



IAP PEDIATRIC PRACTICE GUIDELINES

IAP Presidential Action Plan 2026

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National President, IAP 2026

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Section

NON-COMMUNICABLE DISEASES

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Tackling JUNCs: Practical Paediatric Guidelines to Combat Unhealthy Food Consumption in Indian Children

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Tackling JUNCS: Practical Paediatric Guidelines to Combat Unhealthy Food Consumption in Indian Children

01

Authors: Amol Joshi, Trupti Joshi, Abhishek Jain

Introduction

- Increasing consumption of unhealthy foods among Indian children has emerged as a major concern in recent years.
- Surveys in school-age children have revealed findings such as-.
 - >50% consume packaged food/beverages at least once daily.
 - >90% consume salted packaged foods and/or sugar-sweetened beverages regularly.
 - >70% purchase/consume packaged foods in or near schools.
- This surge in unhealthy food consumption has been accompanied by a rise in diet-related non-communicable diseases such as obesity, diabetes, and cardiovascular disease (National Family Health Survey–5 [NFHS-5], 2019–21)
- Such a dietary transition has paralleled a sharp increase in childhood overweight and obesity—with 81% of affected children residing in Low- and middle-income countries (LMICs)—and is associated with poor diet quality, micronutrient deficiencies, and elevated future non-communicable disease (NCD) risk (UNICEF, 2025).
- The Indian Academy of Pediatrics (IAP) has coined the acronym Junk foods, ultra-processed foods, nutritionally inappropriate foods, caffeinated/coloured/carbonated beverages, and sugar-sweetened beverages (JUNCS) to help identify various types of unhealthy foods.
- As primary caregivers for many children, paediatricians hold the important responsibility of combating unhealthy food choices by children by promoting healthier eating habits at individual, family, school, and community levels.

Impact of JUNCS Foods on Child Health

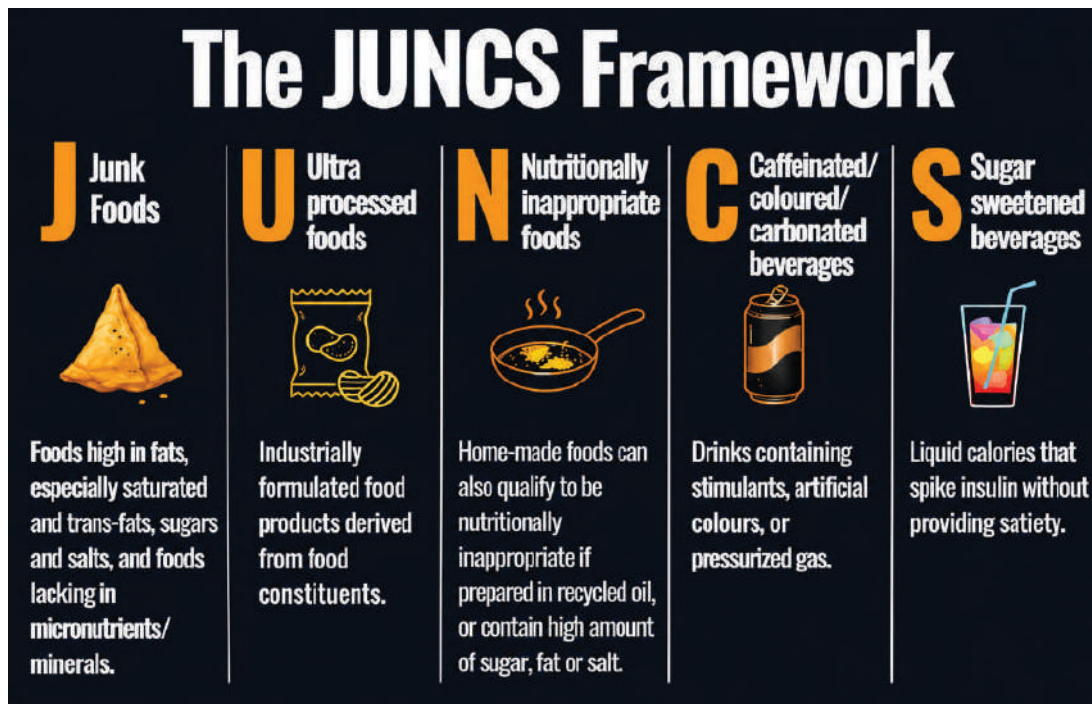
Consumption of JUNCS foods in children is associated with the numerous hazards including, but not restricted to, the following.

