

## Editor's comments

## The Importance of Measuring Waist Circumference of Children

CHUN-MING CHEN

*International Life Science Institute Focal Point in China*

A large number of positive scientific evidences confirmed that central obesity was highly associated with CVD, diabetes and hypertension. Studies in different countries and ethnic groups demonstrated that waist circumferences (WC), waist-hip ratio (WHR) and waist circumference-height ratio (WHtR) (or waist circumference-stature ratio WSR) performed as strong predictors when being added to body mass index (BMI). And WC and WHtR could be independent predictive indices for risk of CVD events and diabetes<sup>[1-6]</sup>. The same trend has been confirmed and several recommended optimal cutoffs of WC, WHtR, and WHR for disease prevention have been made by national representative epidemiological studies and follow-up studies in China<sup>[7-11]</sup>. Currently, screening indicators for central obesity and its application is a hot topic in disease prevention

strategy implementation.

WHO Expert Consultation on WC and WHR convened in 2008 considered approaches to develop international guidelines for indices and action levels in order to characterize health risks associated with these measures of body fat distribution-alternative or to complement the existing WHO guidelines for assessments of generalized obesity on the basis of body mass index.

The six background papers for the consultation examined a range of health outcomes and issues including whether there was a basis for choosing WC over WHR and whether different action levels by gender, age, ethnicity, country or region were warranted. In which the following table summarized the WC cutoffs for Chinese which were recommended by different authors<sup>[12]</sup> (Table 1).

TABLE 1

Summary of the WC cutoffs for Chinese Recommended by Different Authors

Study	Population	Outcomes	Recommendation on WC
Ko and Tang (2007)	14 919 Hong Kong Chinese men and women without CVD	10-year CVD risk (415%) using Framingham model in women 10-year CVD risk (420%) using PROCAM and SCORE risk models	Central pre-obesity Men: 84-90 cm Women: 74-80 cm
Lin <i>et al.</i> (2002)	factors or 55 563 men and women in Taiwan (nomedications for risk disease)	Hypertension (sBP $\geq$ 140 mmHg and/or dBP $\geq$ 90 mmHg) Diabetes (FPG $\geq$ 7.0 mmol/L) Dyslipidemia (TC $\geq$ 6.21 mmol/L and/or LDL-C $\geq$ 4.14 mmol/L and/or TG $\geq$ 2.26 mmol/L and/or HDL <0.91 mmol/L) Risk (any one or more of the above)	Men: 80.5 cm Women: 71.5 cm
Bei-Fan (2002) for the Working Group on Obesity in China	Meta-analysis of 13 studies with 111 411 men and women	Hypertension (sBP $\geq$ 140 mgHg and/or dBP $\geq$ 90 mmHg) Diabetes (FPG $\geq$ 6.9 mmol/L) Dyslipidemia (TC $\geq$ 5.2 mmol/L and/or TG $\geq$ 2.26 mmol/L and/or HDL<0.9 mmol/L) Risk (any two or more of the above)	Men: 85 cm Women: 80 cm
Ko <i>et al.</i> (1999)	1 513 men and women	Hypertension (sBP $\geq$ 140 mmHg and/or dBP $\geq$ 90 mmHg) Diabetes (PG $\geq$ 7.8 mmol/L or 2-h PG $\geq$ 11.1 mmol/L) Dyslipidemia (TC $\geq$ 5.2 mmol/L and/or TG $\geq$ 2.3 mmol/L and/or HDL<0.9 mmol/L) Albuminuria (urinary albumin $\geq$ 20 mg/L)	Men: 82 cm Women: 76 cm

(to be continued)

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Study	Population	Outcomes	Recommendation on WC
Diaz <i>et al.</i> (2007)	104 men and women	Self-reported diabetes or HbA1c > 4.6.1%	Men: 95.1 cm Women: 83.7 cm Cutoffs 10.7 and 12.2 cm lower than white men and women, respectively
Li <i>et al.</i> (2008, b)	13 817 men and women in Shanghai (random sample)	Dyslipidemia (TC $\geq$ 5.2 mmol/L and/or LDL-C $\geq$ 3.36 mmol/L and/or HDL-C < 0.90 mmol/L mg/dl) Diabetes (FPG $\geq$ 6.9 mmol/L and/or insulin or oral hypoglycemic agent use and/or self-reported diabetes) Hypertension (sBP $\geq$ 140 mmHg and/or dBP $\geq$ 90 mmHg and/or use of antihypertensives) Risk (two or more of the above)	Men: 85 cm Women: 80 cm
Bao <i>et al.</i> (2008)	1 140 men and women	Optimal visceral fat area associated with predication of metabolic syndrome	Men: 90 cm Women: 85 cm

In this issue, three articles on disease risk of overweight and obesity of Chinese population published, They are focused on the body fat accumulation and WC and their relation to the increase of disease risks in Chinese population. Two of the articles on WC of children aged 7-18 were the reports of a Collaborative Research Group on Optimal Cutoffs of WC for Children which was the information based on the poll analysis of 7 data banks with around 90 000 subjects that provided a WC percentile curve of Chinese children aged 7-18 years and the recommendation on the optimal WC cutoffs for prevention of CVD risk factors and high blood pressure among children. The review article written by Wei-ping Jia presented the epidemic and the feature of obesity in Chinese population and discussed IDF and WHO recommended definitions of central obesity of Chinese population with the data from Chinese studies. Some Chinese-specific pathophysiological features were introduced. These three papers demonstrated some important and attractive research achievements in central obesity research and I hope these will stimulate broader research and discussions in the future.

