

Obesity and Cardiovascular Diseases: The Risk Factor in African Diets

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Abstract

The increasing prevalence of overweight and obesity is relevant not only in developed nations but also recently, in developing countries of Africa. Given that obesity is associated with morbidity and mortality from several health conditions including cardiovascular diseases this has attracted growing concern. In addition, scientific evidence is accumulating regarding the links between diet, obesity and the prevalence of cardiovascular diseases. Africa is diverse in vegetation, culture and therefore, dietary habits. However, the typical African diet (with regional variations) is composite in nature, with whole grains or tubers usually being the staple, accompanied with legumes, leafy and non leafy vegetables, meat or fish and vegetable fat. Such a composition appears to carry a low risk for obesity, though recently, studies suggest that Africans, especially in the urban areas are gradually departing from this traditional dietary pattern toward a western diet high in saturated fat, sugar and refined carbohydrates and low in fibre thereby significantly raising this risk. Africa is the least urbanized continent, but has the fastest rate of urbanization in the world. This development has greatly influenced African feeding habits and physical activity patterns, and has been associated with rapid changes in the prevalence of obesity and other nutrition-related chronic diseases. Yet a lingering concern is that child undernutrition remains a compelling public health issue, especially as the outcome of this nutritional transition in such undernourished children includes metabolic risks in adult life, thus presenting another dimension to the burden of cardiovascular disease in the continent.

Timely dietary and lifestyle intervention will go a long way in the prevention of obesity and its associated cardiovascular disease risk in Africa. Emphasis should be placed on nutrition and lifestyle interventions to sustain the consumption of healthy traditional diets. Although this will require financial investments, these are small when compared with the resources needed for the treatment and management of cardiovascular diseases, as well as the losses due to morbidity and mortality.

Introduction

Once thought to be a problem of developed countries, the epidemic of obesity and its associated chronic diseases is now growing in the developing world as well. This is influenced by the dietary and lifestyle changes that accompany economic development which include less physically demanding manual labour, urbanization, rising purchasing power and modernized food marketing. These factors, as extensively discussed by Witkowski (2007), are further exacerbated by genetic predispositions and early life undernutrition. The consequence is that basic energy equation is altered, as both energy intake and expenditure are affected. The resulting overweight and obesity has been associated with an upsurge in the prevalence of chronic diseases such as cardiovascular disease (CVDs), hypertension, Diabetes mellitus, stroke

and osteoporosis. Evidence is also building as regards the links with some forms of cancer (World Cancer Research Fund/ American Institute of Cancer Research 2007). The global burden of these chronic diseases is daunting, as they remain significant causes of disability and mortality worldwide. Deaths caused by chronic diseases dominate mortality statistics even in developing countries. In 2001, chronic diseases contributed approximately 60% of the 56.5 million total reported deaths in the world (WHO 2002). This amounted to 46% of the global burden of disease in that year, and this proportion is expected to increase to 57% by 2020. However, the locus of the burden will reside in the developing world, as it has been projected that, by 2020, about three-quarters of mortality due to Ischaemic Heart Disease, stroke and diabetes will occur in developing countries.

One major underlying determinant of obesity is the dietary intake, in addition to genetics, intrauterine influences, physical activity and socio-cultural factors. In Africa, obesity is becoming a serious problem in some regions and among certain population groups, despite the widespread prevalence of undernutrition. Since the diet has been recognized as a key player as a risk factor for obesity and CVDs, the question arises: what risk(s) does the African diet pose in this regard? What dietary patterns exist which have either positive or negative implications for obesity and CVDs? How and why are dietary habits changing, and what implications may these have on obesity and CVD risk? Understanding gained from these investigations will aid timely interventions and play a role in ensuring well being, and invariably quality of life for present and future generations in Africa.