- Poor diet quality
- Overweight and obesity
- Micronutrient deficiencies
- Dental caries
- An increased long-term risk of diet-related non-communicable diseases, including diabetes and cardiovascular disorders.
- Early metabolic changes, impaired gut health, reduced physical fitness, and adverse effects on cognitive performance and psychosocial well-being, potentially influencing health trajectories into adulthood.
- Early-life exposure to ultra-processed foods (UPFs) can establish unhealthy dietary patterns that persist into adulthood.
- Animal studies have revealed that exposure to excess amounts of fat and/or sugar during the perinatal and immediate postweaning periods alters the development of the central reward pathway and programs an increased preference for such foods later in life.
- Junk food diet exposure during adolescence could possibly be crucial for establishing lifelong food preferences and offers a period for positive interventions.
- Highly processed foods (HPFs) can meet the criteria to be labelled as addictive substances using the standards set for tobacco products.

Understanding Unhealthy Foods

- Identification of unhealthy foods is critical to limiting their consumption
- JUNCS: The acronym classifies unhealthy foods and beverages commonly consumed by children, encompassing junk foods (J), ultra-processed foods (U), nutritionally inappropriate foods (N), caffeinated/colored/carbonated beverages (C), and sugar-sweetened beverages (S).
- This framework highlights foods and drinks high in fats, sugars, salt, additives, or unhealthy preparation practices that contribute to poor diet quality and adverse health outcomes in children.

Figure 1. Understanding JUNCS framework



- The carbohydrate-to-fiber ratio ($\leq 5:1$), derived from WHO-endorsed nutrient-profiling models and validated against cardiometabolic outcomes, is commonly used to identify higher-quality carbohydrate foods
- Protein density (protein-to-calorie ratio or percentage of energy from protein), is used in nutrient-profiling systems to distinguish protein-rich foods from energy-dense, nutrient-poor foods.
- Ratios providing ≥ 10 –15% of energy from protein are generally considered adequate, while $\geq 20\%$ reflects high protein density.

Suggested OPD Assessment: Questionnaire-Based

Assessment of food ecosystems at home and school, and dietary behaviours, is essential to identify areas for improvement to enable the clinician to impart the needed specific preventive advice.

Several points for assessment, for integration into the dietary history, are suggested below.

Home Food Environment

- Home meals are mostly freshly prepared, not packaged or ready-to-eat foods?
- Child eats fruits (not juices) at least 5 days/week?
- Plain water and milk are the usual drinks at home?
- Sugary drinks / packaged juices are given ≤ 1 time per week?
- Packaged snacks/biscuits do not replace regular meals?
- JUNCs foods are not stocked at home?

Family Practices and Role Modelling

- Family members model healthy eating in front of the child?
- Clear limits are set for intake of JUNCs foods?
- Meals are screen-free (no TV/mobile)?
- Junk foods are not used as reward or bribe?

JUNCs Intake

- Which JUNCs foods are most commonly consumed by the child?
- Child eats junk/fast/package foods ≤ 1 time per week?
- JUNCs intake is limited to no more than one serving with portion size appropriate for the child's age?
- Child consumes energy drinks / caffeinated drinks?

