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Risk classification paradox of anthropometric measurements in Saudi Arabia: need for further consideration

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Lifestyle (including dietary habits) and socioeconomic status have changed in Saudi Arabia (SA) over the last decades. SA suffers from a high burden of non-communicable diseases (NCDs) such as cardiovascular diseases, hypertension and type 2 diabetes mellitus, fuelled by obesity and overweight[1]. A steep population increase (~75 % in just over 10 years) and a young population (63 % aged under 30) implies that the burden of NCDs will increase further in the forthcoming decades[2]. Monitoring overweight and obesity in SA is therefore an urgent imperative to develop adequate public health policies. This study aims to integrate current national surveys to build a comprehensive picture of overweight and obesity in SA, discussing the use of body mass index and waist circumference as best descriptors.

We carried out secondary analysis of data obtained from five Saudi national and sub-national surveys (Saudi Health Information Survey 2013[1], National Health Survey 2004–2005[3], Capital-wide Biomarker Screenings in Riyadh region 2008–2009 and 2013–2014[4], and the Riyadh Validation Survey 2013[5–6]). Participants (18 years old and over) had been randomly selected from the community for all surveys. Height, weight, waist and hip circumferences (WC, HC) were measured after informed consent. Body weight (kg) was divided by height (m) squared to generate BMI (body weight (kg)/height (m^2)). Obesity was defined according to BMI (≥30 kg/m^2) and risk associated with large waists was determined based on established WC cut-offs: *i*) elevated risk 1 - ♀ > 80 cm and ♂ > 94 cm; *ii*) high-risk 2: ♀ > 88 cm and ♂ > 102 cm. Data was analysed using the Statistical Package for Social Sciences (SPSS) software, version 21·0 for Windows (SPSS Inc., Chicago, IL, USA). Data from the five surveys were combined into a single database. Subjects were grouped into fifteen 10-year age bands, identified by the middle year from 25 (that is, ages 18–27) to 95 (ages 88–97) years. Subjects were also divided into two age groups: <45 years old and >45 years old. Spearman's correlations and regression analyses were performed to determine the relationship between body composition and age within each gender.

A total of n = 24,689 adults were included in the analysis (55 % female, 45 % male). The median age was 40 years (IQR 29–52). Complete anthropometric measurements were available for n = 12,744 participants (52 %); 45 % of women and 31 % of men were obese; 51 % of women and 35 % of men had a large waist (elevated and high risk). Linear regression analysis showed significant increase in body weight, waist circumference and BMI for every 5 years increase in age ($p < 0{\cdot}001$): 1·35 kg; 2·1 cm and 0·72 kg/m^2 in women; and 0·32 kg; 1·27 cm and 0·27 kg/m^2 in men, respectively. The magnitude of the difference in prevalence of obesity and having a large waist in women and men was statistically significant ($\chi^2 = 494{\cdot}7$; $\chi^2 = 565{\cdot}6$ respectively, both $p < 0{\cdot}0001$). Around 25 % of the women and 30 % of the men with a very large waist (high-risk 2) would not have been identified as high-risk based on their (non-obese) BMI. Among those aged >45 years with a BMI between 18·5–25, 59 % of women and 34 % of men had a large waist (risk 1 or 2), approximately twice as many as those aged under 45 with a normal BMI (24 % of women, 16 % of men with elevated large waist).

SA experiences high prevalence of obesity, compounded by the fact that half of older adults (~42 %) not categorised as obese based on BMI in fact have a large waist. The use of BMI may be misleading as a measure of adiposity across populations especially in older people. It is necessary to investigate further whether BMI and WC are better predictors of health outcomes (metabolic risks) among Saudi Arabs since the current cut-offs derived from a European Caucasian population.

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