is particularly serious for people with long-term chronic CVDs such as chronic heart failure, stroke survivals with significant physical disabilities because the costs of medical care is often life-long and relatively expensive. Indirect costs are a reduction in income subject to illness due to loss of productivity resulting from illness or death; the cost of time spent by adult members of the family household caring for those who are ill. There is also the loss of income that will result from the sale of goods necessitated by the need to meet direct costs and unpredictable expenses, and the missed opportunities for children who are forced to give up school to care for sick adults or contribute to the family economy [21]. Hence, CVDs will not only have a detrimental effect on the income of the patients with CVDs, but also on that of the family; subsequently, there will be with a marked pejorative impact on the economy of different African nations resulting in a drop in the economy of the African continent.

6. Prevention of cardiovascular diseases and insurance health system of African countries

6.1 Prevention of cardiovascular diseases

According to the WHO, primary prevention of CVDs is defined as measures put in place to decrease the incidence of cardiovascular events (ischaemic heart disease and strokes) in individuals at risk of CVDs who have not yet developed overt or clinical CVDs. Efforts geared at preventing recurrent clinical cardiovascular events in individuals with CVDs are called secondary prevention [22]. Reports have shown the beneficial impacts of pharmacological interventions in primary and secondary the prevention of CVDs, though with caveats for population-based interventions. The need for economic assessment of these studies to identify those which have best value for money is paramount in inform decision making by health policy makers in designing a health system insurance policy [23]. Furthermore, WHO projects that by 2030, NCDs will overtake all other causes of mortality in all Africa [24]. With the increasing CVDs burden in Africa, the AHN was created in 2001. The AHN is a joint collaboration of various cardiovascular societies and national heart foundations sharing the same agenda: curbing CVDs in Africa, thereby improving the cardiovascular health for all Africans. The vision of the AHN is to play a leading role in the prevention and reduction of the burden related to CVDs, including cerebrovascular accident to halt from no longer being the major etiology of disability and premature death in the African continent. The AHN shares the vision of the World Heart Federation (WHF), the main organization of national and continental cardiovascular societies and foundations globally. The WHF's global target of '25 by 25' represents the objective of decreasing premature deaths caused by CVDs by 25% by the year 2025—an interim goal addressed by the Sousse' Declaration of 2018 [25]. The objective of the AHN held in Tunisia in 2018

