

ORIGINAL REPORTS: DIET AND OVERWEIGHT

OBESSE AFRICAN AMERICANS: THE PREVALENCE OF DYSLIPIDEMIA, HYPERTENSION, AND DIABETES MELLITUS

Context: The prevalence of the cardiovascular disease risk factors, dyslipidemia, hypertension, and diabetes mellitus, is increased in the setting of obesity.

Objective: To determine whether the prevalence of these risk factors increases with increasing body mass index in an obese cohort, or whether there is a threshold for their appearance.

Design and Setting: Individuals with body mass index ≥ 30 kg/m² joined a weight reduction program in the Howard University General Clinical Research Center.

Participants: Five hundred fifteen African Americans (aged 12–74 years, mean body mass index of 42.8 ± 8.5 kg/m²).

Outcome Measures: The cohort was divided by incremental increases in body mass index of 4.99 kg/m², and the prevalence rates of hypertension (blood pressure $\geq 140/90$ mm Hg), dyslipidemia (total cholesterol >200 mg/dL, or low-density lipoprotein >130 mg/dL, or elevated ratio of total or low-density to high-density lipoprotein cholesterol) and diabetes mellitus (fasting blood glucose ≥ 126 mg/dL or random blood glucose >200 mg/dL) were determined for each group.

Results: The cohort prevalence rates were: dyslipidemia, 27.0%; hypertension, 56.9%; and diabetes mellitus, 24.1%. These rates are higher than those found in the African-American population by the third National Health and Nutrition Examination Survey. After adjusting for age and sex, there were no significant differences in the prevalence rates of these risk factors according to increasing body mass index, suggesting a threshold of between 30 kg/m²–34.99 kg/m² for maximal appearance of these risk factors.

Conclusion: The incidence rates of dyslipidemia, hypertension, and diabetes mellitus do not increase with a greater degree of obesity above a body mass index of 34.99 kg/m². (*Ethn Dis.* 2004;14:384–388.)

Key Words: African Americans, Cardiovascular Disease Risk Factors, Diabetes Mellitus, Dyslipidemia, Hypertension, Obesity, Females

Otelio S. Randall, MD; Tamrat M. Retta, MD, PhD;
John Kwagyan, PhD; Victor R. Gordeuk, MD; Shichen Xu, MD;
Abid R. Maqbool, MD; Muluemebet Ketete, MD;
Thomas O. Obisesan, MD

INTRODUCTION

It is estimated that 25% of women and 20% of men in the United States are obese, as defined by BMI ≥ 30 kg/m².¹ Within the African-American population, obesity is disproportionately higher, with an estimated prevalence of 40% in women and 21% in men compared with 25% in White women and 20% in White men.¹ Dieting is almost an obsession to many, even though most do not stick to any structured, reasonable pattern designed to maintain ideal body weight.^{1–3} In spite of this, the prevalence of obesity continues to increase at epidemic proportions,^{4,5} and the obesity-related health cost is substantial.^{6,7}

While research has shown obesity to be associated with major cardiovascular disease risk factors, including dyslipidemia, hypertension, and type 2 diabetes mellitus,^{1,8–16} few of such studies have been conducted among the African-American population, and, to the best of our knowledge, limited or no data exist examining the relationship of risk factors with different degrees of obesity.

From the Department of Medicine, Howard University, Washington, DC.

Address correspondence and reprint requests to Otelio S. Randall, MD; General Clinical Research Center; Howard University Hospital; 2041 Georgia Ave. NW, 4 West; Washington, DC 20060; 202-865-7272; 202-865-1933 (fax); osrandall@howard.edu

This study was undertaken to describe the association of different degrees of obesity with 3 major cardiovascular disease risk factors: dyslipidemia, hypertension, and type 2 diabetes mellitus, in a group of obese African-American participants. In the general population, the prevalence rates of these risk factors increase progressively from a BMI category of <25 kg/m² to BMI categories of 25 kg/m²–26 kg/m², 27 kg/m²–29 kg/m², and ≥ 30 kg/m².¹ We hypothesized that the prevalence rates of these risk factors would continue to rise progressively in obese patients as the BMI increases from 30 kg/m² to >55 kg/m².