Parent Awareness and Safeguards

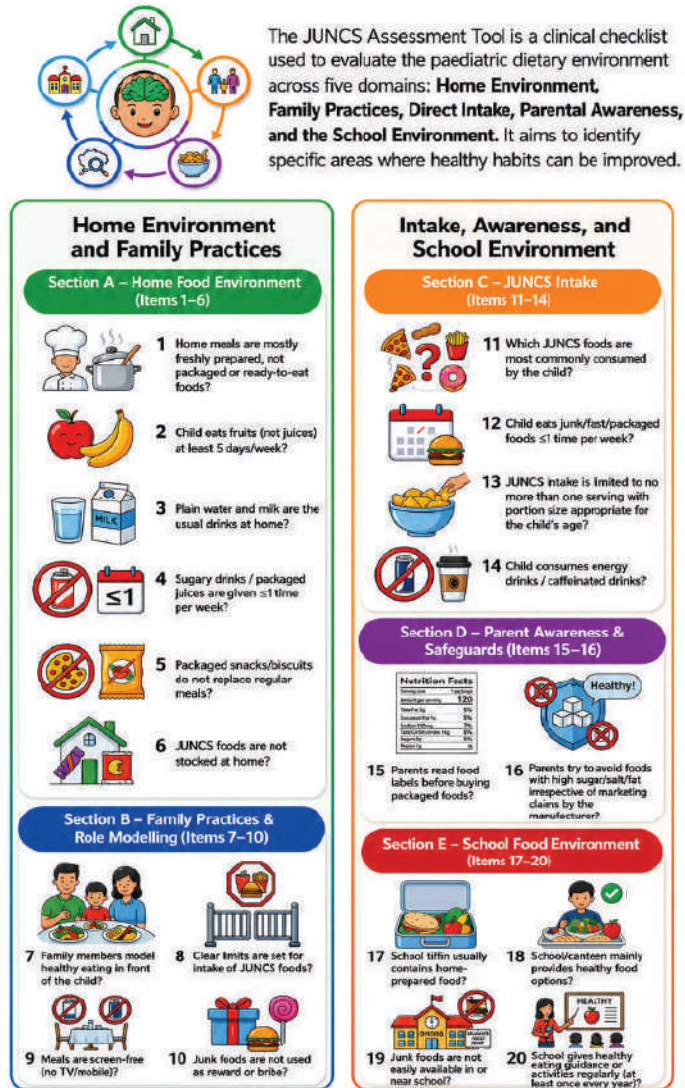
- Parents read food labels before buying packaged foods?
- Parents try to avoid foods with high sugar/salt/fat irrespective of marketing claims by the manufacturer?

School Food Environment (If Applicable)

(Skip if child not attending school)

- School tiffin usually contains home-prepared food?
- School/canteen mainly provides healthy food options?
- Junk foods are not easily available in or near school?
- School gives healthy eating guidance or activities regularly (at least once every year)?

Algorithm 1. JUNCs assessment tool: questionnaire-based



- The ALPAC method (Ask, Listen, Praise, Advise, Check) may be followed for counseling
- Pediatricians have credibility with schools and parent groups; hence, they can play a key role in advocating for healthy food environments, reinforcing consistent nutrition messaging at home and school, and promoting sustainable dietary behavior change at the community level

Age Group-Specific Recommendations*

- Age-specific guidance is essential to prevent early, sustained and excessive exposure to unhealthy foods, as dietary control, autonomy, and environmental influences vary across childhood and adolescence.

Table 1. Age-specific characteristics and evidence-informed dietary recommendations for preventing JUNCS food exposure in children and adolescents

Age Group	Characteristics	Recommendations
Birth-6 months	Breastfeeding meets almost all the nutritional needs	Exclusive breastfeeding
6 months–2 years (Infant–Toddler)	Caregiver-dependent feeding; taste preferences are being programmed	• Continue breastfeeding up to 2 years and beyond • Start complementary feeding at 6 months with home-prepared foods • No added sugar in foods till 2 years of age, no added salt till 1 year. • Avoid JUNCS entirely (no biscuits, bakery items, packaged snacks, SSBs including milk supplement powders) • Minimise consumption of HFSS foods and ultra - processed foods. (ICMR National Institute of Nutrition).
2–5 years (Preschool)	Parents have primary control; the child has minimal food autonomy	• Avoid routine exposure to JUNCS as snacks or in the form of positive reinforcement rewards • Fixed meal and snack timings (3 meals + 2 snacks) • Prefer home-prepared foods; packaged foods no more than once/week • No sugar-sweetened beverages.
6–9 years (School-age)	High-risk phase due to school canteen access and peer influence	• Limit JUNCS to no more than once weekly, pre-decided with the child. Keep portion size small. • Encourage daily breakfast • School tiffin: 1 fruit + 1 homemade item daily

JUNCS: Junk foods, ultra-processed foods, nutritionally inappropriate foods, caffeinated/coloured/carbonated beverages, and sugar-sweetened beverages; SSBs: Sugar-sweetened beverages; HFSS: High fat, sugar and salt; ICMR: Indian Council of Medical Research.

