Tool 5

Measurement and assessment of overweight and obesity – CHILDREN

Measuring overweight and obesity using Body Mass Index (BMI)

BMI is calculated by dividing an individual's weight in kilograms by the square of their height in metres (kg/m²).

There is widespread international support for the use of BMI to define obesity in children^{1, 2, 3} even though there is no universally accepted BMI-based classification system for childhood obesity. This is because for children and young people, BMI is not a static measurement, but varies from birth to adulthood, and is different between boys and girls. Interpretation of BMI values in children and young people therefore depends on comparisons with population reference data, using cut-off points in the BMI distribution (BMI percentiles).¹

Different growth reference charts can be used to assess the degree of overweight or obesity of a child. These are calculated to allow for age, sex and height. **The National Institute for Health and Clinical Excellence (NICE) has recommended that the BMI measurement in children and young people should be related to the UK 1990 BMI growth reference charts⁴ to give age- and gender-specific information.**⁵ The Growth Reference Review Group, a working group convened by the Royal College of Paediatrics and Child Health (RCPCH), has also recommended that for children under the age of 2 years, the UK 1990 reference charts⁴ are the only suitable charts for weight, length and head circumference. It also recommended that the UK 1990 BMI reference is the only suitable reference for assessing weight relative to height.⁶ However, the Australian NHMRC guidelines for children highlighted several difficulties with the BMI-for-age percentile cut-offs:

- Data are derived from a reference population.
- Classifying a child as overweight or obese on the basis of BMI being above a certain percentile is an arbitrary decision and is not based on known medical or health risk.⁷

These difficulties have resulted in different BMI centiles being used. For example, the NHMRC guidelines have recommended that a BMI above the 95th percentile is indicative of obesity and a BMI above the 85th percentile is indicative of overweight.⁷ However, the SIGN guidelines have recommended that a BMI at the 98th percentile or over is indicative of obesity (on the UK 1990 reference charts for BMI centiles for children⁴), and a BMI at the 91st percentile is indicative of overweight.¹ The Department of Health has also recommended that the 98th and 91st centiles of the UK 1990 reference chart for age and sex be used to define obesity and overweight, respectively.³ This is because when using the BMI of more than the 91st centile on the UK 1990 charts, sensitivity is moderately high (it diagnoses few obese children as lean) and specificity is high (it diagnoses few lean children as obese) which is paramount for routine clinical use.^{1, 8}

NICE recommendation for specific cut-offs for overweight and obesity

NICE considered that there was a lack of evidence to support specific cut-offs in children. However, the recommended pragmatic indicators for action are the 91st and 98th centiles (overweight and obese, respectively).⁵



See **Tool 6** for centile BMI charts for children.

103

Use of growth reference charts in clinical settings

The growth reference or BMI charts are used in two broad clinical settings: for the assessment and monitoring of individual children, and for screening whole populations.⁶

Assessing and monitoring individual children

 BMI reference curves for the UK, 1990⁴ – NICE recommends that the 91st centile (overweight) and the 98th centile (obese) of the 1990 UK reference chart be used for assessing and monitoring individual children.⁵ The Department of Health and SIGN make the same recommendation.^{1, 3}

Screening whole populations

- UK National BMI Percentile Classification⁴ The majority of published epidemiological work has used a definition of obesity as a BMI of more than the 95th centile and overweight as a BMI of more than the 85th centile of the UK 1990 reference chart for age and sex.¹ SIGN has recommended that, for comparative epidemiological purposes, it is important to retain this definition. Furthermore, the obesity PSA target defines childhood overweight and obesity using this classification.
- International Classification An alternative method for measuring childhood obesity is the International Obesity Task Force (IOTF) international classification⁹ using data collected from six countries (UK, Brazil, Hong Kong, the Netherlands, Singapore and the United States) of a total of 190,000 subjects aged from 0 to 25 years. This classification links childhood and adult obesity/overweight standards using evidence of clear associations between the adult BMI cut-off values of 25kg/m² and 30kg/m² and health risk. However, it has been reported that the international cut-offs exaggerate the differences in overweight and obesity prevalence between boys and girls by underestimating prevalence in boys. Other possible limitations include concerns about sensitivity (the ability to identify all obese children as obese), the limited sample size of the reference population and the lack of BMI cut-off points for underweight.¹⁰

Measuring waist circumference

Until recently, waist circumference in children had not been regarded as being an important measure of fatness. Although the health risks associated with an excessive abdominal fat distribution in children in comparison with adults remain unclear, mounting evidence suggests that this is an important measurement. For example, data from the Bogalusa Heart Study showed that an abdominal fat distribution (indicated by waist circumference) in children aged between 5 and 17 years was associated with adverse concentrations of triglyceride, LDL cholesterol, HDL cholesterol and insulin.¹¹ The first set of working waist circumference percentiles was produced using data collected from British children.¹² Although there is no consensus about how to define obesity among children using waist measurement, for clinical use the 99.6th or 98th centiles are the suggested cut-offs for obesity and the 91st centile is the cut-off for overweight.¹²

Note: Neither the National Institute for Health and Clinical Excellence (NICE)⁵ nor the Department of Health³ recommend the routine measurement of waist circumference for children, and the Department of Health's guidance to PCTs on how to measure childhood obesity does not include the measurement of waist circumference.¹³ NICE suggests that waist circumference measurements may be used to give additional information, as appropriate.