METHODS

Participants

The Howard University Institutional Review Board approved the study, and all participants gave written, informed consent. The participants were recruited from physicians' offices and clinics to be enrolled in a weight-reduction program at Howard University's General Clinical Research Center, conducted between August 1998 and July 2000. Entrance criteria included BMI ≥ 30 kg/m² and age >12 years. Exclusion criteria included known metabolic and hormonal diseases that cause obesity, and clinical conditions that would not allow moderate to vigorous exercise. A cardiologist performed a complete cardiovascular evaluation. Also excluded were patients with known coronary artery disease, or

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coronary disease provoked by diagnostic exercise treadmill tests, a history or symptoms of heart failure, or electrocardiographic evidence of arrhythmia. Subjects with seizure disorders and/or musculoskeletal conditions precluding exercise (mainly due to arthritis), and participants unable to consume fat-modified diets (mainly for allergy reasons), also did not participate in the study. Height and weight were recorded, and the BMI was calculated as weight in kg divided by the square of the height in meters. Prior to obtaining blood pressure, patients sat in a chair, with feet on the floor, for at least 5 minutes. Blood pressure was obtained with an appropriately sized cuff mercury sphygmomanometer (Baumanometer, W.A. Baum Co. Inc., Copiague, NY) fitted on the same arm, and supported at the heart level on 3 occasions, 5 minutes apart, in an office setting. Venous blood samples were obtained after fasting for at least 8 hours, and lipid profiles and serum chemistries were measured in Howard University Hospital's Central Laboratory by the timed end point method, which uses enzymatic reactions analyzed on a Synchron Clinical LX20 (Beckman Coulter, Brea, Calif.).

Diagnosis of Dyslipidemia, Hypertension, and Diabetes Mellitus

Participants were classified as having dyslipidemia if they were currently be-

Table 1. Clinical characteristics of 515 obese African-American study participants

Dyslipidemia* (all)	139 (27.0)
Hypertension† (all)	293 (56.9)
Diabetes mellitus‡ (all)	124 (24.1)
No additional risk factor	135 (26.2)
One additional risk factor	225 (43.7)
Dyslipidemia only	43 (8.3)
Hypertension only	150 (29.1)
Diabetes mellitus only	32 (6.2)
Two additional risk factors	134 (26.0)
Hypertension and dyslipidemia only	62 (12.0)
Hypertension and diabetes mellitus only	60 (11.7)
Diabetes mellitus and dyslipidemia only	12 (2.3)
Three additional risk factors	21 (4.1)

* Dyslipidemia: total cholesterol >200 mg/dL, or low-density lipoprotein >130 mg/dL, or elevated ratio of total or low-density lipoprotein cholesterol to high-density lipoprotein cholesterol.

† Hypertension: blood pressure \geq 140/90 mm Hg on 3 occasions.

‡ Diabetes mellitus: fasting blood glucose \geq 126 mg/dL or random blood glucose >200 mg/dL.

ing treated for the condition, their total cholesterol was >200 mg/dL, their low-density lipoprotein cholesterol was >130 mg/dL, their ratio of total cholesterol to high-density lipoprotein cholesterol was >4.5, or their ratio of low density lipoprotein cholesterol to high density lipoprotein cholesterol was >3.5. Participants on anti-hypertensive medications, or those having blood pressure measurements of \geq 140/90 mm Hg on 3 or more office visits, separated by at least a week, were classified as having hypertension. Participants with fasting blood sugar levels \geq 126 mg/dL, non-fasting blood sugar levels \geq 200 mg/dL, or with a history of diabetes mellitus requiring treatment, were classified as having diabetes mellitus.

Data Analysis

The participants were empirically divided into the following 6 groups: BMI of 30 kg/m²–34.9 kg/m², BMI of 35 kg/m²–39.9 kg/m², BMI of 40 kg/m²–44.9 kg/m², BMI of 45 kg/m²–49.9 kg/m², BMI of 50 kg/m²–54.9 kg/m², BMI of \geq 55 kg/m². The Cochran-Armitage Trend test was used to examine the prevalence rates of dyslipidemia, hypertension, and diabetes mellitus, across these BMI categories. The relationship of BMI to the cardiovascular risk factors

of hypertension, dyslipidemia, and diabetes mellitus was examined in logistic regression models controlling for age and sex. In another model, we examined the relationship of BMI with these risk factors by assigning a risk count of zero, if a participant had no risk factor, one if there is only one risk factor, and so on. We analyzed the count data utilizing Poisson regression analysis, adjusting for age and sex.

RESULTS

The study sample consisted of 515 obese African Americans, 85% female, with mean \pm SD age of 46 \pm 13 years, and BMI of 42.8 kg/m² \pm 8.7 kg/m². The clinical characteristics are shown in Table 1. After obesity, hypertension was the most common cardiovascular risk factor, observed in 56.9% of the participants. Dyslipidemia was found in 27%, and diabetes mellitus in 24.1%. Twenty-six percent of the participants exhibited no cardiovascular risk factor, other than obesity, while 43.7% had only one additional risk factor, 26% had 2 additional risk factors, and 4.1% had 3 additional risk factors.