Obesity and cardiovascular diseases (CVDs)

The health dangers of obesity are widely recognised, dominant among which is its role as an important determinant of CVDs. A large body of epidemiological studies of obesity have documented a relationship between obesity and risk of CVDs, especially in younger age groups. Both obesity - a body mass index (BMI) of 30 or greater and overweight (BMI of 25 to 30) confer elevated risks of CVDs. The Renfrew–Paisley study (Murphy et al. 2006), which was a 20-year follow-up of more than 15 000 middle-aged men and women underscored the long-term cardiovascular consequences of obesity , and demonstrated the association of obesity with an increase in a broad range of fatal and non-fatal cardiovascular events. A recent study also showed that higher BMI during childhood is associated with an increased risk of coronary heart disease in adulthood, suggesting that as children are becoming heavier worldwide, greater numbers of them are at risk of having coronary heart disease in adulthood (Baker et al. 2007). Existing literature reveal that risk factors for coronary heart disease, such as hypertension, dyslipidemia, impaired glucose tolerance, and vascular abnormalities, are already present in overweight children (Weiss et al. 2004;Viner et al. 2005). For adolescents, the (similar) picture as depicted in the study of Bibbins-Domingo et al (2007) is that of the noteworthy possibility that adolescent overweight will increase rates of coronary heart disease among future young and middle-aged adults, resulting in substantial morbidity and mortality.

These observed effects of obesity and overweight are largely mediated through hypertension (Thomas et al. 2005), and a cluster of metabolic disorders including dyslipidemia (Mokdad et al. 2001), and glucose metabolism ((Barrett-Connor and Pyorala ,2001) which, in turn, elevate risk of CVDs.

Obesity Estimates in Africa

The prevalence of obesity has been accelerating rapidly throughout the world not just in affluent, industrialized nations, and it is increasingly becoming common in Africa. In many parts of Sub-Saharan Africa, there has been a marked increase in the prevalence of not only obesity, but also of chronic diseases. Further, it is in this region, more than any other region in the world that these chronic diseases co-exist with high rates of communicable diseases such as HIV/AIDS, malaria and tuberculosis (Thiam et al. 2006). This double burden of disease, a major part of the multifarious health problems in Africa is further complicated by the yet to be resolved problems of undernutrition and micronutrient deficiencies throughout the life cycle – and its latent costs for the health of future generations.

In Africa, the epidemiology of obesity varies widely between and within regions. Table 1 presents prevalence data for females aged 15-49 years ($BMI \geq 30 \text{ kg/m}^2$) in some African countries, extracted from the World Health Organization Global database on Body Mass Index. This provides a snapshot of the situation in different countries of Africa. Reports of small-scale studies from various African countries also exist in the literature, and a number of these are highlighted in the following paragraphs.

In the West African sub-region, the available data indicate overweight prevalence ranged from 10% amongst Gambian males to 44% among females in Sierra Leone (WHO 2006). Abubakari et al (2007) conducted a meta-analysis of twenty eight studies on obesity in adult West African populations. Mean body mass index ranged from 20.1 to 27.0 kg^2 . Prevalence of obesity was estimated at 10.0%, with women being more likely to be obese than men. Urban residents were more likely to be obese than rural residents, and the results from time trend analyses indicated that prevalence of obesity in urban West Africa more than doubled (114%) over 15 years, accounted for almost entirely in women. Aryee et al. (2007) observed a propensity for

developing obesity in an adult male population living in and around a rapidly urbanising community in the Northern region of Ghana. Their study reported a prevalence of 33.1% and 10.3% for overweight and obesity among these males, with higher figures associated with increasing age, lower socioeconomic status, smoking and drinking status as well as low physical activity. One in every three subjects had a waist –hip ratio of 1 or greater.

From the Southern African sub-region, results from the first South African Demographic and Health Survey (SADHS) showed that more than 29% of men and 56% of women were classified as overweight and obese (Puoane et al. 2002). With this, South Africa has figures that are higher than those reported in other African countries (Goedecke et al. 2006). The problem is more pronounced among urban women than their rural counterparts, and in both groups, BMI increase with age. In addition, the findings from the younger age groups (15-24 years) suggest that adolescents and young people are also at risk of this epidemic. With pockets of undernutrition still on hand, the double burden of malnutrition is also of significance in this sub-region. A community-based study conducted among low income elderly in South Africa revealed widespread household food insecurity, micronutrient deficiencies (76.3% had mean serum zinc values lower than 70ug/dl cut off), while at the same time 83.6% of the women were overweight or obese, and 68% were hypertensive (Oldewage-Theron and Samuel. 2007). Thus it is apparent that obesity is now a major disease in South Africa, along with HIV/AIDS and child undernutrition.