was on the prevention of CVDs. The conference was endorsed by the Minister of Health of Tunisia, highlighting the importance of governmental collaborations in attending 'health-for-all'. Themes arising from the conference included the management of various cardiovascular risk factors, legislation of these cardiovascular risk factors, and using the leverage of other local and international organizations to improve cardiovascular health in Africa. Cited cardiovascular risk factors to be urgently cared for in Africa include diabetes mellitus, hypertension and dyslipidaemia. There is therapeutic inertia in the therapeutic algorithms of these conditions especially hypertension. The AHN emphasized on the importance of the timely treatment of resistant hypertension. Obesity was highlighted as the main driver of the diabetes epidemic in Tunisia as well as Africa, with 75% of patients with Type 2 diabetes mellitus dying from CVDs. A 1% improvement in glycosylated hemoglobin was shown to decrease mortality from ischemic heart disease by more than 14% in the Tunisian population although glycemic control is not often achieved in the African continent due to low awareness, treatment and control of diabetic patients who often present late with acute complications of diabetes mellitus such as hyperglycemic comas. Various barriers to control had been identified, namely the inability of clinicians to apply treatment guidelines, inadequate monitoring or surveillance of blood pressure and glycaemia, lack of community education and empowerment, and most importantly, the cost of accessing healthcare. There is also a poor awareness of the cardiovascular risks associated with dyslipidemia in SSA. The South African perspective displayed an increase in the burden of dyslipidemia due to anti-retroviral therapy (ART) induced dyslipidemia in patients living with HIV/AIDS and treated with ART. This needs to be promptly managed in order to prevent CVDs. Previous studies have identified the huge burden of premature ischemic heart disease partly due to dyslipidemia in Africa compared to other regions [26]. This reflects a lack of prevention, early detection and effective management of CVDs in Africa. Preventing CVDs remains a major challenge for development within the region as it results in significant health, financial and social consequences for individuals and government. Likewise, the control of tobacco use, known a risk factor of six of the eight leading causes of CVDs death was highlighted as being important. The role of healthcare providers and health authorities in preventing CVDs due to tobacco use was addressed through a governmental vote on the increment of tobacco taxation as there remains a discrepancy between taxes paid and the treatment cost of tobacco related health disease and death. The WHO 'MPOWER' package was emphasized as a tool to assist countries with tobacco reduction measures. In addition, patients should be motivated by clinicians and family members to quit smoking with both counseling and the early use of pharmacotherapy. In the same vein, the formulation of legislations to control cardiovascular risk factors including the control intervention for the effective implementation of physical exercise and encouraging a low-calorie dense foods to prevent CVDs mortality related to obesity and diabetes mellitus are strongly recommended. This will however, require an involvement from policy makers for the formulation of public health interventions geared at curbing the burden of CVDs in Africa. Moreover, there is a shortage in drugs and equipment for monitoring CVDs between African countries which needs to be addressed for CVDs prevention. This is due to preference in healthcare expenditures for infectious diseases at the detriment of CVDs in Africa. Various partnerships including the WHF, the United Nations the Non-communicable disease alliance (NCD Alliance), Pan African Society of Cardiologists (PASCAR), American Heart Association (AHA), Medtronic Foundation, Heart and Stroke Foundation of South Africa, World Heart Day events, The Kenyan-Heart Talking Walls project are key continental and inter-continental foundations trying to achieve and prevent

cardiovascular health for all in Africa. Also, the social media is a crucial platform to increase awareness in communities regarding CVDs awareness and prevention. Successful CVDs preventive interventions such as the RESOLVE and the WHO Global Hearts projects need to be taken by African Stakeholders to improve cardiovascular health by addressing important issues such as improved management of hypertension, decreasing salt intake and tobacco use. It is worth to mention that CVDs prevention in Africa can significantly be achieved by identifying health advocates as well as effective leadership and the coalition of professional groups. Hence, an 'Africa-specific' guidelines for CVDs prevention need to be formulated and adopted. CVD risk factors prevention in Africa cannot be overemphasized as cardiac surgery to amend cardiovascular diseases still remain expensive and scarce in a continent already overburdened with poverty.

The International Forum for Hypertension Control and Prevention in Africa formulated treatment guidelines for CVDs prevention in 2003 [27]. Since then, CVDs preventive interventions to identify cardiovascular risk factors and set guidelines are now under way. Some African countries have conducted epidemiological studies, a few have begun to continually monitor and assess their programmes, and others, Nigeria and South Africa, have their own guidelines for managing hypertension. There is hope though, and some attention has finally been focused on CVDs prevention in Africa. However, challenges such as poor healthcare infrastructure, underfunded and understaffed health systems in Africa, inadequate access to cheap generic drugs and lack of public recognition and acceptance of the importance of CVDs will continue to hinder the effective implementation of both population-based health programmes and those aimed at people at high CVDs risk [28, 29]. The continent's people need education on healthier lifestyles such as weight reduction, smoking cessation, and greater physical activity.

