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Original article

Metabolic syndrome and impaired health-related quality of life and in non-Hispanic White, non-Hispanic Blacks and Mexican-American Adults

Ike S. Okosun [a,*], Francis Annor [a], Fred Esuneh [b], Emmanuel E. Okoegwale [c]

[a] Division of Epidemiology & Biostatistics, Public Health, Georgia State University, Atlanta, GA 30302, USA
[b] Department of Microbiology, Ambrose Alli University, Ekpoma, Edo State, Nigeria
[c] Department of Botany, Ambrose Alli University, Ekpoma, Edo State, Nigeria

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ABSTRACT

Objective: We examined the relationship between metabolic syndrome (MetS) and impaired health-related quality of life (HRQoL) in non-Hispanic Whites (NHW), non-Hispanic Black (NHB), and Mexican-Americans (MA).
Methods: Data (n = 5170) from 2009–2010 NHANES were used. Subjects perceived poor overall health (POH), poor physical health (PPH), and poor mental health (PMH) status in the past 30 days were used as indices of impaired HRQoL. Race/ethnic-specific associations between MetS and indices of HRQoL were determined using prevalence odds ratios (POR) from logistic regression models. Statistical adjustments were made for age, sex, education, marital status, income and smoking.
Results: Rates of POH, PPH and PMH in the past 30 days increased linearly with increased number of components of MetS in NHW, NHB and MA. MetS was associated with increased odds of PPH in NHW (POR = 2.34; 95% CI = 1.73–3.17) and MA (POR = 1.65; 95% CI = 1.09–2.50); increased odds of PPH in NHW (POR = 1.65; 95% CI = 1.18–2.31), NHB (POR = 1.83; 95% CI = 1.01–3.35), and MA (POR = 1.67; 95% CI = 1.09–2.83); and increased odds of PMH in NHW (POR = 1.50; 95% CI = 1.08–2.08), NHB (POR = 2.28; 95% CI = 1.29–4.01), and MA (POR = 1.44; 95% CI = 0.80–2.59). Upon adjustment for other independent variables, smoking and lack of education were found associated with increased odds of impaired HRQoL.
Conclusions: MetS is associated with POH, PPH, and PMH in American adults. From clinical standpoint, this study further suggests that HRQoL should be considered in the management of subjects with MetS. Robust public health programs designed to reduce the prevalence of MetS may help in reducing impaired HRQoL, including POH, PPH, and PMH in American adults who have MetS.

1. Introduction

Metabolic syndrome (MetS) is a complex disorder defined by a cluster of interrelated factors that increase the risk of cardiovascular atherosclerotic diseases and type 2 diabetes. Described originally by Hanefeld and Leonhardt [1] and popularized by Reaven [2], MetS remains a subject of considerable curiosity because of the complexity of the pathophysiology. The main components of MetS are abdominal obesity, elevated arterial blood pressure, dysregulated glucose homeostasis, and dyslipidemia (hyperinsulinemia, hypercholesterolemia, hypertriglyceridemia, and low levels of high-density lipoprotein cholesterol) [3,4]. An emergent aspect of MetS is its increasing prevalence in childhood [5], adolescent [6] and young adulthood [7], and the future implications to the global health burden it could confer. MetS has a high socioeconomic cost and is considered a worldwide epidemic [8]. Many organizations and expert groups variably define MetS. However, the two most widely used definitions are those of the National Cholesterol Education Program Adult Treatment Panel III (NCEP) [9], and the International Diabetes Federation (IDF) [10] focusing specifically on abdominal obesity measured using waist circumference in addition two other factors.

Prevalence of MetS in the United States range from between 34.3% and 38.5% depending on the criteria that is employed [11]. Prevalence increases with age among Americans, and tend to peak among those aged 60–69 years [12]. Prevalence of MetS is lower among African American men than White or Mexican American men, and lower among White women than among African American or Mexican American women [12]. In the period between 1988–1992 and 1999–2000, the prevalence of MetS among U.S. adults increased by 15.9%, and among U.S. adolescents the prevalence increased by approximately 52% [12].

* Corresponding author at: Division of Epidemiology & Biostatistics, Public Health, Georgia State University, Suite 861 Urban Life Building, PO Box 3995, Atlanta, GA 30302-3995, USA. Tel.: +1 404 413 1138; fax: +1 404 413 1140.
E-mail address: iokosun@su.edu (I.S. Okosun).

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Although the effects of many individual components of MetS on quality of life have been investigated, the impact of MetS on health-related quality of life (HRQoL) is yet to be clearly delineated because of inconsistencies in findings that are reported in the literature. For example two previous studies reported that subjects with MetS have reduced quality of health [13,14]. These studies show that psychiatric co-morbidities that includes psychosocial, physical, emotional problems, and depressive conditions are more common in subjects with MetS as compared with subjects without MetS [13–15]. Some studies also reported negative association between MetS and HRQoL [16,17]. Discrepancy in findings may be attributed to differences in the definitions of MetS or HRQoL.

