Editorial

Use of ethnic specific BMI and waist cut-offs for prevention of diabetes and cardiovascular disease

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Sri Lanka Journal of Diabetes, Endocrinology and Metabolism 2015; **5**: 1-3

Introduction

Burden of obesity and its implications

The terms overweight and obesity are used to identify states in which abnormal or excessive fat accumulation has occurred in the body leading to adverse effects on health of an individual (1). According to the World Health Organization (WHO) estimates, nearly 2 billion adults are suffering from overweight and 600 million from obesity in the world (1). Each year nearly 3 million adults die due to being overweight and obese and it is estimated that 35.8 million (2.3%) of global DALYs can be accounted to be due to overweight or obesity (1). Obesity is strongly associated with diabetes, dyslipidaemia, hypertension, cardiovascular disease, non-alcoholic fatty liver disease and mechanical problems like obstructive sleep apnoea, osteoarthritis and even psychological issues such as depression and anxiety (2).

Sri Lanka is not an exception; obesity associated metabolic diseases have reached epidemic proportions. One-fifth Sri Lankan adults are suffering from dysglycemia and 10% from diabetes (3). Moreover, 25% of adults have hypertension (4) and a similar percentage of adults are having metabolic syndrome (5). Deaths due to cardio-vascular diseases in Sri Lanka are more prevalent than many developed countries (6). However, according to the international BMI cut-offs, derived based on data from White Caucasians obesity prevalence is very low. Sri Lanka Diabetes and Cardiovascular Study reported only 4% of obesity in 2005-2006 (7). This level has not changed significantly in our second data collection carried out in 2011(8). Hence there seems to be a paradox between obesity data according to the international cut-offs and obesity related co-morbidities based on prevalence data.

Use of anthropometric measurements to classify adiposity

Body Mass Index (BMI) is a simple index of weight-for-height that is commonly used to classify underweight, overweight and obesity in adults. It is defined as the weight in kilograms divided by the square of the height in metres (kg/m^2). BMI values used internationally are age-independent and same for both sexes.

However, BMI may not correspond to the same degree of fatness in different populations – in part due to different body proportions and fat distribution patterns [9]. Although the health risks associated with BMI shows a continuous association, the absolute risk may differ in different populations (10).

Over the last two decades, there was an ongoing debate on using same BMI cut-offs in different ethnic groups (11). This was based on growing evidence that the association between BMI, percentage of body fat, and body fat distribution were different across populations. It was shown that the South Asians had higher fat percentage for a given BMI compared to White Caucasians and therefore the obesity related diseases appeared at a lower BMI (11).

Waist circumference (WC) is another clinically relevant and increasingly used method of assessing adiposity. Whereas BMI provides a marker of overall adiposity, WC is a better marker of abdominal adiposity, and is the best correlate of visceral fat mass (12). Higher levels of WC are strongly associated with cardiovascular disease. To identify those with an European origin with an increased and a substantially increased risk of developing chronic diseases, the WHO currently recommends WC cut-off points of 80 cm and 88 cm respectively for women and 94 cm and 102 cm respectively for men. However, as with BMI, population specific cut-off points have been shown to be more appropriate for WC as well. The International Diabetes Federation recommends a WC cut-off point of 80cm for women and 90cm for men to diagnose metabolic syndrome in South Asians (13).

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Differential effects of BMI on diabetes and other outcomes in different populations

Several clinicians and researchers from India, Sri Lanka and other populations have shown that the WHO cut-off points derived according to White Caucasian data may not be applicable to Asians (14, 15).

The group led by Misra et al. in India has showed that BMI cut-off of 21kg/m^2 was optimum in identifying individuals with at least one obesity related comorbidity (14). In another study Snehalatha et al showed that a BMI cut-off of 23kg/m^2 was optimal in identifying at least two obesity related risk factors (16). Similar data have also shown by other groups in India. Based on Indian studies, a consensus group of experts in India has arrived at BMI cut-offs of 23kg/m^2 to diagnose overweight and 25 kg/m^2 to diagnose obesity (14). In addition they recommended a waist circumference of 80cm in men and 90cm in women to diagnose abdominal adiposity.

The Sri Lanka Diabetes and Cardiovascular Study (SLDCS) conducted in 2005 also showed nearly identical data to those of India (15). According to SLDCS data the cut-off values for BMI and WC for males were 20.7kg/m^2 and 76.5cm. The respective values for females were 22.0 kg/m^2 and 76.3cm. The common cut-off value for BMI for males and females was 21.5 kg/m^2.

