High Prevalence of Normal Waist Circumference in Japanese Employees with a Cluster of Metabolic Abnormalities

To the Editor

Recently, international diagnostic criteria of metabolic syndrome were jointly proposed by the International Diabetes Federation and the American Heart Association/National Heart, Lung, and Blood Institute. In the criteria, increased waist circumference, i.e., abdominal obesity, is not treated as an obligatory component, but as an equal component to other metabolic abnormalities. This is in contrast to the original diagnostic criteria in Japan, in which abdominal obesity is a key and obligatory component of metabolic syndrome. The international criteria mean that some subjects diagnosed with metabolic syndrome may have metabolic abnormalities without abdominal obesity, suggesting that their overlapped metabolic abnormalities are not based on abdominal obesity.

To date, there are no data available about the prevalence of these cases, especially in Asia. We therefore investigated waist circumference in Japanese subjects who could be diagnosed with metabolic syndrome by the international criteria due to the coexistence of three or more metabolic abnormalities.

We used the database of Japanese employees of Amagasaki City Office who participated in an annual health checkup (UMIN000002391). Of the 2175 men and 759 women attending the health checkup in fasting state, whose age was 47 ± 11 years, 303 men and 42 women (14% and 6%, respectively; p < 0.01) had three or more components other than increased waist circumference (i.e., hypertriglyceridemia, decreased HDL cholesterol level, raised blood pressure, and/or elevated fasting glucose level) and could be diagnosed with metabolic syndrome, irrespective of abdominal obesity, according to the international criteria. They accounted for 58% and 71% of male and female cases with metabolic syndrome. In the male subjects with three or more metabolic abnormalities, the prevalence of hypertriglyceridemia, decreased HDL cholesterol level, raised blood pressure and elevated fasting glucose level was 97% (n = 293), 61% (n = 186), 91% (n = 275), and 81% (n = 254), respectively. The corresponding prevalence in women was 86% (n = 36), 81% (n = 34), 81% (n = 34), and 71% (n = 30), respectively. We analyzed the waist circumference in these subjects.

As a result, the waist circumference of men (n = 303) was 89 ± 9 cm, and the average value was significantly higher than the cutoff value of 85 cm (p < 0.01). However, it should be noted that not all subjects had a waist circumference ≥ 85 cm, as shown in Fig. 1A. Indeed, the prevalence of a normal waist circumference (i.e., < 85 cm) was as high as 34% (n = 102 of 303) in the subjects. Fig. 1B shows the prevalence of a normal waist circumference in the subgroups classified by accumulated metabolic abnormalities.

On the other hand, the waist circumference of women (n = 42) was 86 ± 12 cm (Fig. 1C), and the average value was in turn significantly lower than the cutoff value of 90 cm (p < 0.05). Furthermore, as shown in Fig. 1D, the prevalence of a normal waist circumference (i.e., < 90 cm) was as high as 71% (n = 30 of 42), indicating that the majority lacked abdominal obesity. When the prevalence of those with three or more metabolic abnormalities without abdominal obesity was assessed in the whole population, it was similar between men and women: 5% (n = 102 of 2175) in men and 4% (n = 30 of 759) in women (p = 0.48).

To our best knowledge, this is the first report revealing the prevalence of a normal waist circumference in Japanese subjects with overlapping metabolic abnormalities who could be diagnosed with metabolic syndrome according to the international criteria. The criteria were published years ago but are still discussed from many aspects. Treating abdominal obesity as a selectable component is one of the topics. Metabolic syndrome diagnosed by the criteria can include overlapping metabolic abnormalities unrelated to abdominal adiposity. If the prevalence of these cases is very low and clinically ignorable, the emphasis on these “rare exceptions” might not always be necessary in healthcare settings; however, our study revealed that the lack of abdominal obesity was rather common in subjects with sufficient metabolic abnormalities to be diagnosed with metabolic syndrome. Around one-third of the men and two-thirds of the women lacked an increased waist circumference.

It is well known that clustering metabolic abnormalities are independent risk factors of atherosclerosis irrespective of the presence of abdominal obesity, and therefore their management is clinically important. In the subjects with accumulated metabolic abnormalities who have abdominal obesity, a strategy targeting visceral fat reduction is important. On the other hand, such a strategy is not useful in subjects...
reported its fairly good correlation with visceral fat deposits measured by computed tomography (CT)\(^8\), and its high reproducibility\(^9\). Second, we used the data of city employees and some may wonder how representative the current population is of the target population in Japan. However, given that cohorts of civil servants are often used as those providing representative features overseas\(^{10}\), we believe that the current study design could provide reliable information to some extent.

In conclusion, in Japanese employees with three or more metabolic abnormalities who could be diagnosed with metabolic syndrome by the international criteria, not a few subjects lacked increased waist circumference.

![Fig. 1. Waist circumference in subjects with three or more metabolic abnormalities.](image)

A and C: Distribution of waist circumference in men (A) and women (C). The class widths of the histograms were determined according to statistical rules (Starges', Scott's, and Freedman-Diaconis' rules). When female waist circumference was divided into 5 cm bins, the frequency in each bin was as follows: 2 in 65-70 cm, 3 in 70-75 cm, 8 in 75-80 cm, 11 in 80-85 cm, 6 in 85-90 cm, 4 in 90-95 cm, and 3 in 95-100 cm, 2 in 100-105 cm, 1 in 105-110 cm, 1 in 110-115 cm, 1 in 130-135 cm, and 0 in the other bins. B and D: The prevalence of normal waist circumference in men (B) and women (D). Normal waist circumference was defined as $< 85$ cm in males and $< 90$ cm in females. Data presented are those in overall subjects (Overall), and 5 subgroups classified by metabolic abnormalities (Group 1 to 5). Group 1, having all metabolic abnormalities except hypertriglyceridemia; Group 2, having all except reduced HDL cholesterol; Group 3, having all except raised blood pressure; Group 4, having all except elevated fasting glucose level; Group 5, having all four metabolic abnormalities. Error bars demonstrate 95% confidence intervals given by Clopper-Pearson's exact method.
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We declare that we have no conflict of interest.

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