6.2 Insurance health system of African countries

CVDs are very burdensome to manage in Africa due to a lack of a national health insurance policy in most SSA countries [30]. Health systems insurance is primordial for achieving universal healthcare by providing financial protection to patients. It helps protect people from high healthcare costs by pooling funds to allow a cross-subsidization between the rich and poor and between the healthy and the sick [31]. Healthcare insurance coverage is still inexistent or at an embryonic stage in most African countries. This has largely contributed to poverty, poor cardiology service delivery and mortality from CVDs in Africa. Implementing an African health system insurance remains an important goal to improve the health status of individuals in Africa [4]. Reports illustrates that in the several SSA countries, direct out-of-pocket payments as a share of total health expenditure are still above 40%, exorbitantly high above WHO 20% threshold level of the total health expenditure below which financial risk protection can be ensured, and thus leading to poverty in Africa [32]. There is a serious handicapping sparsity of health systems insurance in most African nations where only about 15% of the 55 countries have national comprehensive health insurance schemes [33]. Evidence abounds that in SSA, the poor bear the highest burden of diseases and subsequently, experience very high expenses on healthcare costs [34]. Hence, the development of a health system insurance scheme should be advocated in public health and financial planning within African countries for better healthcare delivery in general. A universal healthcare system with national-level health insurance scheme would probably be more efficacious to avoid the low-socioeconomic class of the population from being marginalized. Strategies such as compulsory taxations from employees, deductions from sales taxes, and an increment on tobacco taxes have been shown to be effective in

some countries in SSA [35] .A comparative study of five African countries (Ghana, Tanzania, Kenya, Rwanda and Ethiopia) sought to help fill this gap by looking at how a national health system insurance schemes can cover the poor or not, as the case may be. Selected countries had were national insurance schemes with the intent of providing health insurance for all their inhabitants. Ghana, Kenya and Tanzania had similar health insurance programmes [36–40]. Ghana's National Health Insurance Scheme (NHIS), covers every citizen by law. Tanzania and Kenya had separate insurance schemes for the public and private sectors. Rwanda and Ethiopia operated a Community-Based Health Insurance (CBHI), but Rwanda's CBHI was the only one with wide coverage of the poor. Hence, setting down insurance policies or programmes does not guarantee reaching the poor. Many have questioned whether African countries have been too eager to adopt Western-style policies that are not necessarily appropriate to their context-specific fiscal laws. The selected countries are characterized by large informal sectors, making it difficult for the rolling out of health insurance scheme models that depend on this group. After almost 12 years of introducing national health insurance in Ghana, less than 40% of the population were covered by the health system insurance scheme. In spite of provisions made to cover the poor, health system insurance programmes have faced challenges in enrolling this group. Defining who the poor are is a task that policymakers have grappled with. Many terms have been used to identify the poor—ultrapoor, very poor, indigent and vulnerable. Coining these terms and explaining what they mean and who qualifies to be categorized as such has become not only burdensome but costly—and political [41].

The way forward to establishing a sustainable cost-effective and context specific health system insurance scheme in SSA should take into consideration the following. Firstly, the fact that the educational and socioeconomic status of a family play key roles in the decision of whether to enroll in health insurance should take into consideration that community-based health insurance provides some financial protection by reducing out-of-pocket spending [42]. Secondly, data analysis from micro-level household indicates that community financing improves access by rural and private sector workers to needed heath care and provides them with some financial protection against the cost of illness. Thirdly, analysis from macro-level cross-country gives empirical support to the hypothesis that risk-sharing in health financing matters in terms of its impact on both the level and distribution of health, financial fairness and responsiveness indicators [43].

7. Conclusion

In view of the vicious circle of poverty, lifestyle and cardiovascular disease in Africa, we propose some solutions to break this cycle. Women of childbearing age need to be well nourished, empowered and educated. They are "the most proximal levers" on which we can act to ensure optimal foetal and infant nutrition to break the vicious circle of poverty; malnutrition, underdevelopment and non-communicable disease. Obstacles hampering primary and secondary prevention of CVDs in SSA such as insufficient health care systems and infrastructure, scarcity of cardiologists, skewed budget allocation and disproportionate prioritization away from NCDs, high cost of cardiac treatments and interventions coupled with rarity of health insurance systems in most African countries need to be urgently addressed by the various governments and ministries of health of different African countries.

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