Nurses' health study and SLDCS

The nurses' health study conducted in USA clearly showed the association of BMI with diabetes risk (Figure 1) (10). The diabetes risk started to double when the BMI was more than 25kg/m^2. When Sri Lankan data were considered (Table 1) the prevalence of diabetes, metabolic syndrome, hypertriglyceridaemia doubled when the BMI was 18kg/m^2 and blood pressure and low HDL cholesterol proportions increased by more than 25% when the BMI was over 23kg/m^2.

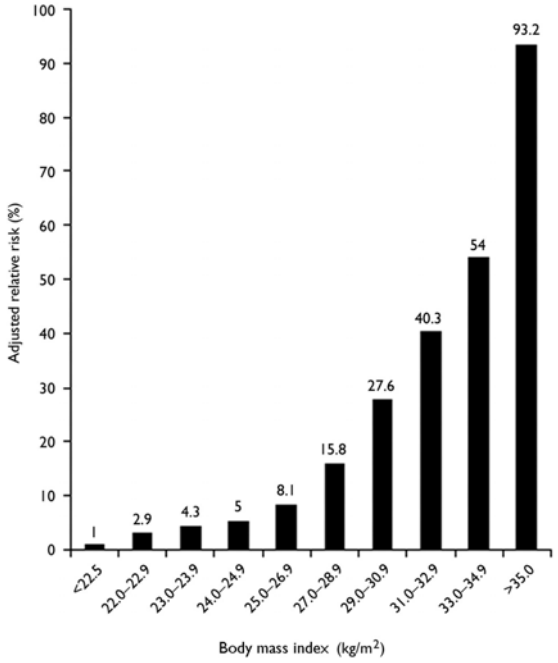

Figure 1. Relative risk for diabetes according to the BMI (Nurses Health Study USA).

Table 1. Prevalence of diabetes, elevated blood pressure, hypertriglyceridaemia, low HDL cholesterol and metabolic syndrome according to BMI in Sri Lankan adults – SLDCS Study

BMI category (Kg/m^2)	*< 16.0*	*16.0-18.4*	*18.5-22.9*	*23.0-27.4*	*≥ 27.5*	*p value*[‡]
Diabetes	4.2%	4.4%	9.8%	19.3%	19.0%	<0.001
Elevated blood pressure[†]	26.7%	28.5%	38.2%	55.6%	63.7%	<0.001
Low HDLC	33.2%	38.3%	45.9%	61.0%	61.9%	<0.001
High triglycerides	7.6%	10.2%	20.9%	34.5%	33.4%	<0.001
Metabolic syndrome*	3.6%	4.6%	15.9%	49.4%	65.7%	<0.001

[[†]systolic blood pressure ≥ 130 mmHg, diastolic blood pressure ≥ 85 mmHg or on antihypertensive treatment, *NCEP criteria, [‡]p value for trend]

WHO perspective

A WHO expert consultative committee was appointed to look into the controversy of anthropometric cut-offs and to review scientific evidence on this important issue. After extensive literature review the committee suggested that Asian populations have different associations between BMI, percentage of body fat, and health risks than their White Caucasian counterparts (11). They concluded that the Asians are at high risk of type 2 diabetes and cardiovascular disease at substantially lower BMI compared to the existing WHO cut-off level for overweight (>25 kg/m^2). However, since they considered data from different Asian groups including South Asians and Chinese they were unable to arrive at a uniform cut-off. Instead of considering different cut-offs for South Asians and Chinese no attempt was made, to redefine cut-off points for each population separately.

American Diabetes Association perspective

In the United States, the prevalence of overweight and obesity is lower in South Asians than the White Caucasians (17). However the clinicians have noticed a very high prevalence of diabetes and CVD in Asians at a lower BMI. Based on the studies among the Asian Americans and studies done in South Asian countries, the American Diabetes Association (ADA) have taken a more bold approach compared to the WHO. The ADA has lowered the cut-off for screening for type 2 diabetes from 25kg/m^2 to 23kg/m^2.

Way forward

There is overwhelmingly good quality data from India, Sri Lanka and from South Asians living in USA and the other developed countries to redefine anthropometric cut-offs for South Asians (14-17). Therefore clinicians, epidemiologists and other professionals working on health of South Asians need to accept and follow the South Asian specific cut-offs for defining overweight, obesity and central obesity. BMI cut-offs of 23kg/m^2 and 25kg/m^2 should be considered to classify overweight and obesity respectively. A waist circumference cut-off of 80cm for females and 90cm for males should be considered to classify abdominal obesity. Compared to the BMI and WC robust data comparable between different studies are lacking for waist to hip ratio (WHR). Therefore further research is needed before arriving at consensus values for WHR.

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