The waistline of America has been expanding now for decades, largely as a consequence of an obesogenic environment, with a car-worshipping culture and take-away lifestyle par excellence. No upper limit to the prevalence or environment, with a car-worshipping culture and take-away lifestyle, were less likely to present the full picture of obesity-related outcomes, as demonstrated once again here by Zhang et al. Third, and the most important, abdominal adiposity. Even though the results presented here suggest a roughly linear association between waist circumference and mortality, with most of the studies reported to date, waist circumference was not measured, with obesity measured using the body mass index (BMI), a crude measure of overall obesity that, as multiple studies have now shown, is often not the best predictor of obesity-related outcomes. In the current issue of Circulation, Zhang et al expand on the already considerable evidence suggestive of a strong positive relationship between overall obesity (using BMI) and mortality with a report from the large Nurses’ Health Study examining the impact of abdominal obesity (using waist circumference) on all-cause, cancer, and CVD mortality in US women. The study is well powered to examine such associations, with over 3500 deaths during the 16 years of follow-up. As noted by the authors, this is one of only a handful of studies to examine the association of waist circumference and mortality, with most of the others also showing strong associations. Two studies failed to show an association between waist circumference and mortality, but these were conducted in much older populations that, although they may have substantial mortality, were less likely to present the full picture of obesity-related premature mortality because of the changing associations between obesity and mortality with age.

In the present paper, the authors have demonstrated among US women nurses a clear step-wise increase in risk for each of cancer, CVD, and overall mortality with increasing quintiles of waist circumference or waist:hip ratio. The J-shaped curve commonly seen in appropriately adjusted studies of BMI and mortality (which results largely from increased respiratory disease death among underweight individuals and increased CVD and cancer death among the overweight and obese) was not seen in this study. This demonstrates the difference in outcomes from overall obesity as compared with abdominal adiposity. Even though the results presented here suggest a roughly linear association between waist circumference and mortality, it needs to be acknowledged that a limit exists to the recommendation that a reduced waist circumference decreases mortality risk. Diseases such as anorexia and bulimia in more affluent societies, and the chronic malnutrition still present in much of the developing world, remind us that in another context, “underweight” can and does also present an increased mortality risk.

The important debate as to which measure of obesity, waist circumference, waist:hip ratio, or BMI, is “better” is probably best divided into clinical and research perspectives. In the busy clinical setting, the importance of this question relates to whether the time-consuming burden of multiple measures of obesity is indeed justified. Various practical and scientific considerations are relevant here. First, the simplicity of the message delivered by measurement of waist circumference to the individual or patient is of paramount importance. For example, who is unable to relate to the experience of a pair of jeans that is feeling a little tight, or the belt that no longer quite fits? Both BMI and waist:hip ratio are abstract concepts in comparison. Second, and just as important, abdominal obesity is a stronger predictor of obesity-related outcomes, as demonstrated once again here by Zhang et al. Third, and the only practical drawback to waist circumference, it is not easy to obtain an accurate waist measurement, with no standardized protocol practiced, and different studies use different locations to take the measurement. Even with a standard protocol, clinicians will differ in the measurement of an individual’s waist. Having said this, it is also true that obtaining an accurate weight measurement is also surprisingly difficult because of inaccuracies in scales used, changes with time of day, and variation in the amount of clothing removed before measurement. Height measurement is also not always entirely accurate. Finally the question arises of whether the measurement of waist in addition to BMI helps to identify an additional subset of the population at increased risk. The findings from Zhang et al clearly demonstrate that...
among those women classified as “normal” after measurement of BMI, the risk of mortality (and CVD mortality in particular) increases if they are also classified as obese by waist circumference. The same is true among those classified as normal by waist circumference but obese by BMI. This would appear to suggest that in women both BMI and waist circumference provide important components of mortality risk.

Does this mean that measurement of both central and overall adiposity in the clinical setting is justified? On the surface, it would appear so. However, to answer this question fully requires both an analysis of whether models that include both waist circumference and BMI are significantly better than those that contain waist circumference alone (for example, comparing the area under the receiver operating characteristic curve for both models) as well as an examination of the implications in a population setting. The correlation between continuous BMI and waist variables in the Nurses’ Health Study was high, reported as 0.81 by Zhang et al. Yet, the concordance of waist and BMI in categorizing the population into normal, overweight, and obese using established cut points is not nearly so high. In the national Australian Diabetes, Obesity and Lifestyle (AusDiab) study,16 95% of women who were classified as obese by BMI were also classified as obese by waist circumference, but conversely, only 58% of those deemed obese by waist circumference were also obese by BMI. Similarly, 85% of those classified as overweight by BMI are either overweight or obese by waist circumference, but only 63% of those overweight by waist are classified similarly or worse by BMI. The upshot of this is that even though BMI and waist are largely colinear,17 someone classified as overweight, or even more particularly obese, by BMI is overwhelmingly likely to be similarly classified by waist circumference, but not vice versa. The main reason for this is that using the cut points suggested for Europids, obesity defined using waist circumference identifies a much larger proportion of the population than does obesity defined by BMI. So, even though the mortality risk may be higher in those identified as obese by both waist and BMI, in reality, measuring BMI in addition to waist will not identify a large additional population at higher risk (at least using currently recommended cut points18), whereas using waist circumference alone will identify both those already identified by BMI as obese, plus a significant additional high-risk population.

Summarizing all of these arguments leads to the conclusion that monitoring changes in waist size (whether or not the cut points are taken into consideration) is as important, or even more important, than monitoring changes in weight and BMI. The findings of Zhang et al confirm the importance of this, at least for women (analysis of similar male cohorts is therefore also required to confirm these findings for both sexes). The simple measurement of waist circumference should be strongly encouraged in the clinical setting and also as a health promotion message to encourage prevention of the multiple obesity-related outcomes such as type 2 diabetes mellitus, CVD, and also death.

An interesting and controversial facet of the relationship between obesity and mortality that was not addressed in the report of Zhang et al is the changes in this relationship that occur with age. Obesity has different implications not only based on the degree of severity, but also on the age at which it develops. This is a reality and an issue that is seldom addressed, usually because of the absence of lifetime data or numbers of subjects and events that are inadequate for analyzing mortality by age group. Stevens et al addressed this question in their analysis of the relationship between age, BMI, and mortality in the large American Cancer Prevention Study, demonstrating that the strength of the relationship between mortality and BMI declined with age (even though it remained significant up to age 74 years).8 This conclusion could explain the absence of an association between waist circumference and mortality seen in those 2 studies that only included elderly subjects13,14 and suggests that, whereas obesity needs to be recognized as an important risk factor for mortality (and other outcomes), the message of its health implications needs to be particularly directed at younger populations. The heightened risk of obesity in younger populations is 2-fold: firstly, they have a lifetime in which the consequences of their obesity can be played out, and secondly, they have a longer time in which their adiposity can further increase. For these reasons, a push to curb childhood and adolescent obesity is of paramount importance.

A final mention of the novel findings on the strong relationship between central obesity and cancer mortality in the present study should be made. These results are of great importance and serve to further highlight the multifaceted nature of the consequences of an obesity epidemic. The multiple important messages on the consequences of obesity presented in this paper come at an opportune time, with little evidence to date of the paradigm shift in thinking required to prevent a worsening of the obesity-related crisis and to attack the environmental and behavioral issues that are creating the obesogenic environment that surrounds us.

Disclosures

None.

References


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Expanding Evidence for the Multiple Dangers of Epidemic Abdominal Obesity
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