South American Journal of Public Health
Volume 4, Issue 2, 2016

Comparing the risk of obesity-related morbidity and mortality in different ethnic groups

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Abstract

Objective: This paper aims to review the current literature in order to compare different ethnic groups with respect to the known racial disparities in the risk of obesity-related morbidity and mortality, thus orienting clinical practitioners for a better practice in light of evidence-based data.

Methods: Literature review using key words - obesity, metabolic syndrome, ethnic differences, BMI, cardiovascular risk - through PubMed database from 2000 to now.

Results: The prevalence of metabolic syndrome and cardiovascular diseases as complications of overweight and obesity are variable among different ethnicities worldwide. Recent studies contra-indicate the use of global cutoff points for measures like body mass index (BMI) and waist circumference (WC) as it has been demonstrated that, for similar BMI and WC values, different populations present distinct patterns of body shape and fat deposition. For instance, South Asians are at increased risk of cardio-metabolic disorders even with a lesser degree of body adiposity.

Conclusions: Instead of a direct cause-effect relationship, biologic/genetic and environmental factors like socioeconomic status, culture, religion, health habits, geographic location, and their intricate interactions form the complex basis of ethnic disparities on predisposing to obesity-related diseases, thus the importance of an individualized analysis of the obesity indexes, in order to optimize patient management and to reduce health risks.

Keywords: *obesity, BMI, adiposity, ethnicities, metabolic syndrome, diabetes*

Introduction

Ethnic and racial differences as predisposing factors to obesity and metabolic disorders have a significant impact on public health worldwide. Although obesity as assessed by body mass index (BMI) has been associated with an increased risk of metabolic disorders and cardiovascular disease (CVD), some studies have demonstrated a contrasting finding, called 'obesity paradox'. This term is used to describe the inverse relationship between BMI and mortality risk in subjects with CVD, despite the conventional knowledge that CVD is highly associated with obesity and overweight. It is well known that BMI singly cannot discriminate lean and fat mass, thus the concept of 'normal weight obesity', referent to patients who have high body fat in spite of normal BMI. Such patients are at increased risk of CVD and have elevated mortality rates, particularly females. The most accepted explanation for these observations is the close relationship between central fat accumulation and visceral fat, which is the major etiopathogenic factor of high blood pressure, inflammation and insulin resistance[1].

The different patterns of body shape and fat deposition observed in distinct ethnicities make BMI an inaccurate method for predicting fat distribution and cardio-metabolic risks in different parts of the world. For instance, it has been demonstrated that for similar BMI values, South Asians accumulate more fat and African less fat than the general population. As a result, obesity may be overestimated among African groups and underestimated among South Asians[2].

Susceptibility to a multifactorial disease like obesity includes biologic (genetic) and non-biologic (environmental) factors. Genome and DNA sequences differ in frequency in distinct

populations and the interaction between genetic traits and specific environments results in the observed phenotypic variation at individual and population levels. A great challenge in this area is the difficulty to measure the relative influence of environmental versus genetic predisposing factors, and how they interact with each other. The recent advances on genetic information, particularly in the nutritional and metabolic fields, might be very helpful for better understanding the risks disparities among different populations, thus facilitating the development of effective prevention and control interventions[3].

Ethnic differences

Asia comprises the population with the most rapidly increasing diabetes prevalence rates. According to recent estimates, by the year of 2025, this continent will have 100 million people with type 2 diabetes mellitus (DM2). Such enormous prevalence rate differs from other countries and continents as it has quickly increased in a relatively short period, besides affecting a younger population with lower BMI. It has been observed that, when compared to Caucasians, Asians with similar BMI have higher percentages of body fat, more accentuated abdominal obesity pattern, higher concentrations of intramyocellular lipids and higher fat stores in the liver. These high-risk features are sufficient to predispose the Asian population to insulin resistance even at a lesser obesity degree[4].

The remarkable disparities in body composition vary according to the region of Asia. Considering the three major racial Asian groups – Chinese, Indians and Malay – for a similar BMI, Indians present the highest levels of body fat, followed by Malay and Chinese. Obviously, genetic variability affecting body composition, i.e., lean versus fat mass plays an important role in the predisposition to the distinct patterns of adiposity and muscularity in different races. Moreover, further interactions with the environment and other genes during the prenatal and postnatal periods, as well as during lifetime may be responsible for modifying body composition, the distribution of fat and related metabolic disturbances[4]. In the United Kingdom, current data revealed that in males, obesity rates are lower in Chinese, Bangladeshi, Pakistani, Indian and Black groups compared to the general population. Among females, prevalence is higher among Black African, Caribbean and Pakistani populations, and lower in the Chinese[2].