Based on the enormous scientific evidences and strategic analysis on the high Population Attributable Risk of overweight/obesity (between 7%-20%)<sup>[13]</sup> and the impact of low blood pressure awareness rate on prevention of hypertension, stroke, coronary heart disease, and the considerations on the feasibility and efficiency of proposed recommendations, the Chinese national health authority set up Obesity prevention as the first priority in chronic disease prevention and documented "Healthy weight and Healthy blood pressure" as the current strategy in 2007.

Beside the well accepted optimal BMI cutoffs for Chinese adults and for children and adolescents<sup>[14-15]</sup>, optimal WC for Chinese population is now under vigorous discussion. It is especially expected to establish an optimal cutoff of WC for Chinese children and adolescents since it could be a simple and easy to operate indicator for screening purpose, program evaluation and public health action. Strikingly, Ma's paper revealed the blood pressure rose even at 75th percentile of WC and jumped up prevalence of  $\geq$  2 risk factor clustering happened at the 90th percentile. As an indicator for health risk screening of childhood obesity, WC seems better to be used than using BMI only, because (1) Use of WC measurement for preventing overweight during childhood was evidently safer than the use of BMI measurement because the intervention on reduction of BMI conceals danger of confined weight growth; (2) While physical activity intervention will be expanded in primary schools, WC measurement might be a better indicator for intervention evaluation on health benefits for children since body fat percentage reduced without BMI change when physical activity intervention was undertaken among school children in several studies; (3) WC was a simple measurement and it could be taken regularly by the parents; (4) For clinical practices, WC measurement could be a better indicator for alerting disease risks. Considering the high proportion of central obesity among Chinese adults, which is 50%-60% among adults aged over 45 years old. WC control since childhood is extremely important. Therefore, WC could be a priority indicator for public health practice and further investigation on predictive function of WHtR and WHR on health risk in children and in adolescents is urgently required.

## REFERENCES

1. Ian Janssen, Peter T, *et al.* (2004). Waist circumference and not BMI explains obesity related health risk. *Amer Clin Nutr* **79**, 379-384.
2. George Bray (2004). Don't throw the baby out with the bath water. *Amer Clin Nutr* **79**, 347-349.
3. Sameul Klein, Allison D B, Heymefial S B, *et al.* (2007). WC and cardiometabolic risk: A consensus statement from Shaping American's Health: Association for Weight Management and Obesity Prevention, NAASO, The Obesity Society, The American Society for Nutrition and American Diabetes Association *Obesity* **15**(5), 1061-1067.
4. F Hadaegh, Zabelian A, *et al.* (2009). Appropriate cutoff values of anthropometric variables to predict cardiovascular outcomes: 7.6 years follow-up in an Iranian population. *International J Obesity* **33**, 1-9.
5. The DECODA Study Group (2008). BMI compared with waist circumference in relation to diabetes and hypertension in Asian. *Obesity* **16**, 1622-1635.
6. Zahi Morad Mohd Eaher, Robageal Z, *et al.* (2009). Optimal cut-off levels to define obesity: BMI and WC and their relationship to CVD, deslipidemia, hypertension and diabetes in Malays. *Asian Pac J Clin Nutr* **18**(2), 209-216.
7. Rachel P Wildman, Gu D F, *et al.* (2004). Appropriate BMI and Waist Circumference for categorization of overweight and central adiposity among Chinese adults. *Amer J Clin Nutr* **80**, 129-136.
8. Rachel P Wildman, Gu D F, *et al.* (2005). Are waist circumference and BMI independently associated with cardiovascular disease risk in Chinese adults? *Amer J Clin Nutr* **82**, 1195-1202.
9. Y Ye, Bao Y, *et al.* (2009). Identification of waist circumference cutoffs for abdominal obesity in the Chinese Population: A 7.8 years follow-up study in Shanghai. *International J Obesity* **33**, 1058-1062.
10. Ziqing Zhou, Hu D Y, *et al.* (2009). Association between obesity indices and blood pressure or hypertension: Which is the best? *Pub Health Nutr* **12**, 1061-1071.
11. Yuna He, Zhai F Y, *et al.* (2008). Abdominal obesity and the prevalence of diabetes and intermediate hyperglycemia in Chinese adults. *Pub Health Nutr* **12**, 1078-1084.
12. S A Lear, James P T, Ko G T, *et al.* (2010). Appropriateness of waist circumference and waist-to-hip ratio cutoffs for different ethnic groups. *European J of Clin Nutri* **64**, 42-61.
13. Wenhua Zhao, Zhai Y, Hu J, *et al.* (2008). Economic burden of obesity-related chronic disease in Mainland China. *Obesity Reviews* **9**(suppl. 1), 62-67.
14. Beifan Zhou (2002). Predictive value of body mass index and waist circumference for risk factors of certain related diseases in Chinese adults- Study on optimal cutoff points of body mass index and waist circumference in Chinese adults. *Biomed Environ Sci* **15**, 83-96.
15. Chengye Ji (2005). Report on childhood obesity in China (1) Body mass index reference for screening overweight and obesity in Chinese school-age children. *Biomed Environ Sci* **18**, 390-400.