In the Northern sub-region, Belahsen and Rguibi (2007) provided an overview of obesity and its determinants in six North Africa countries (Morocco, Mauritania, Algeria, Libya, Tunisia and

Egypt). The figures reported ranges from 13.5 to 46% in women, 4% to 22% in men, 6.8% to 12% in preschool children and 9% - 18% in school children and adolescents. Hence, it has become a significant health problem as well in this region. In another study, Benajiba et al. (2007) compared obesity trends in two Mediterranean countries, Morocco and Spain, belonging to two different continents. Their findings indicated that although adult prevalence of obesity is similar in both countries (13%), in the last two decades, the prevalence doubled in Spain (Europe), but tripled in Morocco (Africa).

On the whole, the common trend in all African sub-regions is that the figures are rising, however at different velocities.

The African diet

Africa, the second largest continent in the world, is rich in geographic and cultural diversity and therefore, dietary habits. As a result, each region of Africa has its distinct cuisines, though the basic staples that provide the bulk of the energy intake include cereals (such as maize, millet, wheat, barley and sorghum) and tubers (such as yams, cassava). However, many African countries have in the past three generations experienced extensive changes in food supplies and in household diets (Oniang'o et al. 2003), and exotic (untraditional) foods now dominate many urban areas in Africa. Even in the rural areas, the range of traditional domestic foodstuff has been considerably reduced partly due to increased cost of production and processing, and long and laborious domestic preparation methods. Shifts in the traditional eating patterns, new forms of cooking and new sources of food have emerged, coupled with shifts towards higher levels of women's participation in the workforce and subsequent changes in domestic roles and culinary practices. Regional variations exist in the traditional African diet.

For Northern Africa, much of the diet is based on grains, which are used to prepare flat breads and porridges. Couscous (made from hard wheat and millet) is often the main dish at lunch, which is the primary meal. This may be accompanied by vegetables and meat from a variety of domesticated and wild animals. Legumes such as broad beans (fava beans), lentils, yellow peas, and black-eyed peas are also important staples. Cooking with olive oil, onions, and garlic is common. Notable spices include cumin, caraway, clove, and cinnamon, while the fruits consumed include oranges, lemons, pears, and mandrakes. Alcoholic drinks are forbidden in many places as the cuisine largely reflects the Islamic traditions of the region. Mint tea and coffee are very popular non-alcoholic beverages in this region.

In West Africa, Staples vary widely within the region, ranging from Rice (from Mauritania to Liberia and across to the Sahel) to root crops, primarily varieties of yam and cassava (common along the coast from Côte d'Ivoire to Nigeria and Cameroon. The staple is eaten with soups made from legumes, green leafy vegetables, other vegetables, meat, fish or foods from animal sources, with palm or vegetable oil.

The soups in this territory tend to be generously spiced with peppers and other condiments and spices to add taste and variety to the dishes. Meat sources of protein include cattle, sheep, chicken, beef and goat. Fish is eaten in the coastal areas. "Bush meat" is widely eaten, giant snails are also eaten in various parts of West Africa. West Africans also utilize a wide range of dry beans and other legume crops (cowpea). These are typically water cooked and eaten as porridge, or dehulled and steamed in leaves. Maize and millet are used for making breakfast porridge, and also fermented for beer. West African Fruit include Plantain, bananas, oranges, guava, melons, passionfruit, figs, jackfruit, mangos, pineapples, cashews, and wild lemons.

In humid regions of East and Central Africa, the abundant green bananas and plantain are used as the base of the main dish. The main dish may be eaten with a relish made from pumpkin, cowpea or cassava leaves with addition of groundnut sauce or red palm oil (Oniang'o et al. 2003). Other main staples include potatoes, rice, and a maize meal that is cooked up into a thick porridge. Beef, goat, chicken, or sheep are the most common meats.

The traditional meal in the Southern African region is centered on a staple crop, usually rice or maize, served with a stew. The most common dish made from cornmeal is called mealie meal, pap or nshima / nsima depending on the country. It is usually eaten with stew poured over it, the stew may include a few boiled vegetables, such as cabbage, spinach, carrots or turnips. Chicken and Beef are widely eaten. A great variety of fruits are available in the southern part of the continent. Within this region, a specific mention of the country South Africa is noteworthy because is a mixture of several cultures - White South Africans (Dutch descendants), Europeans, and Asian Indians all who have diets similar to their countries of origin. This perhaps explains why the country appears to be farther ahead of the rest of Africa in adopting a westernized diet and lifestyle.