The commonest way of assessing abdominal obesity, which is considered the most dangerous pattern of the disease, is through the waist circumference (WC) and waist-to-hip ratio (WHR) measurements. Recently, it has been demonstrated that the central or abdominal distribution of fat has a great direct impact in the mortality rates of patients with CVD[1]. The cutoff points of these indexes were set during an event carried out by the CDC – Centers for Disease Control and Prevention - in Atlanta, USA, based on White Caucasian people, mostly Europeans. However, due to the well-known population heterogeneity concerning obesity diagnostic criteria, it is now consensual that the currently used cutoff points might not be applicable to all ethnicities. Experts consider that BMI and WC thresholds should be ideally determined according to the population racial background. These parameters include Asians who live in their native continent and their descendants who live in Western countries as well. In comparison with Caucasians, Asian ethnic groups present greater body fat with lower measures of weight, height, BMI and WC[5].

The World Health Organization (WHO) has tried to pragmatically classify the risks of metabolic disorders and hypertension based on Caucasians BMI. A value of 25 was considered reasonable to be overall applied but it was far from a consensus, since many American researchers agreed that BMI values up to 27-28 would be normal, especially for middle aged and older Caucasians. On the other hand, Japanese researchers claimed that lower thresholds would be needed for assessing Asian patients considering their increased cardio-metabolic risks[6]. Since then, several groups have been trying to establish lower BMI cutoff points for Asians. For instance, China and Japan reduced BMI thresholds to 24 (overweight) and 28 (obesity). In India, these values are 23 and 27, respectively[7].

European data and the International Diabetes Federation have demonstrated that abdominal obesity should be assessed considering ethnic-specific WC values, which are more reliable predictors of metabolic syndrome and cardiovascular risks than BMI[8,9]. A conjoint WHO/IASO/IOTF[10] meeting had already proposed different WC cutoff points for distinct populations, as summarized in table 1.

Ethnic group	Gender	WC cutoff points (cm)
USA	Male Female	102 88
Europeans	Male Female	94 80
South Asians	Male Female	90 80
Chinese	Male Female	90 80
Japanese	Male Female	85 90

Table 1: Racial differences in the proposed WC thresholds for predicting risks of metabolic syndrome. Observations: (i) South and Central Americans: use South Asian recommendations until more specific data are available; (ii) Sub-Saharan Africans, Eastern Mediterranean and Middle East (Arab) populations: use European data until more specific data are available[10].

Ethnic differences in younger and older groups

Obese adolescents are at high risk for physical and mental health disorders such as hypertension, diabetes and depression. Risk factors for obesity in childhood and adolescence include socioeconomic conditions, gender and ethnicity. In the last decade, the prevalence of obesity among African and Hispanic American adolescents increased by more than 10%, which contributes for the higher rates of diabetes in these populations in comparison with their White peers. According to an American investigation, the poorer the population, the higher the adolescent obesity prevalence. Furthermore, minority populations (Black and Hispanic) tend to have higher rates of obesity in adolescence[11]. Official British data also show higher obesity rates for Black girls and boys than for the White population at the same age in the United Kingdom[2].

In comparison to Caucasians, Asian adolescents present higher subcutaneous fat deposition and a less prominent gynoid fat pattern. In fact, when Indian adolescents with abdominal obesity were compared to Caucasians at the same age, it has been observed a lower sensitivity to insulin in the Asians group[4].

Taking into consideration the other life extreme, a clinical study investigated the association between the onset of functional disabilities as a long-term effect of overweight and obesity in middle-aged and elderly Americans divided into 3 racial groups – White, Black and Hispanic[12]. Possible confounders like lifestyle, chronic diseases and socio-demographic aspects were statistically controlled. The trial evaluated data over a period of 10 years and included a representative sample of individuals, ranging from 50 to 64 years old. The researchers proposed two main questions: i) Do ethnic differences affect the impact of obesity on the onset of functional impairment? ii) If they do, are these disparities related to mobility and difficulties on the daily living activities (DDLA)?

This study demonstrated that overweight and obese Blacks and Hispanics were more likely to progress to DDLA than Whites with the same BMI over the follow-up period. Moreover, this negative effect was more pronounced in Hispanics than in Blacks[12]. These findings may be explained by the distinct body composition – fat versus lean mass – in different racial groups, as previously discussed.

Conclusion

Several uncertainties remain concerning the association between ethnicity and obesity. This is especially true when we try to determine how much of the prevalence disparities of obesity and the related comorbidities among distinct ethnic groups are due to biologic/genetic factors, lifestyle, culture, health behaviors, environment or socioeconomic status.

By now, the main conclusion in this issue is with respect to establishing individualized approaches, particularly when analyzing measures like BMI and WC, which have been shown to vary considerably among different populations and ethnicities. Such measures are helpful and simple tools for the diagnosis of overweight, obesity and abdominal obesity, and for predicting associated health risks, especially cardio-metabolic disorders. In order to avoid over- or underestimating obesity and its serious consequences, the practitioner should keep in mind that those indexes are to be carefully analyzed in each patient, as they are highly influenced by ethnic differences. Furthermore, a better comprehension of the role of genetic factors in obesity and metabolic syndrome will optimize the current strategies of prevention and control of these conditions.

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