- Use of devices with digital screens (TV, smartphone etc.) during meals needs to be strictly avoided at all ages.

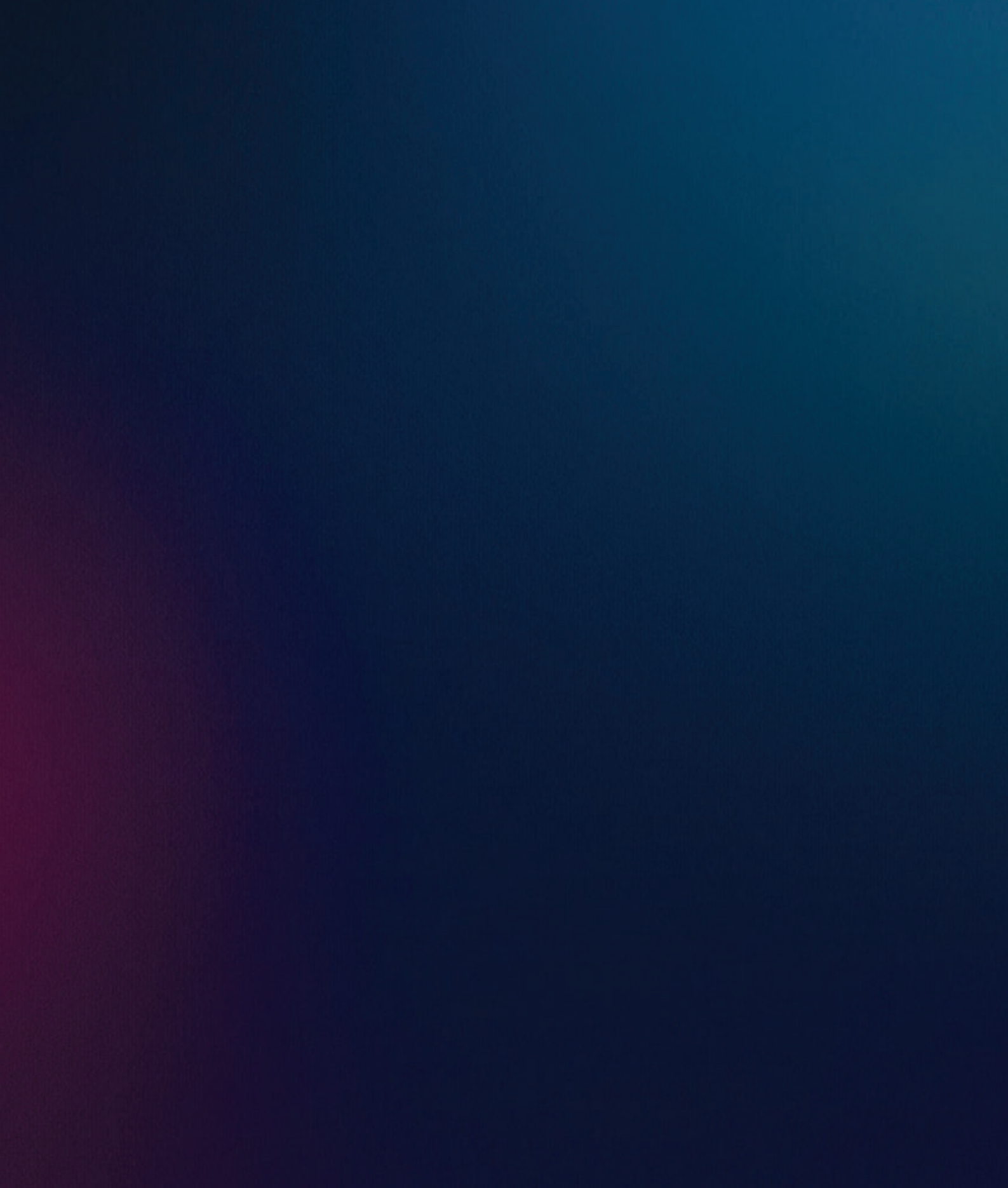
(*Suggested recommendations adapted from the Indian Academy of Pediatrics Nutrition Chapter guidelines, World Health Organization recommendations on infant and young child feeding and food marketing, and UNICEF evidence on ultra-processed foods).

