

3. DEFINING OBESITY

Obesity is often defined simply as a condition of abnormal or excessive fat accumulation in adipose tissue, to the extent that health may be impaired. However, obese individuals differ not only according to the degree of excess fat, which they store, but also in the regional distribution of the fat within the body. Indeed, excess abdominal fat is as great a risk factor for disease as is excess body fat per se (WHO 1998).

3.1 Body Mass Index

One of the most commonly used indices of relative weight is the Body Mass Index (BMI), which is defined as body weight in kilogram divided by height, in meters squared. It was not originally intended as an index of obesity but is now commonly employed as such in epidemiological studies, to predict obesity-related morbidity and mortality in adults. A BMI of 30 kg/m² is considered the threshold of obesity. BMI however, does not distinguish between weight associated with muscle and weight associated with fat. BMI can be considered to provide the most useful, albeit crude, population-level measure of obesity. The classification of overweight and obesity in adults as proposed by WHO (1998) is shown in Table 1.

Table 1: Classification of weight status in adults according to Body Mass Index (BMI)

Classification	BMI (kg/m ²)	Risk of co-morbidities
Underweight	< 18.5	Low (but risk of other clinical problems increased)
Normal range	18.5 – 24.9	Average
Overweight:	≥ 25	
Pre-obese	25 – 29.9	Increased
Obese class I	30.0 – 34.9	Moderate
Obese class II	35.0 – 39.9	Severe
Obese class III	≥40.0	Very severe

Source: WHO (1998)

The adequacy of the current international standard (WHO 1998) for informing policy and interventions in some populations has been questioned due mainly to substantial inter-population differences in the meaning of a given BMI (with respect to the level of body fatness, the associated level of health risk, or both) and in the range of BMI itself.

There has been two previous attempts to interpret the WHO BMI cut-offs in Asian and Pacific populations (WHO/IASO/IOTF 2000; James et al. 2002). A proposal has been made to redefine the classification of obesity using BMI for Asian population (Table 2) as there are now evidence that the increased risks of co-morbidities with obesity occurs at a lower BMIs in Asians (WHO/IASO/IOTF 2000). The recommendation is however based on two studies - in Hong Kong (Ko et al. 1999) and in Singapore (Deurenberg-Yap et al. 2000).

Table 2: Classification of weight status according to BMI in Asian Adults

Classification	BMI (kg/m ²)	Risk of co-morbidities
Underweight	< 18.5	Low (but risk of other clinical problems increased)
Normal range	18.5 – 22.9	Average
Overweight:	> 23.0	
At Risk	23.0 – 24.9	Increased
Obese class I	25.0 – 29.9	Moderate
Obese class II	> 30.0	Severe

Source: WHO/IASO/IOTF (2000)

WHO convened another expert consultation in Singapore in 2002 to address the debate on interpretation of recommended BMI cut-off points for determining overweight and obesity in Asian populations.

The population level of BMI cut-off points is to identify risks of adverse health outcomes associated with different levels of body composition, so as to inform and trigger policy action, facilitate prevention programmes and to measure the impact of interventions. BMI cut-off points are also used for epidemiological purposes to help in determination of the aetiology of diseases. For clinical applications, population specific cut-off points will need to be determined by countries as most appropriate and should be used with an individual's clinical history and other clinical measurements (e.g. waist circumference and presence of other related factors). Ethnic-specific cut-off points may not be useful as it is likely to create great confusion in health promotion and disease prevention and management.

Rationale

- It has become increasingly clear that there is an emerging high prevalence of non-insulin dependent diabetes (NIDDM) and cardiovascular risk factors in parts of Asia below the cut-off points of less than 25 kg/m² for overweight and BMI less than 30.0 for obesity. (Ko et al. 1999; Deurenberg 2001; China Obesity Task Force 2002; Yajnik 2002; Zhou 2002)
- It is also known that relationship between BMI, and body fat percent and fat distribution, are less favourable in many Asian populations compared with Caucasian/European populations (Wang et al. 1994; Gurruci et al. 1998; Deurenberg-Yap et al. 2000; He et al. 2001).
- The BMI cut-off points for observed increased risk in different Asian populations varies from 22 to 25 kg/m² and for high risk varies from 26 to 31 kg/m² (Deurenberg & Deurenberg-Yap 2003)

If BMI cut-off values for overweight and obesity were to be lowered, it will automatically increase their prevalence rate overnight. This would then require adaptation in public health policies and clinical management guidelines. It would, however, also increase the governmental and public awareness and as such help to combat the increasing prevalence of obesity.

