

Childhood Obesity

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India faces a double burden of malnutrition with undernutrition at one end of the spectrum and overweight and obesity at the other. Childhood obesity is far more dangerous because it tends to track into adulthood with far reaching health related and psychological complications. WHO has remarked obesity as the most neglected epidemic of modern times with serious long term consequences. Although obesity can be defined in many ways, most popular clinical method of defining overweight and obesity is based on body mass index (BMI) which is calculated as weight in kilograms divided by height in meters squared.

Definition

According to WHO¹:

In children < 2 years: weight for supine length > 97th percentile on sex-specific WHO growth charts.

In children > 2 years: BMI > 85th but < 95th percentile is taken as overweight; > 95th percentile is taken as obese for age and sex. BMI of > 35 kg/m² is or equal to 120% is defined as extremely obese.

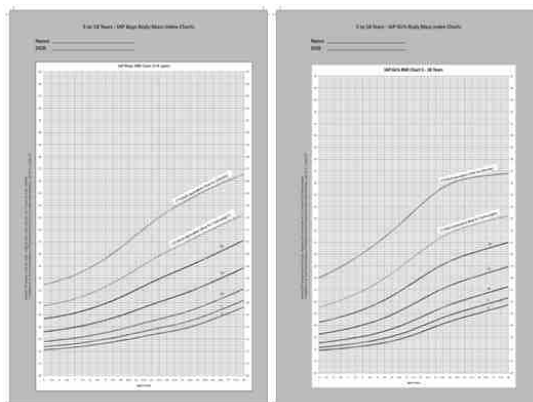
According to IAP²

BMI charts for 5-18 year old children have 23 adult equivalent as overweight and 27 adult equivalent is obese.

Some of the risk factors for adult obesity are one or both parents with obesity, younger onset of obesity, greater severity of obesity, bottle feeding during

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infancy, gestational diabetes in mother, over-nutrition and unhealthy lifestyle.



Causes of childhood obesity

1. Simple nutritional obesity (97% cases): Lifestyle and diet (calorie excess, sedentary lifestyle)
2. Endocrine : hypothyroidism, Cushing's, GH deficiency, hypoparathyroidism
3. Syndromes : Prader-Willi, Cohen, Baedet-Biedl
4. Monogenic disorders : leptin/melanocortin related defects
5. CNS : hypothalamic tumours, malformations, trauma
6. Drugs: glucocorticoids, anti-depressants, anti-epileptics
7. Psychogenic: anxiety, depression

Health consequences of obesity

1) Type 2 Diabetes Mellitus disease	7) Non-alcoholic fatty liver
2) Increased risk of heart disease	8) Polycystic ovarian syndrome
3) Dyslipidaemia	9) Depression, anxiety
4) Hypertension	10) Obstructive sleep apnoea
5) Metabolic syndrome	11) Buried penis
6) Lipomastia	12) Orthopaedic Problems

Clinical evaluation of obese children

Pointers on history

- 1) Short and obese: Endocrine disease
- 2) Mental retardation: genetic aetiology
- 3) Polyuria, polydipsia: Type 2 diabetes or central cause, post craniopharyngioma surgery
- 4) Snoring, morning headaches: Obstructive sleep apnoea
- 5) Medication history
- 6) Hirsutism, irregular menses: PCOS

Pointers on examination

- 1) Tall and overweight is nutritional obesity while short and fat is endocrine or syndromic obesity
- 2) Papilloedema: Pseudotumour cerebri
- 3) Hirsutism: PCOS
- 4) Dysmorphism: genetic syndromes
- 5) Acanthosis nigricans: insulin resistance
- 6) Hepatomegaly: hepatic steatosis
- 7) BP > 95th percentile: hypertension
- 8) Tanner staging: early puberty
- 9) Moon face, buffalo hump, striae over abdomen: Cushing's / Exogenous steroids

Metabolic syndrome

Most commonly accepted definition in paediatric and adolescent age is by IDF3. International Diabetes Federation's criteria for diagnosis of Metabolic syndrome

	10 - 16 years	>16 years
Waist circumference	> 90 th centile	> 94cm (males) > 80cm (females)
Triglycerides	>150 mg/dl	> 150 mg/dl
HDL cholesterol	< 40mg/dl	< 40mg/dl (males) < 50mg/dl (females)
Blood pressure	SBP >130 mm Hg DBP >85 mm Hg	SBP >130 mm Hg DBP > 85 mm Hg
Fasting plasma glucose	> 100 mg/dl or Known case of T2DM	>100mg/dl or Known case of T2DM

Waist circumference in Indian children and adolescents have been published by the authors' group. For Indian children we recommend 70th percentile cut off for waist for defining risk for metabolic syndrome. 70th percentile values for Indian children are given in the following Table.