Key Messages

- JUNCs foods can be addictive and drive childhood obesity and diet-related NCDs.
- Learn to identify all types of JUNCs foods.
- Paediatricians must routinely check dietary habits and food environments, to provide preventive advice tailor-made for each client.
- Paediatricians also need to advocate and guide development of better food ecosystems at home, school and community levels, and policy actions needed to drive the same.
- Restriction of JUNCs early in life can help develop lifelong healthy eating habits.

Suggested Reading

- Bhushan C, Taneja S, Khurana A. *Burden of packaged food on schoolchildren: Based on the CSE Survey 'Know Your Diet'*. Centre for Science and Environment. 2017 New Delhi, India: Centre for Science and Environment; 2017. Accessed February 2026. Available at: https://cdn.cseindia.org/attachments/0.37055100_1520598445_burden-packaged-food-school-children.pdf
- Kumar A, Kulchar RJ, Khadka N, et al. Maternal-child consumption of ultra-processed foods and sugar-sweetened beverages in informal settlements in Mumbai, India. *J Health Popul Nutr.* 2023;42(1):142.
- Gupta P, Shah D, Kumar P, et al. Indian Academy of Pediatrics guidelines on fast and junk foods, sugar-sweetened beverages, fruit juices, and energy drinks. *Indian Pediatr.* 2019;56(10):849-863.
- United Nations Children's Fund. *Ultra-processed foods and children: state-of-the-art review*. Child Nutrition and Development Programme Group, UNICEF; 2025. Accessed February 3, 2026. Available at: <https://www.unicef.org/>
- Gupta A, Bidla N, Dutta R. *The junk push: rising ultra-processed food consumption in India—policy, politics and reality*. Breastfeeding Promotion Network of India; 2023. Available at: <https://www.bpni.org/wp-content/uploads/2023/09/The-Junk-Push-Executive-Summary.pdf>





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HFSS Culprits - How to Identify

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Introduction

- Over the last few decades, consumption of foods high in fat, sugar and salt (HFSS) has increased rapidly, including in children and adolescents.
- This has been recognised as a major modifiable dietary risk factor for non-communicable diseases (NCDs).

Definition

- Foods labelled as HFSS are those foods that are prepared/cooked/manufactured with more than the recommended levels of visible fat, added sugar, and salt and exceed their thresholds per 100 gm of food as per the guidelines of the Indian Council of Medical Research- National Institute of Nutrition (ICMR-NIN) (Table 1) or as per the WHO South-East Asia Region office nutrient profile of packaged food products.
- They are energy-dense, nutrient-poor, ultra-processed foods that are designed to be hyper-palatable and are often aggressively marketed. However, some homemade foods and foods cooked in shops also contain high levels of fat, sugar, and salt.

Examples of HFSS Foods

- Breakfast cereals like cornflakes, chocolate cereals, muesli, etc. (high sugar, saturated fats)
- Bakery products like white bread, buns, pav croissant, etc. (high sodium, saturated fats, sugar)
- Packaged salty snacks like potato chips, bhujia, namkeen mixtures, crunchy puffed corn etc. (high saturated fats, salt)
- Sauces like tomato sauce, ketchup, mayonnaise, etc. (high sugar, fat, sodium)
- Ready and instant meals like instant noodles, frozen food items, packaged soup, etc. (High salt)
- Industrially produced beverages like soft drinks, juices, energy drinks, flavoured milk, ready-to-drink coffee and tea, and yogurts, etc. (High sugar)
- Desserts and sweets like gulab jamun, jalebi, ice-cream, etc. (high fat, sugar).