On the whole, however, considering the traditional African diet, the following common features are apparent:

- The traditional diet is high in complex carbohydrates, as well as pulses and vegetables, lowering the risk of obesity. It is also low in sugar, and saturated fat.
- In Africa, cereals are an important part of the diet. Whole grain, as part of a healthy diet, is known to help reduce the risk of the development of the metabolic syndrome and ultimately a reduction in heart disease. It also promotes healthy weight maintenance.

Whole grain foods are naturally low in fat. The soluble fiber helps maintain blood sugar levels, prolongs digestion of minerals and maintains blood sugar levels.

- Condiments and spices are liberally used as part of daily African cuisine; there may be beneficial health effects of these.
- Widespread consumption of leafy vegetables and traditional plants is also a feature of the traditional African diet. High total phenol content and antioxidant activity in commonly consumed leafy vegetables in Nigeria was reported by Oboh and Akindahunsi (2004), thus suggesting health benefits .
- An abundance and variety of fruits exist all over Africa, though whether consumption of these fruits is adequate is in question. Scientific evidence is accumulating to show that flavonoids found in fruits and vegetables may protect against heart diseases. Unlike consumption of other food groups, fruit consumption remains low in the continent from infancy throughout adulthood (Oniang'o et al. 2003). Houti et al. (2007) also observed this scenario in Algeria. This is suggesting that the potential protective effect of fruits is being under-utilized.

In all, the composition of the traditional diets appears to carry a low risk for obesity and its related risk for CVDs. However, the current observed acceleration in prevalence of obesity and overweight observed in the country studies suggests that Africans, especially in the urban areas are gradually departing from traditional diets toward a westernized diet and lifestyle, thereby significantly raising CVD risk. This is the focus of the next section of this paper.

The nutrition transition in Africa.

Studies suggest that Africa is already experiencing a nutrition transition, with its associated health risks. Africans, especially in the urban area are gradually departing from a traditional diet toward a western diet, high in saturated fat, sugar and refined CHO and low in fibre. This is occurring alongside with all the accompanying changes in physical activity and body composition. The scale and pace of urbanization may be playing a key role, as Africa, though being the least urbanized continent has the fastest rate of urbanization. Nigeria, the most populous country in sub-Saharan Africa (140 million), has seen the proportion of people living in urban areas grow from 44 to 52 per cent in 10 years. In 1991, one in three Nigerians was an urban dweller, compared to 40 years earlier when it was just one in ten .

Globally, the processes of urbanization or westernization associated with migration (cross-country and intra-country) lead to the availability and abundance of calorie-dense/low-fiber foods and the adoption of sedentary lifestyles. Inevitably, this is leading to increased risks of morbidity and mortality from CVDs and other diseases. Urbanization is changing physical activity levels in several ways: Decreased physical activities, increased use of motorized transportation, use of labour saving devices in the home, phasing out of physically demanding manual tasks in the workplace, physically undemanding leisure time, increased traffic build up in urban areas, reduction or even elimination of children's ability to play safely outside the home and last but certainly not the least, television and computer games.

Adding substantially to this problem is the double burden in Africa. This is a situation in which, whereas some traditional feeding habits may have been associated with some nutritional deficiencies, modern feeding habits and increasing sedentariness have also brought a number of life-threatening nutritional disorders, thus presenting the double burden of malnutrition in the continent. Child undernutrition remains a compelling public health issue, and micronutrient

deficiencies are still widespread among nutritionally vulnerable groups. The extension of this phenomenon to CVD risk can be explained from Barker's Hypothesis on Foetal Origins of Adult Diseases, which suggests that previously undernourished persons are at a higher risk for chronic metabolic diseases. This risk may be even higher when combined with environmental changes that also favor chronic diseases, such as low levels of physical activity or diets high in sugar, salt and fat. This hypothesis also finds support in studies on African populations migrating from home countries with a high prevalence of malnutrition which found observed increased rates of obesity, hypertension, and T2DM among these migrants (Fall and Barker 1997; Olatubosun et al. 2000). This has been attributed to migration-induced nutritional transition in those with "early-life adverse events" such as low birth weight and fetal growth retardation.