Table 2 summarizes the results of the prevalence rates of cardiovascular risk

Table 2. Distribution of the cardiovascular disease risk factors across BMI category. Results are number (%)

BMI (kg/m ²)	N	Dyslipidemia	Hypertension	Diabetes Mellitus
30–34.99	85	21 (24.7)	53 (62.3)	16 (18.8)
35–39.99	124	42 (33.9)	76 (61.3)	35 (28.2)
40–44.99	110	32 (29.1)	58 (52.7)	24 (21.8)
45–49.99	92	24 (26.1)	44 (47.8)	18 (19.6)
50–54.99	50	9 (18.0)	35 (30.0)	17 (34.0)
≥55	54	11 (20.4)	28 (51.9)	15 (27.8)

factors according to BMI categories, and these are highlighted in Figure 1. There were no significant differences in the prevalence rates of dyslipidemia, hypertension, or diabetes mellitus, according to increasing BMI categories, nor was there a significant difference in the prevalence of combinations of these risk factors, according to increasing BMI categories. The relationship of cardiovascular disease risk factors to BMI was also examined in logistic and Poisson regression models controlling for age and sex, and no significant relationships of hypertension, dyslipidemia, and diabetes mellitus with increasing BMI were found, whether considered as individual risk factors or combinations of risk factors, suggesting a threshold between 30 kg/m²–34.99 kg/m² for maximal appearance of these risk factors. Within the BMI categories, however, there was a highly significant correlation between increasing age and the presence of the risk factors of hypertension, dyslipidemia, and diabetes mellitus.

DISCUSSION

This study was undertaken to describe the association of obesity with 3 major cardiovascular disease risk factors, dyslipidemia, hypertension, and diabetes mellitus, in African Americans. Seventy-four percent of the participants in this study exhibited one or more of these risk factors (Table 1). This high prevalence of cardiovascular disease risk factors supports previous studies dem-

onstrating a strong association between obesity and cardiovascular diseases.^{7–13} In the general population, the prevalence rates of these cardiovascular disease risk factors are substantially higher in Blacks than in Whites.^{11,15–20}

The major finding of this study is that, in this group of African-American study participants, capable of engaging in an exercise program, a BMI greater than 34.99 kg/m² did not appear to further increase the prevalence rates of the obesity-related cardiovascular disease risk factors, dyslipidemia, hypertension, and diabetes mellitus (Figure 1). Earlier investigations observed similar results of little or no correlation between increasing degrees of obesity and greater rates of CHD risk.^{21,22} Other investigators have found that the prevalence rates of these risk factors increase progressively from a BMI category of <25 kg/m² to BMI categories of 25 kg/m²–26 kg/m², 27 kg/m²–29 kg/m², and ≥30 kg/m² in the general population.¹ The results of the present study are therefore consistent with the presence of a threshold of 30 kg/m²–34.9 kg/m² for the increased incidence of hypertension, dyslipidemia, and diabetes mellitus in the context of obesity. This observation, however, does not suggest that a BMI ≥35 kg/m² is healthful.

The prevalence rates of cardiovascular disease risk factors we report here are true for a limited group of obese individuals in a given region of the country, and do not necessarily apply to the general population of the United States. African Americans, in general, have ex-

cess prevalence rates of obesity,^{5,15} physical inactivity, the metabolic syndrome,¹⁶ and other cardiovascular disease risks factors.¹⁵ This excess prevalence emphasizes the need to focus on obesity reduction in this population. Further, the participants in this study were limited to a select group of obese individuals, in that they were screened to exclude diseases and pre-existing clinical conditions that would preclude moderate to vigorous exercise routines, and in that they were motivated to join a weight-reduction program centered on exercise and diet control. Whether our finding of a lack of correlation between increasing BMI and cardiovascular disease risk factors would apply to obese individuals in general would, therefore, require further study.

The American Heart Association (AHA) has added obesity to the list of major, modifiable coronary artery disease risk factors,²³ and a panel of experts assembled by the National Institutes of Health recognized the importance of the consequences of obesity in the development of cardiovascular disease in the United States.¹ If the incidence of obesity continues to rise in the population, along with other associated cardiovascular risk factors, the recent decrease in cardiovascular disease incidence will be slowed or reversed. Therefore, non-pharmacologic means to curtail obesity are urgently needed. The present study suggests that a maximal benefit in reducing cardiovascular disease risk factors will be achieved by diet control measures that reduce the BMI to less than 30 kg/m², as this appears to be the approximate threshold for a change in the actual prevalence of these factors. Fontaine and colleagues²⁴ studied the impact of obesity on the health-related quality of life, and reported greater impairment in obese persons when compared to the general population. The pattern of the results indicated that, as weight increases, quality of life related to the physical domains becomes adversely affected. A recent report²⁵ also