The WHO Expert Consultation (2004) made no attempt to redefine BMI cut-off points for each population based on the body composition data. Rather, the Consultation identified potential “public health action points” along the continuum of BMI. Reasons for this approach;

- 1) The relationship between BMI and risk curves are continuous, hence, all cut-off points based on risk slope are arbitrary.
- 2) Epidemiology “hard outcomes” such as defined disease were considered better than body composition and more meaningful to clinicians and policy makers.
- 3) BMI versus body composition varies substantially but the variation is not consistent across populations and within a given population under different social and lifestyle changes over time.

Recommendations (WHO Expert Consultation 2004)

- 1) The current WHO cut-off points of 18.5, 25, 30 and 40 kg/m² are retained. But the cut-off points of 23, 27.5, 32.5 and 37.5 kg/m² (Figure 1) are to be added as points for public health action.
- 2) For continuity, particularly in countries with concurrent problems of undernutrition and overnutrition, the distribution should continue to be presented as a continuum beginning with BMI less than 16 kg/m², through the BMI category of equal to or more than 40 kg/m². Above 18.5 kg/m² the categories are simply midway between the current cut-off points, except for the 18-24.9 kg/m² category. In this latter case, the intermediate cut-off point (23.0 kg/m²) was chosen as a public health action point on the basis of the results of the meta-analysis from 9 countries in Asia and other published work.
- 3) For many Asian populations, additional trigger points for public health action were identified as 23 kg/m² or higher, representing increased risk, and 27.5 kg/m² or higher, as high risk. The suggested categories are as follows: less than 18.5 kg/m² underweight; 18.5-23 kg/m² increasing but acceptable risk; 23-27.5 kg/m² increased risk; and 27.5 kg/m² or higher, high risk.

Guidance should be provided to countries to identify public health action points that are most useful for the situation in each country. Countries should be aware that the increased risk is a continuum with increasing BMI, and that cut-off points are merely a convenience for public health and clinical use. Consequently, ranges were given (see Figure 1) but with the assumption that many Asian countries will use the ranges suggested. However global definition of overweight and obesity would remain as 25 kg/m² and above for overweight and 30 kg/m² and above for obesity.

- 4) In considering BMIs of less than 21, it should be borne in mind that the lower range of BMI might reflect undernutrition in populations with current or recent widespread undernutrition.
- 5) Wherever possible, countries should use all categories for reporting purposes with a view to facilitating international comparisons (i.e. 18.5, 20, 23, 25, 27.5, 30, 32.5 kg/m², and in many populations, 35, 37.5 and 40 kg/m²)
- 6) Where possible, in populations with a predisposition to central obesity and related increased risk of developing the metabolic syndrome, waist circumference should also be used to refine action levels based on the basis of BMI. For example, action levels based on BMI might be increased by one level if the waist circumference is above a specified action level.