Minimizing the diet-related CVD risk in Africa

As the adoption of westernized dietary patterns have been implicated in the burden of chronic diseases, emphasis should be placed on nutrition education and health promotion activities to sustain consumption of a healthy traditional diet, and to support valuable food traditional systems. Also important is a focus on diet and lifestyles of adult men and women, particularly in the urban areas, which are more advanced in the nutrition transition than the rural areas. There has to be increased research endeavors on food consumption and dietary patterns at community and national levels among different socioeconomic classes of the populace.

A viable and effective nutrition surveillance system must be put in place to constantly monitor changes in dietary patterns, thereby providing warning signs of undesirable impending nutritional and health outcomes. This is definitely an area which must be improved and strengthened in Africa. Nutrition education would make use of data obtained from food

consumption research and surveillance systems to create awareness in all stakeholders and aim to change undesirable dietary practices, and sustain desirable ones.

Other action areas would include combined diet, nutrition education and exercise intervention projects among high risk groups/in the workplace. Investing in the nutrition of adolescent girls, pregnant / lactating women and infants/young children is also essential.

Conclusion

Obesity and its associated risks for CVDs and other chronic diseases is indeed a reality in Africa. Although the traditional African diet appears to carry a low risk for CVD, the gradual shift from this to a westernized diet and lifestyle will significantly increase this risk. Timely dietary and nutrition intervention will go a long way in the prevention of CVDs. Although this will require financial investments, these investments are small when compared with the resources needed for the treatment and management of CVDs, as well as the losses due to morbidity and mortality.

References

- Aryee, P.A., Mobund, A., and Annan, R.A. 2007. A propensity for developing obesity in an adult male population living in and around a rapidly urbanizing community in the Northern region of Ghana. 1st Meeting of the Federation of the African Nutrition Societies (FANUS), Ouarzazate (Morocco), May 7-9.
- Baker, J.L., Olsen, L.W., and Sørensen, T.I.A. 2007. Childhood Body-Mass Index and the Risk of Coronary Heart Disease in Adulthood. *N Engl J Med* (357) :2329-37.
- Barrett-Connor, E. and Pyorala, K. 2001. Long-term complications: diabetes and coronary heart disease. In *The epidemiology of diabetes mellitus: an international perspective*. Edited by J.M., Ekoe, P. Zimmet, and R. Williams. West Sussex: Wiley & Sons.
- Belahsen, R. and Rguibi, M. 2007. Obesity and Mediteranean Diet in North Africa. 1st Meeting of the Federation of the African Nutrition Societies (FANUS), Ouarzazate (Morocco), May 7-9.
- Benajiba, N., Warnberg, J., Aguenou, H., and Marcos, A. 2007 Obesity Prevalence and Trends: Comparison between Morocco and Spain. 1st Meeting of the Federation of the African Nutrition Societies (FANUS), Ouarzazate (Morocco), May 7-9.
- Bibbins-Domingo, K., Coxson, P., Pletcher, M.J., Lightwood, J. and Goldman, L. 2007. Adolescent Overweight and Future Adult Coronary Heart Disease. *Engl J Med* (357):2371-9.
- Goedecke, J.H., Jennings, C.L. and Lambert, E.V. 2006. Obesity in South Africa In *Chronic Diseases of Lifestyle in Africa 1995-2005*, Technical Report. Edited by K. Steyn, J. Fourie,

and N. Temple .Cape Town: South Africa Medical Research Council.

Houti, L., Landais, E., Eymard-Duvernay, S., Chougrani, S., Heroual, N., Traissac, P., Kolsteren, P., Delpuch, F., Atek, M. and Maire, B. 2007. Fruit and vegetable consumption and nutritional status of the Algerian population - Tahina Project . 1st Meeting of the Federation of the African Nutrition Societies (FANUS), Ouarzazate (Morocco), May 7-9.

Mokdad, A.H., Ford, E.S., Bowman, B.A., Dietz, W.H., Vinicor, F., Bales, V.S., and Marks, J.S. 2003. Prevalence of obesity, diabetes, and obesity-related health risk factors. *JAMA* (289):76-79.