Table 1. Nutrients of concern and their threshold criteria (ICMR-NIN, 2024)

Nutrient per 100 gm or mL	Liquid Foods/Beverage	Solids
Calories (kcal)	70	250
Salt (mg)	175	625
Added Sugar (g)	2.0 Criteria: Not exceeding 30% energy from total sugar (including natural sugar in fruit juices/milk etc.), and 10% from added sugar	3.0 Criteria: Not exceeding 10% energy from total sugar, and 5% energy from added sugar
Added Fat (g)	1.5 Criteria: Not exceeding 30% energy from total fat, and 15% energy from added fat	4.2 Criteria: Not exceeding 30% energy from total fat, and 15% energy from added fat

Healthy Diet

- A healthy diet includes regular consumption of fruits, vegetables, legumes (such as lentils and beans), nuts, and whole grains. In addition, it should meet the following nutritional recommendations:

Sugar

- Free sugars are all sugars added to foods or drinks during production or cooking, as well as sugars naturally present in food items.
 - They should contribute to less than 10% of total energy intake. Ideally, limiting free sugars to below 5% of total energy intake provides additional health benefits.
- Total fat should provide no more than 30% of total energy intake.
 - Within this, saturated fat intake should remain below 10%, and trans-fat intake below 1% of total energy intake.

Salt intake should be adjusted downward from the recommended adult intake of 2 g/day of sodium, based on their energy requirement.

