



ORIGINAL ARTICLE

Mid-upper-arm Circumference and Arm-to-height Ratio in Evaluation of Overweight and Obesity in Han Children



Qiang Lu, Rui Wang, Dong-Hui Lou, Chun-Ming Ma, Xiao-Li Liu, Fu-Zai Yin*

Department of Endocrinology, The First Hospital of Qinhuangdao, No. 258 Wenhua Road, Qinhuangdao 066000, Hebei Province, China

Received Feb 4, 2013; received in revised form Mar 25, 2013; accepted May 23, 2013

Key Words

arm-to-height ratio;
body mass index;
children;
mid-upper-arm
circumference;
obesity

Background: The purposes of this study were: (1) to analyze whether mid-upper-arm circumference (MUAC) could be used to determine overweight and obese children and to propose the optimal cutoffs of MUAC in Han children aged 7–12 years; and (2) to evaluate the feasibility and accuracy of the arm-to-height ratio (AHtR) and propose the optimal cutoffs of AHtR for identifying overweight and obesity.

Materials and methods: In 2011, anthropometric measurements were assessed in a cross-sectional, population-based study of 2847 Han children aged 7–12 years. Overweight and obesity were defined according to the 2004 Group of China Obesity Task Force definition. The AHtR was calculated as arm circumference/height. Receiver operating characteristic curve analyses were performed to assess the accuracy of MUAC and AHtR as diagnostic tests for elevated body mass index (BMI; defined as BMI \geq 85th percentiles).

Results: The accuracy levels of MUAC for identifying elevated BMI [as assessed by area under the curve (AUC)] were over 0.85 (AUC: approximately 0.934–0.975) in both genders and across all age groups. The MUAC cutoff values for elevated BMI were calculated to be approximately 18.9–23.4 cm in boys and girls. The accuracy levels of AHtR for identifying elevated BMI (as assessed by AUC) were also over 0.85 (AUC: 0.956 in boys and 0.935 in girls). The AHtR cutoff values for elevated BMI were calculated to be 0.15 in boys and girls.

Conclusion: This study demonstrates that MUAC and AHtR are simple, inexpensive, and accurate measurements that may be used to identify overweight and obese Han children.

* Corresponding author.

E-mail address: yinfuzai62@163.com (F.-Z. Yin).

Compared with MUAC, AHtR is a nonage-dependent index with higher applicability to screen for overweight and obese children.

Copyright © 2013, Taiwan Pediatric Association. Published by Elsevier Taiwan LLC. All rights reserved.

1. Introduction

In recent years, the prevalence of obesity has reached alarming levels, affecting both developed and developing countries and people of all socio-economic status, age, gender, and ethnicity.¹ Because of changes in childhood lifestyle characterized by the lack of physical activity and an energy-dense diet,² Chinese children have seen marked increases in the prevalence of childhood overweight and obesity over the past few decades.³ The current epidemic of obesity with a subsequent increase in cardiovascular risk factors has constituted a threat to the health of school children in China.⁴

Appropriate early-stage diagnosis and intervention for overweight and obesity prevention in childhood are important for reducing the risk of obesity-related disorders. Body mass index (BMI) is the most common criteria used to determine overweight and obesity. The Working Group of Obesity in China established a set of age- and gender-specific cutoff points for BMI in 2004 for Chinese children and adolescents,⁵ which were mainly based on ethnic Han children as the reference population. However, BMI fails to account for fat distribution.

As is well known, body-fat distribution is closely related to the occurrence and development of cardiovascular disease. Waist circumference is the most commonly used index of central adiposity. In China, waist circumference has been widely used to determine obesity in children. Reference values for waist circumference of Chinese children and adolescents have been provided by several epidemiological studies.^{6,7} Recently, mid-upper-arm circumference (MUAC) has been proposed as another important indicator of obesity in children. Traditionally, MUAC has been commonly used in the assessment of nutritional status.⁸ In 2003, de Almeida⁹ et al suggested that MUAC was an adequate alternative method for obesity screening in preschool children.⁹ This was proved by Mazıcıoğlu¹⁰ et al in children aged 6–17 years.¹⁰ Age-related MUAC cutoffs have been reported for children in two countries, Brazil⁹ and Turkey,¹⁰ but to our knowledge systematic monitoring of MUAC is not a commonly performed method in pediatric studies and clinical practice in China.

As for BMI, the age- and gender-specific standards of waist circumference and MUAC are less feasible for nonprofessional use. More recently, an increasing number of studies documented that the ratio of waist circumference to height [waist-to-height ratio (WHtR)] was an easy anthropometric index to detect obesity and cardiometabolic risk in children and adolescents.^{11,12} A recent study has validated the suitability of WHtR to predict cardiovascular risk factors over direct body-fat measures, such as using dual-energy X-ray absorptiometry scanning and bioelectrical impedance analysis.¹³ It is not known whether the ratio of arm circumference to height can identify overweight and obesity in children.

The purposes of this study were: (1) to determine whether MUAC can be used to diagnose overweight and obese children and propose the optimal cutoffs of MUAC in Han children aged 7–12 years; and (2) to evaluate the feasibility and accuracy of the arm-to-height ratio (AHtR) and propose the optimal threshold values of AHtR for identifying overweight and obesity. Han is the major Chinese ethnicity.

2. Materials and Methods

2.1. Participants

After obtaining informed consent from children and their parents, a cross-sectional, population-based study was conducted. The study population was determined according to two-stage cluster sampling. In the first stage, samples of primary schools in Qinhuangdao, China, were randomly obtained; and in the second stage, children aged 7–12 years in these schools were invited to participate. A total of 2847 Han children (1475 boys and 1372 girls) were included in the study population. All participants were required to be healthy. For this purpose, both a detailed medical history and a complete physical examination were performed prior to the study. The exclusion criteria were major medical conditions such as diabetes, Cushing's disease, thyroid diseases, and medication use. This study was approved by the ethics committee of the First Hospital of Qinhuangdao.

2.2. Anthropometric measurements

Anthropometric measurements, including height, weight, waist circumference, and MUAC were obtained while the participants were in light clothing and barefoot. Height and weight were measured to the nearest 0.1 cm and 0.1 kg, respectively. Waist circumference was accurately measured at the level of midway between the lowest rib and the top of the iliac crest. MUAC was measured using a flexible tape at the midway between the olecranon and acromial process on the upper right arm. All measurements were taken twice, and the two measurements were averaged for analysis. BMI was calculated by dividing weight (kg) by height squared (m²). The WHtR was calculated as waist circumference/height and the AHtR was calculated as arm circumference/height.

2.3. Definition of overweight and obesity

Obesity was defined as BMI \geq 95th percentiles, overweight as BMI between the 85th and the 95th percentiles, and normal weight as BMI $<$ 85th percentiles. The BMI cutoff values used were age- and gender-specific according to the

Download English Version:

<https://daneshyari.com/en/article/4175407>

Download Persian Version:

<https://daneshyari.com/article/4175407>

[Daneshyari.com](https://daneshyari.com)