Murphy, N.F., MacIntyre, K., Stewart S., Hart C.L., Hole, D. and McMurray, J.J.V. 2006. Long-term cardiovascular consequences of obesity: 20-year follow-up of more than 15 000 middle-aged men and women (the Renfrew-Paisley study). *European Heart Journal* 27(1):96-106

Oboh, G. and Akindahunsi, A.A (2004) Change in ascorbic acid, total phenol and antioxidant activity of sun-dried commonly consumed green leafy vegetables in Nigeria. *Nutr. & Health* (18): 29-36.

Oldewage-Theron, W.H. and Samuel, F.O. 2007. The Double Burden of Disease in African Elderly Attending a Care Centre in Sharpeville, South Africa. 1st Meeting of the Federation of the African Nutrition Societies (FANUS), Ouarzazate (Morocco), May 7-9.

Oniang'o, RK , Mutuku, JM & Malaba, SJ (2003) Contemporary African food habits and their nutritional and health implications *Asia Pacific J Clin Nutr* 12 (3):231-236

Puoane, T. Steyn, K., Bradshaw, D., Laubscher, R. Fourie, S., and Lambert V. 2002. Obesity in South Africa: the South African Demographic and Health Survey. *Obes.Res* (10):1038-1048.

SCN News 2005. Overweight and obesity a new emergency? *United Nations System Standing Committee on Nutrition* (29) 8-9

Thiam, I., Samba, K. and Lwanga, D. 2006. Diet related chronic disease in the West African Region. *Standing Committee on Nutrition News* (33): 6-10

Thomas, F., Bean K, Pannier, B., Oppert, J., Guize, L., and Benetos, A. 2005. Cardiovascular mortality in overweight subjects: the key role of associated risk factors. *Hypertension*. (46):654-659

Viner, R.M., Segal, T.Y., Lichtarowicz-Krynska, E., Hindmarsh, P. 2005. Prevalence of the insulin resistance syndrome in obesity. *Arch Dis Child* (90):10-4.

Weiss, R., Dziura, J., Burgert, T.S., 2004. Obesity and the metabolic syndrome in children and adolescents. *N Engl J Med* (350):2362-74.

WHO (2002) The World Health Report 2002: reducing risks, promoting healthy life. Geneva

WHO (2006) Global Info Base . www.who.int/ncd_surveillance/infobase/web

WHO Global database on Body Mass Index, <http://www.who.int/bmi/index.jsp> accessed 01-06-08

Witkowski, T.H. 2007. Food Marketing and Obesity in Developing Countries: Analysis, ethics and Public policy. *Journal of Micromarketing* 27 (2): 126-137

World Cancer research Fund/ American Institute of Cancer Research 2007. Food, Nutrition, Physical Activity and the Prevention of Cancer: a Global Perspective. Washington DC.

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Table 1. National prevalence data (BMI \geq 30 kg/m²) for females aged 15-49 years in some African countries

African Sub-region	Country	Year of survey	Rural/urban	Percentage	Sample size
Central	Cameroon	2004-2005	Both	10.3	1816
Central	Congo	2005-2005	Urban	10.4	3517
Central	Congo	2005-2005	Rural	3.4	2558
Northern	Egypt	2005-2005	Urban	55.2	7158
Northern	Egypt	2005-2005	Rural	40.4	10013
West	Ghana	2003-2003	Urban	12.7	2378
East	Kenya	2003-2003	Urban	12.3	1759
East	Kenya	2003-2003	rural	4.4	5288
Southern	Lesotho	2004-2005	rural	15.2	2391
Southern	Malawi	2004-2005	Both	0.7	1610
West	Niger	2006-2006	Urban	11.1	775
West	Nigeria	2003-2003	Urban	9.2	2258
Southern	Zimbabwe	2005-2006	Both	7.9	1806
Northern	Morocco	2003-2004	Urban	13.8	9671
Northern	Morocco	2003-2004	Rural	6.5	6148
East	Uganda	2006-2006	Urban	12.2	428
Southern	Mozambique	2003-2003	Rural	8.4	3762

Extracted from WHO Global database on Body Mass Index, <http://www.who.int/bmi/index.jsp>