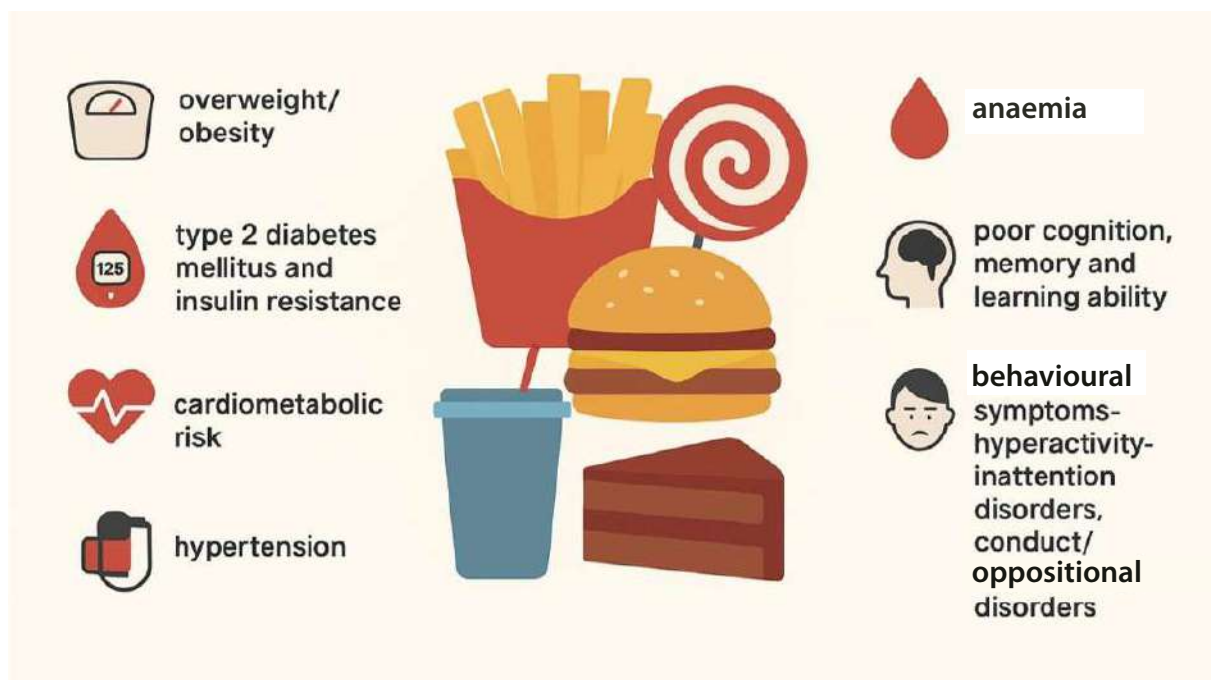
Nutrient Profiling of Packaged Foods

- Nutrient profiling helps in the scientific categorisation of foods on the basis of their nutritional contents. The WHO South-East Asia Region office nutrient profile of packaged food products provides a threshold for total fat, saturated fat, total sugars, added sugars, and sodium.
- The nutrient profile applies to children aged 10–11 years and older. is for children 10-11 years of age and above.
- However, for children less than 10 years of age, nutrients of concern within the following limits will be excessive and harmful.
- The profiling is based on the following assumptions:
 - Daily energy requirement for a 10–11-year-old moderately active child is 2000-2150 kcal. Therefore, average requirement is 2000 kcal/day.
 - Main meals (3 meals/day), each of them, should provide 25% of daily energy requirement.
 - Each snack (2 snacks/day) should provide 10-12% of daily energy requirement.
 - Therefore, a 100 g serving of the product provides approximately 230 kcal. Any food that exceeds 230 kcal per 100 g is considered energy dense.
 - The sodium threshold is set at a ratio of 1:1 (1 mg sodium per 1 kcal of energy). This is based on a daily reference intake of 2000 mg sodium and an average energy intake of 2000 kcal.
 - The sugar threshold is based on the share of energy coming from free sugars.
 - Energy from free sugars is calculated as grams of free sugar multiplied by 4 kcal.
 - A product crosses the threshold when free sugars contribute at least 10 % of total energy in solid foods, and more than 5 % of total energy in sugar-sweetened beverages.
 - Energy from fat is calculated by multiplying the grams of total fat by 9 kcal. A product is classified as high in fat when 30 percent or more of its total energy comes from fat.
 - A product is considered high in saturated fat when energy from saturated fats accounts for 10 percent or more of its total energy.

Risks of Consuming HFSS Food

- HFSS foods are calorie-dense and usually deficient in vitamins, minerals, and fibre
- Regular consumption of HFSS foods reduces children's intake of healthy foods that provides essential amino acids, fatty acids, and micronutrients.
- Excessive intake of HFSS foods is associated with numerous adverse health outcomes, e.g.,
 - Dental caries
 - Childhood obesity
 - Cardiometabolic risk
 - Type 2 diabetes
 - Fatty liver disease
 - Anaemia
 - Behavioural problems
 - Poor learning ability
 - Malignancy risk.

Figure 1. Harmful effects of HFSS foods



Possible Interventions Including Regulatory Provisions to Curb Consumption of HFSS

- Empowering consumers through labelling take as white bullet below- Front-of-pack labels that clearly warn consumers about foods high in sugar, salt or fat promote healthier food choices.
- Enacting and implementing effective food regulations without conflicts of interest–
 - Mandating food brands to reformulate products by gradually reducing salt, sugar, and trans fats
 - Restricting advertisements to children on electronic and social media
 - Limiting availability of HFSS in schools, educational institutions and health care centres
 - Higher taxes on sugar-sweetened beverages and HFSS food items
- Promoting the consumption of healthy foods- Making fresh fruits, millets, whole grains, and low-salt snacks available at all public places especially in school canteens, cafeterias and through street vendors.
- Awareness generation campaign–
 - Regular publication of advisories in media on risks of HFSS foods
 - Nutrition education in schools.

Key Messages

- HFSS foods are high in fat, sugar, and salt but low in essential nutrients, making them a major driver of childhood obesity and other non-communicable diseases.
- Frequent consumption of packaged snacks, sugary drinks, bakery products, and fast foods should be discouraged; these should be occasional treats, not daily foods.
- Promote healthy eating by encouraging fresh fruits, vegetables, whole grains, pulses, nuts, and home-cooked meals from an early age.
- Reading nutrition labels and identifying foods high in added sugar, salt, and unhealthy fats empowers families to make healthier food choices.
- Creating healthy food environments at home, schools, and in the community is essential to prevent childhood obesity and lifelong diet-related diseases.