Assessment

NICE recommends that assessment should begin by measuring BMI and relating it to the UK 1990 BMI charts to give age- and gender-specific information.⁵

It recommends the approach to assessing and classifying overweight and obesity in children shown in the box below.

Assessment and classification of overweight and obesity in children

Determine degree of overweight or obesity

- Use clinical judgement to decide when to measure weight and height.
- Use BMI; relate to UK 1990 BMI charts to give age- and gender-specific information.
- Do not use waist circumference routinely; however, it can give information on risk of long-term health problems.
- Discuss with the child and family.

Consider intervention or assessment

- Consider tailored clinical intervention if BMI at 91st centile or above.
- Consider assessing for comorbidities if BMI at 98th centile or above.

Assess lifestyle, comorbidities and willingness to change, including:

- presenting symptoms and underlying causes of overweight or obesity
- willingness and motivation to change
- comorbidities (such as hypertension, hyperinsulinaemia, dyslipidaemia, type 2 diabetes, psychosocial dysfunction and exacerbation of asthma) and risk factors
- psychosocial distress such as low self-esteem, teasing and bullying
- · family history of overweight and obesity and comorbidities
- lifestyle diet and physical activity
- environmental, social and family factors that may contribute to overweight and obesity and the success of treatment
- growth and pubertal status.

Source: Reproduced from National Institute for Health and Clinical Excellence, 2006 $^{\rm 5}$

The Department of Health³, the Royal College of Paediatrics and Child Health (RCPCH) and the National Obesity Forum (NOF)¹⁴ provide similar recommendations for assessing childhood overweight and obesity.



Tool 17 *Dealing with overweight and obesity – Guidance for health professionals* provides further information on NICE guidance for assessing and managing overweight and obesity in a clinical setting.

Recording of children's data

The Department of Health has developed guidance for PCTs on how to measure the height and weight of children aged between 4 and 11 years. All children in the Reception Year (ages 4-5 years) and Year 6 (ages 10-11 years) should be measured on an annual basis.¹³ The guidance is available at www.dh.gov.uk/obesity.

D Resources

05

References

- 1 Scottish Intercollegiate Guidelines Network (2003) *Management of obesity in children and young people. A National Clinical Guideline.* Edinburgh: SIGN
- 2 Jotangia D, Moody A, Stamatakis E, Wardle H (2005) *Obesity among children under 11*. London: National Centre for Social Research, Department of Epidemiology and Public Health at the Royal Free and University College Medical School
- 3 Department of Health (2006) Care pathway for the management of overweight and obesity. London: Department of Health
- 4 Cole TJ, Freeman JV, Preece MA (1995) Body mass index reference curves for the UK, 1990. Archives of Disease in Childhood; 73: 25-29
- 5 National Institute for Health and Clinical Excellence (NICE) (2006) Obesity: the prevention, identification, assessment and management of overweight and obesity in adults and children. London: NICE. www.nice.org.uk/guidance/CG43
- 6 Wright CM, Booth IW, Buckler JM, Cameron N, *et al* (2002) Growth reference charts for use in the United Kingdom. *Archives of Disease in Childhood*; 86: 11-14
- 7 National Health and Medical Research Council (2003) *Clinical practice guidelines for the management of overweight and obesity in children and adolescents.* Canberra, ACT: NHMRC
- 8 Reilly JJ, Wilson ML, Summerbell CD, Wilson DC (2002) Obesity: diagnosis, prevention, and treatment. Evidence based answers to common questions. *Archives of Disease in Childhood*; 86: 392-94
- 9 Cole TJ, Bellizzi MC, Flegal KM, Dietz WH (2000) Establishing a standard definition for child overweight and obesity worldwide: international survey. *British Medical Journal*; 320: 1240
- 10 Stamatakis E (2003) Anthropometric measurements, overweight, and obesity. In: Sproston K, Primatesta P (eds.) Health Survey for England. Volume 1. The health of children and young people. London: TSO
- 11 Freedman DS, Serdula MK, Srinivasan SR, Berenson GS (1999) Relation of circumferences and skinfold thickness to lipid and insulin concentrations in children and adolescents: The Bogalusa Heart Study. *American Journal of Clinical Nutrition*; 69: 308-17
- 12 McCarthy HD, Jarrett KV, Crawley HF (2001) The development of waist circumference percentiles in British children aged 5.0 6.9y. *European Journal of Clinical Nutrition*; 55: 902-07
- 13 Department of Health (2006) *Measuring childhood obesity. Guidance to primary care trusts.* London: Department of Health
- 14 Royal College of Paediatrics and Child Health and National Obesity Forum (2002) An approach to weight management in children and adolescents (2-18 years) in primary care. London: Royal College of Paediatrics and Child Health