Does waist circumference alone explain obesity-related health risk?

Dear Sir:

In an editorial related to an article by Janssen et al (1), Bray recommended that we be reluctant toward replacing body mass index (BMI; in kg/m²) with waist circumference as the only clinical measurement for indicating health risks associated with overweight and obesity (2). We agree with Bray. In their article, Janssen et al (1) called for prospective studies. We published such a paper last summer (3). Our results support both the hypotheses of Janssen et al and Bray’s reluctance toward ignoring BMI.

Between 1993 and 1997, 57,053 men and women aged 50–64 years were recruited for a Danish prospective study, the Diet, Cancer, and Health study. The cohort represents 7% of the entire Danish population in this age group. From recruitment until 31 December 2002, 2323 deaths (1461 men and 862 women) were identified in the Civil Registration System by using the unique personal identification numbers assigned to all Danish inhabitants. Missing information about variables of interest led to the exclusion of 628 participants, with 483 lost to follow-up.

We examined the independent associations of waist circumference and BMI with all-cause mortality in this cohort of middle-aged men and women (3). We showed how BMI predicted mortality for given values of waist circumference and how waist circumference predicted mortality for given values of BMI (3). No sign of interaction was found (3). Our findings are summarized in the 2 new figures presented here, which show the estimated associations for each of the obesity measures for fixed values of the other measure. The estimated association with mortality is displayed for a 95% normal range of variation in the obesity measure among subjects with a fixed value of the other measure (eg, for waist circumference = 130 cm, the 95% prediction limits for BMI were 35.7–44.3 for men and 38.8–53.4 for women). As shown in Figure 1, the estimated mortality rate ratio decreased with increasing BMI for all values of waist circumference between 60 and 130 cm in women and between 70 and 140 cm in men. The decrease in mortality was strongest for the lowest BMI values. The general increase in mortality with BMI among obese subjects seems to be caused by the fact that high BMI values are observed for subjects with a high waist circumference only, which can be seen from the horizontal extent of the waist circumference–specific curves. As shown in Figure 2, the estimated mortality rate increased log-linearly with waist circumference for BMI values between 17 and 40 in both men and women. Furthermore, increasing mortality with increasing waist circumference was found even for BMI values < 25 (3).

Thus, the importance of BMI for mortality depends on the World Health Organization’s classifications of BMI (4). For overweight

REFERENCES

(BMI of 25–29.9) and obese (BMI ≥30) persons, waist circumference alone captures the increase in the mortality rate and replaces BMI as a risk indicator in a graded fashion, as suggested by Janssen et al (1). In contrast, for underweight (BMI <18.5) persons, BMI dominates the mortality rate, and in the normal weight range (BMI of 18.5–24.9), both waist circumference and BMI predict the mortality rate (3), but in opposite directions.

In summary, when BMI is >25, waist circumference alone is a very good predictor of mortality, whereas when BMI is <25, BMI is also important for the mortality rate, and waist circumference cannot fully replace BMI (3). Further studies investigating other endpoints related to obesity are needed.