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ORIGINAL ARTICLE

Combine body mass index and body fat percentage measures to improve the accuracy of obesity screening in young adults

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KEYWORDS
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Body mass index;
Body composition;
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Summary
Introduction: Obesity screening among young adult groups is meaningful. Body mass index (BMI) is limited to discriminate between fat and lean mass. Asian young adult group tends to have lower BMI and higher body fat percentage (BFP) than other ethnic groups. Accuracy of obesity screening by commonly used BMI criteria is unclear in young Taiwanese population.
Material and methods: A total of 894 young adults (447 males and 447 females) aged 20—26 were recruited. BMI, regional fat percentage and BFP determined by bioelectrical impedance analysis (BIA) were measured. BMI cutoff points were based on the criteria adopted by the Ministry of Health and Welfare in Taiwan. Cutoff points of low or high BFP were defined as 24% in men and 31.4% in women.
Results: Prevalence of BFP defining obesity was 14.8% in young men and 27.3% in young women. 23.2% of young men and only 8.3% of young women were classified to overweight or obesity categories according to the BMI criteria. Disagreement was noticed mainly among overweight males and normal weight females. 68.7% of BMI defining overweight young men had low BFP; however, 29.7% of young women of BMI defining normal group had high BFP. Up to 69.7% of young women with high BFP would be missed by BMI category only.

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Conclusion: Disagreement between BMI and BFP was significant among young adults, especially young women. We suggest combining BMI and BIA for obesity and overweight screening in Asian young adults.
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Introduction

Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health [1]. Fat accumulation, both general and local, has been proved to be correlated with numerous comorbidity and pathophysiologic processes, including insulin resistance, altered lipid metabolism, and endothelial dysfunction [2—7]. Overweight and obesity are the fifth leading risk for global deaths, and at least 2.8 million adults die each year as a result of being overweight or obese. In addition, 44% of the diabetes burden, 23% of the ischaemic heart disease burden, and 7—41% of certain cancer burdens are attributable to overweight and obesity [8]. The increasing trend for obesity and overweight across human races and age groups is well documented all over the world in the past decade [9,10], especially among children, adolescents and young adults [11,12].

Body mass index (BMI) is a common, cheap and convenient tool to screen overweight and obesity. However, BMI is limited because it does not discriminate between fat and lean mass [13,14]. Using BMI may underestimate obesity prevalence defined by excess body fat, particularly in overweight individuals [14—16]. Moreover, obese individuals defined by body fat percentage (BFP) are related to higher cardiometabolic risk, prediabetes and type 2 DM development, even having normal BMI [15,17,18]. Individuals with normal BMI but high BFP are called normal weight obesity (NMO).

It is well known that body composition, relationship between BMI and BFP, and their ideal cutoff points are different across different ethnic groups [19,20]. Cutoff points for obesity ought to be population-specific. In Taiwan, the cutoff points of BMI category for adult population are mainly modified from Asia-Pacific perspective [21]. However, there is no consensus about an ideal cutoff point of BFP in Taiwan. Moreover, it seems that Asian adults have relatively lower BMI but higher BFP than Caucasians [22]. Western criteria of BFP might not reflect the current status for the increasing obesity epidemic in Taiwanese communities.

As far as we know, there is still no official definition of BFP since associated data is relatively insufficient around the world. 25% in men and 30% in women are commonly used BFP cutoff points [16,23]. However, the set of cutoff points is not based on researches related to clinical outcomes. On the other hand, a cross sectional study of Chinese Asian population showed that 23.95% in men and 31.35% in women are optimal BFP cutoff points to predict metabolic syndrome [24].

Right and early detection for true obesity could help increase self-awareness about health status and appropriate intervention. Commonly used BMI cutoff values to diagnose obesity have high specificity, but low sensitivity to identify adiposity [16]. That is to say, a certain number of individuals with excessive body fat may be missed by BMI screening only.

Timing for screening obesity is also an important issue. Generally, values of BFP increase as ageing, especially having started from adolescent period in both genders [19,25]. Adolescent metabolic syndrome or adiposity did not predict early adult metabolic syndrome, independent of adult BMI, according to a prospective cohort study [26]. Thus, young adults would be the most ideal population for metabolic factors screening.

To the best of our knowledge, there is no well-designed population-based study focusing on the relationship between BMI and BFP among Taiwanese or Chinese young adult population. Therefore, this study has aimed to investigate the relationship between BMI and BFP and to improve accurate prediction of obesity among young Taiwanese population.

Material and methods

Study group

Our study group was based on the reference group of Chang et al.'s study [27]. This study was approved by the ethical review board, National Taiwan University Hospital (201010021R). About one thousand young adults were recruited from people undergoing physical examinations in one medical centre in 2011. Gender match was performed while

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