Age and sex-wise WC cut-off for risk of metabolic syndrome⁴

Age, y	70th percentile WC value, cm	
	Boys	Girls
2+	48.8	49.1
3+	50.8	50.4
4+	53.4	53.4
5+	56.1	56.4
6+	59.0	59.3
7+	61.9	62.1
8+	64.9	64.9
9+	68.0	67.9
10+	71.4	71.3
11+	74.9	74.8
12+	78.0	78.1
13+	80.7	80.8
14+	83.0	82.7
15+	84.9	84.1
16+	86.5	85.1
17+	87.9	85.9

According to National Cholesterol Education Programme, individuals with more than or equal to 3 of the following are considered to be at risk of metabolic syndrome⁵:

1. Waist circumference > 90th percentile on age and sex specific WC charts
2. Fasting plasma glucose > 110 mg/dl
3. Triglycerides > 110 mg/dl, HDL < 40 g/dl
4. BP > 90th percentile for age and sex

Metabolic syndrome puts the child at an increased risk cardiovascular disease.⁵

Investigations

Nutritional obesity remains to be the commonest condition seen in the paediatric practice. A multitude of investigations is often unnecessary. Pointers to more specific and sinister

causes of obesity should be picked up clinically and evaluated further. Investigations which may need to be carried out in these children include:

1. Lipid profile
2. HBA_{1c}
3. Liver function test
4. OGTT (type 2 DM) in children older than 10 with family history of type 2 DM
5. Free T4, TSH (hypothyroidism)
- 6) Urine free cortisol, serum cortisol (Cushing's disease)
7. IGF/IGFBP3, GH stimulation test (GH deficiency)
8. Genetic work up (suspected syndromes and monogenic obesity)
9. Leptin level (leptin deficiency)
10. MRI brain (CNS disorder)

Management

The mainstay of treatment remains to be lifestyle modification unless there is a secondary cause of obesity.

The following should be implemented:

1. Consuming less energy dense foods
2. Planned meals containing high protein and lesser sugars and fats
3. Avoiding sugary beverages
4. Limit portion size
5. Limit screen time - no screen time for children < 2 yrs age and < 2 hrs in children > 2 yrs age (includes time spent on tablets, mobile phones)
6. Structured physical activity for at least 1 hour per day
7. Involving entire family in lifestyle modification

Pharmacotherapy

Should be used only if the lifestyle

changes fail to bring improvement.

FDA approved weight loss medications can be used only in children more than 16 years of age with BMI > 30 kg/m² or BMI > 27 kg/m² with at least one weight related co-morbidity.⁶

1. Orlistat : (approved by FDA for use in children >12 years age)
Associated with steatorrhea, faecal incontinence, deficiency of fat soluble Vitamins.⁷
2. Metformin: not approved for use in obesity. Used in PCOS and metabolic syndrome⁸
3. Growth Hormone: in Prader-Willi syndrome⁹
4. Octreotide: in Hypothalamic obesity¹⁰
5. Leptin: in leptin deficiency

Bariatric Surgery

Indicated in patients who have extreme obesity (BMI > 40 kg/m² or BMI > 35 kg/m² with co-morbidities) not responding to lifestyle changes or pharmacotherapy and with near adult height in Tanner stage 4/5.¹¹

Contraindicated in children with unresolved eating disorders, preadolescents, psychiatric disorders and in children with other organic and treatable causes of obesity.¹¹

Prevention

Prevention is most desirable as it is more achievable than the later interventions. Healthy eating habits, regular physical activity and limiting screen time should be focussed on. Weight tracking should be implemented since early childhood. Involvement of the entire family in developing a healthy lifestyle is of

utmost importance. As health care providers it is therefore mandatory to monitor height, weight, weight for height and BMI of every single child from birth till 18 years as primary child health surveillance policy. Simple growth monitoring by all doctors will go a long way in preventing childhood obesity as this will help the health care provider in identifying overweight children early so that intervention can be started at time when it is not too late.

[Abbreviations: WHO- World Health Organisation; BMI: Body Mass Index; PCOS: Polycystic Ovarian Syndrome; HDL: High Density Lipoprotein; OGTT: Oral Glucose Tolerance Test; TSH: Thyroid Stimulating Hormone; IGF: insulin-like growth factor; IGFBP3: insulin like growth factor binding protein 3; MRI: magnetic resonance imaging; FDA: Food and Drug Administration)

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