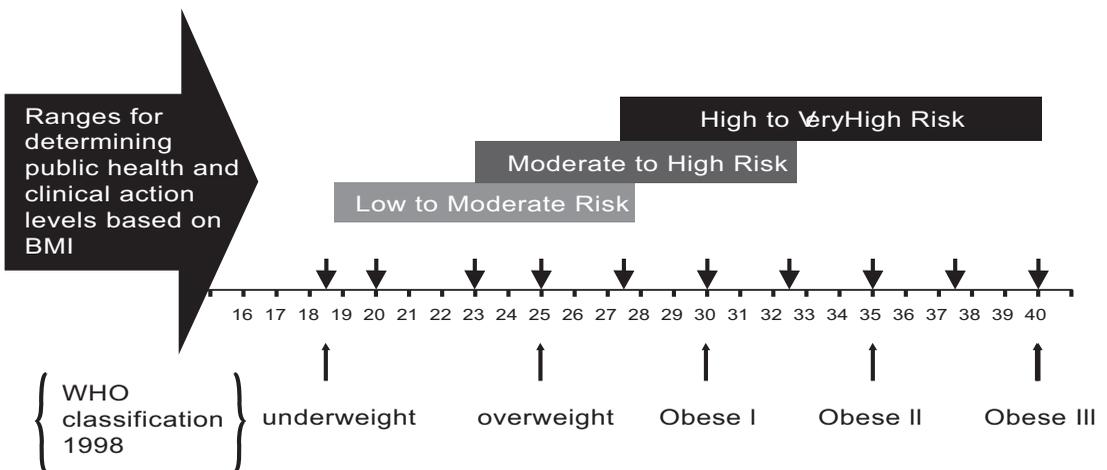


Figure 1: Suggested cut-off points (▼) for reporting population BMI distribution and specific action levels for population and individuals

Source: WHO (2004)

The recommendations above also suggests that the cut-off points for observed risks among Asians varies by three BMI points and made no attempt to redefine cut-off points. There is also lack of local data to support any changes to the BMI classification. The Committee recommends retaining the current WHO classification of BMI (WHO 1998) for adults (Table 1). However, the Committee acknowledges the need to have the public health action points as recommended by WHO Expert Consultation 2004 (Table 3).

Table 3 : Recommended BMI cut-off points for body weight classification and public health action for Malaysians

Body weight classification	BMI cut-off points for definition¹ (kg/m²)	Comorbidities risk	BMI cut-off points for public health action² (kg/m²)
Underweight	<18.5		<18.5
Normal range	18.5 to 24.9	Low	18.5 to 22.9
Overweight	≥ 25.0		23.0 to 27.4
Pre-obese	25.0 to 29.9	Moderate	27.5 to 32.4
Obese class I	30.0 to 34.9	High	32.5 to 37.4
Obese class II	35.0 to 39.9	Very high	≥ 37.5
Obese class III	≥ 40.0		

Source: ¹WHO (1998); ²WHO Expert Consultation (2004)

3.2 Waist Circumference and Waist Hip Ratio

Excess abdominal fat is an independent predictor of risk factors and morbidity of obesity-related diseases such as type 2 diabetes, hypertension, dyslipidaemia and cardiovascular diseases. Waist circumference is positively correlated with abdominal fat. Hence, waist circumference is a valuable additional alternative method in identifying individuals at increased risk. Waist circumference (WC) is a convenient and simple measurement (Figure 2), which is unrelated to height and correlates closely with BMI and Waist-Hip Ratio (WHR). It is an approximate index of intra-abdominal fat mass.

Populations differ in the level of risk associated with a particular waist circumference, and so global cut-off points cannot be applied. For Caucasians, waist circumference of 94 cm and above in men and 80 cm and above in women denotes increased risk while waist circumference of 102 cm and above in men and 88 cm and above in women denotes substantially increased risk of metabolic complications (WHO 1998). WHO/IASO/IOTF (2000) report suggested cut off points of 90 cm and above in men and 80 cm and above in women.

However, it has become increasingly clear that there is a high prevalence of type 2 diabetes mellitus and cardiovascular risk factors in parts of Asia below these cut off points. Evidence from several Asian countries is now available including Hong Kong (Ko et al. 1999), Singapore (Deurenberg 2001) and China (China Obesity Task Force, 2002;

Zhou 2002; Jia et al. 2002). Thus based on the current evidence, the WHO/IASO/IOTF (2000) proposed waist circumference cut-off points are adopted (Table 4).

Table 4: Waist circumference cut-off points for increased risk to metabolic diseases

	Men	Women
WHO (1998)	≥94cm (37 inches)	≥80cm (32 inches)
WHO/IASO/IOTF (2000)	≥90cm (35 inches)	≥80cm (32 inches)

Over the last decade, a high WHR (WHR more than 1.0 in men and more than 0.85 in women) has become accepted as the clinical method of identifying patients with abdominal fat accumulation. However, recent advances suggest that waist circumference alone is a better and more practical measure.



Figure 2: Measuring Waist Circumference

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