Although minorities in the United States have higher rates for many cardiometabolic risk factors and lower rates of HRQoL than non-Hispanic Whites, only little is known about the impact of MetS in racial/ethnic differences for HRQoL. Because of the escalating prevalence of MetS in the United States, understanding its impact on quality of life is essential for developing public health initiatives for managing subjects with MetS. This study was therefore designed to examine the association between MetS and impaired HRQoL in American adults. Specifically, we sought to determine association between MetS and self reported HRQoL assessed using overall health, physical health, and mental health in non-Hispanic White (NHW), non-Hispanic Black (NHB) and Mexican-Americans (MA). Due to the well know racial/ethnic differences in quality of life as well as MetS, we hypothesize that the association between MetS and impaired HRQoL will vary by race/ethnicity.

2. Methods and procedures

2.1. Study design

Data from the 2009–2010 United States National Health and Nutrition Examination Surveys (NHANES) were used for this investigation. NHANES are multifaceted cross-sectional sampling designs administered to a representative sample of the civilian non-institutionalized individuals within the U.S. population. Participants in NHANES were interviewed in their homes and subsequently received physical and laboratory examination in mobile examination centers. Descriptions of the plan and operation of the surveys are available on the world-wide-web [18], and other investigators have also described the survey methods [19]. In summary, the 2009–2010 surveys were based on stratified, multistage probability sample. The stages of sample selection were as follows: [a] Primary Sampling Units [PSUs], which were counties or small groups of contiguous counties; [b] segments within PSUs [a block or group of blocks containing a cluster of households]; [c] households within segments; and [d] one or more participants within households [18].

The institutional review board of the National Center for Health Statistics approved the NHANES study protocols. For the household interview, participants were those who understood, agreed to and signed interview consent for the household interview portion of the survey [18]. After the household interview was completed, all interviewed persons were asked to complete the health examination component. Those who agreed to participate were asked to sign additional consent forms for the health examination component. Informed consent was obtained from each subject in the study. In order to obtain high quality data, the health examinations were conducted at standardized settings [mobile examination centers] [18]. Overall, approximately 10,500 persons completed the 2009–2010 NHANES.

2.2. Study population

This study is restricted to adults (20 or more years of age) that had values for height, weight, waist circumference, education, marital and smoking status, and assayed for fasting blood glucose (FPG), oral glucose, triglycerides and high-density lipoprotein-cholesterol (HDL). This study was also restricted to the three major United States racial/ethnic consisting of NHW, NHB and MA who provided HRQoL information. Women who were pregnant at the time of the surveys were excluded from analysis. Because many cardiovascular diseases are associated with impaired quality of life, participants who have coronary heart disease, myocardial infarction, angina pectoris, or stroke were excluded from this study.

In the 2009–2010 NHANES, anthropometric measurements were done in the mobile examination centers. The anthropometry protocol requires specific measurements depending on the age of the participant. Height was measured at an upright position with a standiometer [18]. Weight was measured at a standing position using a Toledo self-zeroing weight scale. Waist measurement was made just above the right iliac crest at the mid-axillary line and to the nearest 0.1 cm [18]. In NHANES, three consecutive blood pressure readings were obtained at a one-time examination visit using a standard protocol. In this investigation, averages of the three systolic and diastolic blood pressure readings were used as representative of the participants' systolic and diastolic blood pressure values. Triglycerides, HDL, and blood glucose were analyzed after 8 h of overnight fasting. Triglycerides and glucose were measured enzymatically in serum using a series of coupled reactions. Serum HDL was measured using direct immunoassay method [18].

In this study, education was categorized as less than high school, high school and college, while marital status was dichotomized as not married and married. Smoking was categorized into current smokers defined as participants who had smoked >100 cigarettes during their lifetime and were still smoking, past smokers defined as participants who had smoked >100 cigarettes during their lifetime but had stopped, and non-smokers as participants who had smoked less than 100 cigarettes during their lifetime.

2.3. Definition of metabolic syndrome and impaired health-related quality of life

2.3.1. Metabolic syndrome

MetS was defined using the IDF criteria [10] as abdominal obesity (waist circumference of $\geq$102 cm for men and $\geq$ 88 cm for women) in addition 2 or more of the followings: (1) raised triglycerides ($\geq$150 mg/dL or specific treatment for this lipid abnormality), (2) reduced HDL cholesterol ($<$40 mg/dL in males and $<$50 mg/dL in females or specific treatment for this lipid abnormality), (3) raised blood pressure (systolic BP $\geq$ 130 or diastolic BP $\geq$ 85 mmHg or treatment of previously diagnosed hypertension), (4) raised fasting plasma glucose ($\geq$100 mg/dL or previously diagnosed type 2 diabetes).

2.3.2. Impaired health-related quality of life

In NHANES, subjects were asked the following HRQoL questions: (a) "Would you say that your health in general is: excellent, very good, good, fair, or poor?" (b) "Thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?" (c) "Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?" In this study, general health status was dichotomized into fair or poor health (poor overall health-POH) versus good, very good, or excellent health (good overall health). We defined PPH and PMH using values of 14 days or more of not having good physical health and not having good mental health, respectively. These values correspond to 90th percentiles for physically unhealthy days and mentally unhealthy days and correspond to values that are used by