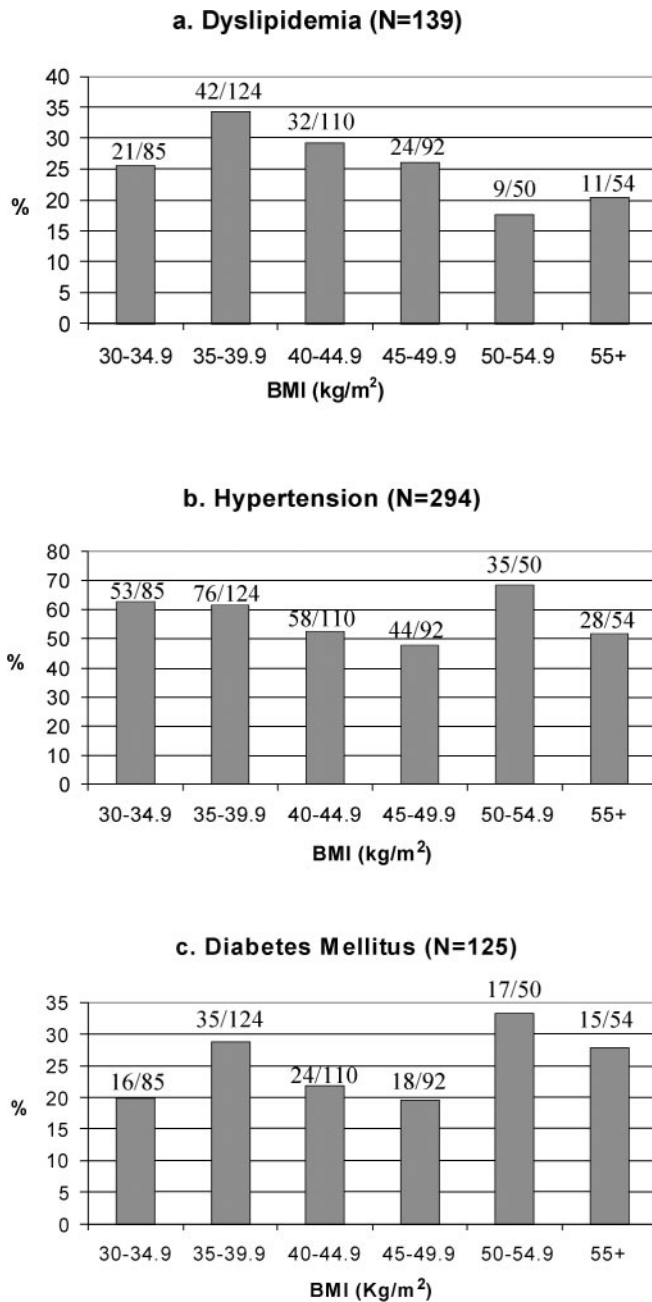


Fig 1. The prevalence of dyslipidemia, hypertension, and diabetes mellitus according to increasing BMI categories in a cohort of 515 obese African-American participants

indicated marked reduction in life expectancy due to obesity, with significant differences observed between races. In this study, the maximum years of life lost for young adult obese Black men were estimated at 20, compared to 13 years for Whites. It is, therefore, important to emphasize that even modest reductions in body weight are of substan-

tial benefit in reducing the morbidity and mortality of obesity.²⁶⁻²⁹ In this regard, we have found that a program including a varied, low-calorie, low-fat, low-salt diet, combined with treadmill exercise, can lead to substantial reductions in weight and improved lipid profile among African-American women.^{30,31}

... in this group of African-American study participants, capable of engaging in an exercise program, a BMI greater than 34.99 kg/m² did not appear to further increase the prevalence rates of the obesity-related cardiovascular disease risk factors, dyslipidemia, hypertension, and diabetes mellitus.

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AUTHOR CONTRIBUTIONS

Design and concept of study: Randall, Gordeuk, Maqbool, Ketete
Acquisition of data: Randall, Xu, Maqbool, Ketete
Data analysis and interpretation: Randall, Retta, Kwagyan, Gordeuk, Xu, Obisesan
Manuscript draft: Retta, Kwagyan, Gordeuk, Obisesan
Statistical expertise: Kwagyan, Gordeuk
Acquisition of funding: Randall
Administrative, technical, or material assistance: Randall, Kwagyan, Xu, Maqbool, Ketete, Obisesan
Supervision: Randall