

METABOLIC SYNDROME IN SUB-SAHARAN AFRICA

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INTRODUCTION

Metabolic syndrome is a cluster of metabolically related cardiovascular disease (CVD) risk factors that increases the risk of CVD by 2-fold and the risk of developing type 2 diabetes mellitus by 3-fold. The underlying pathophysiology is thought to be related to abdominal obesity and insulin resistance. Other associated pathophysiologic conditions are physical inactivity, aging, and polycystic ovarian syndrome. The cluster includes various combinations of obesity (total body obesity measured by body mass index, or central obesity measured by waist-to-hip ratio or waist circumference), atherogenic dyslipidemia (increased triglycerides, decreased high-density lipoprotein cholesterol), elevated blood pressure (systolic and diastolic), abnormal glucose tolerance (fasting blood glucose, 2-hour postprandial blood glucose), and insulin resistance measured by the homeostasis model assessment (HOMA-IR) or fasting insulin.^{1,2}

There have been several definitions using different criteria, including those of the World Health Organization (WHO) (1998, 1999), European Group for the Study of Insulin Resistance (1999), American Association of Clinical Endocrinology (2000), National Cholesterol Education Program Adult Treatment Panel III (ATP III) (2001, 2004). In 2005, the International Diabetes Federation (IDF) proposed a further definition for metabolic syndrome for use in epidemiology studies and clinical practice, which would allow for comparison between different population groups and the assessment of its relationship with various health outcomes.¹⁻³

A prerequisite in the IDF definition of the metabolic syndrome is central

obesity measured by ethnicity-specific waist circumference and it is recommended that European cutpoints be used for populations for which such data are not available, eg, in sub-Saharan Africans.

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The available emerging data suggests variable prevalence of metabolic syndrome in different parts of the world and in different ethnic groups. According to the IDF definition,¹ in men, rates range from 3.9 % in Chinese to 50.6% in Mexican Americans, and in women, from 2.5% in Japanese to 46.2% in Mexican Americans. When the ATP III definition is used,² the rates are higher: in women, from 5.6% in Japanese to 59.8% in Mexican Americans, and in men, from 3.2% in Chinese to 40.3% in Mexican American.^{4,5}

Africa, which makes up 22% of the world's total land area, is the second largest continent. Culturally, Africa is diverse, with an estimated population of 642 million living in \approx 50 countries and making up 3000 ethnic groups and \geq 1000 languages. It is believed that Africa was the cradle of human life; however, today, it is very much part of the developing, not developed, world. Indeed sub-Saharan Africa is in the middle of one of the most rapid demographic and epidemiologic transitions in world history, and different countries and regions are at different stages of this transition. All of the sub-Saharan African countries are experiencing the problems of poverty, increasing urbanization, Westernization of lifestyle, and in some cases the disruption of social fabric. As a consequence, there is a

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multiple burden of diseases—communicable diseases such as malaria and tuberculosis, high levels of trauma and an emerging epidemic of noncommunicable diseases and their risk factors; to add to this, is the precipitous HIV-AIDS epidemic.

Global estimates have confirmed an epidemic of chronic lifestyle disorders such as diabetes and that the prevalence of diabetes will increase; the largest proportional and absolute increases are expected to occur in developing regions of the world, including Africa, due in part to the projected increase in the urban population in developing regions and in the aging populations across the world. From the recent estimates of the IDF, for Africa, in adults aged 20–79 years, the regional prevalence of diabetes is projected to increase from 3.1% in 2007 to 3.5% in 2025, with a corresponding 80% increase in numbers, from 10.4 million to 18.7 million.⁶ The future effect of the demographic and epidemiologic transition in Africa on the prevalence of metabolic syndrome is unknown and is a matter of concern.

From sub-Saharan Africa the available literature on metabolic syndrome is limited mainly to small clinical studies in defined high-risk groups of patients, such as those with type 2 diabetes, coronary artery disease, and rheumatoid arthritis; moreover, synthesizing the results is limited not only by the small numbers but also the variable criteria used for defining metabolic syndrome. Although the prevalence of CVD risk factors and of some of the individual components of the metabolic syndrome have been reported, namely type 2 diabetes,⁶ obesity, and hypertension, the available evidence on the effect of metabolic syndrome from epidemiology studies is limited to a single report from Cameroon.⁷ In this study, the aim was to determine the prevalence of metabolic syndrome with modified WHO, ATP III and IDF definitions (because no high-density

lipoprotein cholesterol levels were available) and to assess the associations between the components of the metabolic syndrome, central obesity and insulin resistance as measured by HOMA-IR. It was a cross-sectional study of 1553 (666 men, 887 women in both urban and rural settings) participants, aged 24–79 years. All participants had a 75-g oral glucose tolerance test, questionnaire information, anthropometric measurements (weight, height for body mass index, waist and hip circumference, waist-to-hip ratio, and blood pressure). Additional biochemical tests included serum insulin, total cholesterol, and total triglyceride; high-density and low-density lipoprotein cholesterol were not measured. According to IDF definitions, there was an absence of metabolic syndrome in rural men, and the prevalence was low in rural (.3%) and urban (1.5%) women and in urban (1.2%) men. According to ATP III definitions, there was an absence of metabolic syndrome in rural men and women, and the prevalence was higher in urban men (.5 %) than in urban women (.2%). Higher rates were found with WHO criteria: in women, 1.8% (rural) and 5.9% (urban) and in men, 1.9% (rural) and 7.3% (urban). Using any criteria, urban rates were higher, both in women and men.

Regarding the prevalence of the individual components of the metabolic syndrome, according to IDF definitions, in women, central obesity as measured by waist circumference was the most prevalent component (rural vs urban, 58.6% vs 49.5%, $P = .008$), while elevated serum triglyceride was the least frequent (rural vs urban, .3% vs .3%). In men, the most frequent abnormality was elevated blood pressure (rural vs urban, 29.4% vs 37.7%, $P = .03$) and serum triglyceride the least frequent (rural vs urban, .4% vs 1.4%, P nonsignificant). The prevalence of all the components was higher in the urban sample but nonsignificant for

elevated fasting plasma glucose and triglyceride.

In multivariate analysis, central obesity was more tightly associated with the components of the metabolic syndrome than was HOMA-IR. This study in a group of urban and rural Cameroonians showed that the prevalence of metabolic syndrome varied greatly by urban vs rural residence and with the different definitions used; moreover, it was the lowest rate recorded in the literature up to that time. Central obesity appears to be the key determinant of the prevalence of metabolic syndrome in this sub-Saharan African community, and the suggestion was that many of the metabolic syndrome definitions may not be appropriate for African populations.

ENVIRONMENTAL FACTORS AFFECTING PREVALENCE OF METABOLIC SYNDROME IN SUB-SAHARAN AFRICA

One of the main results of the Cameroon study was that although the prevalence of total and abdominal obesity was high in rural and urban areas, the prevalence of the metabolic syndrome was low. High physical activity, even without reduced body fat mass, greatly improves all metabolic profiles (lipids, insulin resistance, and blood pressure). Despite the higher energy intake in rural areas shown previously in this population, the urban-rural difference in the prevalence of metabolic syndrome is possibly partly explained by the differences in the levels of physical activity. Therefore, any decrease in the level of physical activity would lead to a dramatic increase in the prevalence of the metabolic syndrome in Africa. Further studies are needed in other populations in sub-Saharan Africa to determine whether the prevalence of metabolic syndrome is heterogeneous and to establish what the best marker for central obesity is in these communities.

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