Suggested Reading

- ICMR-National Institute of Nutrition. *Dietary Guidelines for Indians–2024*. Published 2024. Accessed January 20, 2026. Available at: https://nin.res.in/dietaryguidelines/pdfs/locale/DG-I_2024.pdf
- World Health Organization. *Healthy diet*. Updated January 26, 2026. Accessed January 20, 2026. Available at: <https://www.who.int/news-room/fact-sheets/detail/healthy-diet>
- World Health Organization. *WHO nutrient profile model for South-East Asia Region*. Published January 19, 2017. Accessed January 20, 2026. Available at: <https://www.who.int/publications/i/item/9789290225447>
- Bera OP, Singh R, Bhattacharya S. Food literacy & food labeling laws-a legal analysis of India's food policy. *J Family Med Prim Care*. 2023;12(4):606-610. doi:10.4103/jfmpc.jfmpc_880_22
- World Health Organization. *Policies to protect children from the harmful impact of food marketing: WHO guideline*. Published July 3, 2023. Accessed January 20, 2026. Available at: <https://www.who.int/publications/i/item/9789240075412>





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Ultra-Processed Foods: Hazards and Identification

Authors: Rekha Harish, Deepak Pande, HPS Sachdev

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Ultra-Processed Foods: Hazards and Identification

03

Authors: Rekha Harish, Deepak Pande, HPS Sachdev

Introduction

- Ultra-processed foods (UPFs) are industrial formulations initially comprising of constituents derived from food but are ultimately left with a destroyed food matrix, added sugars, salts, fats, numerous additives, etc., and little or no intact whole food. They are engineered to be highly palatable, appealing, convenient, have a long shelf life, at the cost of nutritional quality.
- UPFs have currently emerged as an important diet-related public-health concern worldwide. Between 2007 and 2022, annual per capita sales of UPFs increased substantially by approximately 60% in low-income countries, 40% in lower-middle-income countries, and 20% in upper-middle-income countries across 93 countries, reflecting their growing penetration into food systems globally.
- Retail sales of UPFs in India increased 40-fold between 2006 and 2019, and household spending on packaged foods also doubled during this period.
- Commonly consumed UPFs include biscuits, Savory snacks, confectionery, sugar-sweetened beverages, flavoured yogurts, processed meats, instant noodles, ready meals, breakfast cereals, energy drinks, soft drinks, and frozen snack foods.
- The extensive industrial processing disrupts the original food matrix and is accompanied by the addition of refined starches, sugars, fats, salt, and numerous additives for flavour, texture, preservation, taste, and appearance, contributing to their poor nutritional profile and potential adverse health effects.
- The Indian Council of Medical Research has stated that 56.4% of the total disease burden in our country is attributable to unhealthy diets, highlighting the importance of dietary quality in the national health profile.
- Due to India's accelerated ultra-processed food market expansion, the Lancet Series on UPFs has identified India as a "priority country" for early intervention.

Food Classification Based on Processing

The **NOVA food classification system** categorizes foods into four groups based on the extent and purpose of processing, and UPFs constitute its fourth group.

Figure 1. Categories of Foods in the NOVA Classification System



Nova Group 1: Unprocessed/minimally processed



Nova Group 2: Processed culinary ingredients



Nova Group 3: Processed foods



Nova Group 4: Ultra processed foods

- UPFs, though initially start with food as an ingredient, are left with a destroyed food matrix, added starches, sugars, fats, etc., and numerous additives for enhancing flavour, preservation and cosmetic purposes.

Characteristics of Ultra-Processed Foods

- Consist of many ingredients, generally more than 5 to 10 items
- Often have industrial ingredients such as maltodextrin, glucose syrup, or protein isolates, etc.
- Cosmetic additives such as emulsifiers, stabilizers, artificial colours, sweeteners, and flavour enhancers
- “Ready-to-eat or ready-to-heat” products requiring minimal cooking
- Have a strong sensory appeal which is often addictive
- Long shelf life.

Hazards of Ultra-Processed Foods

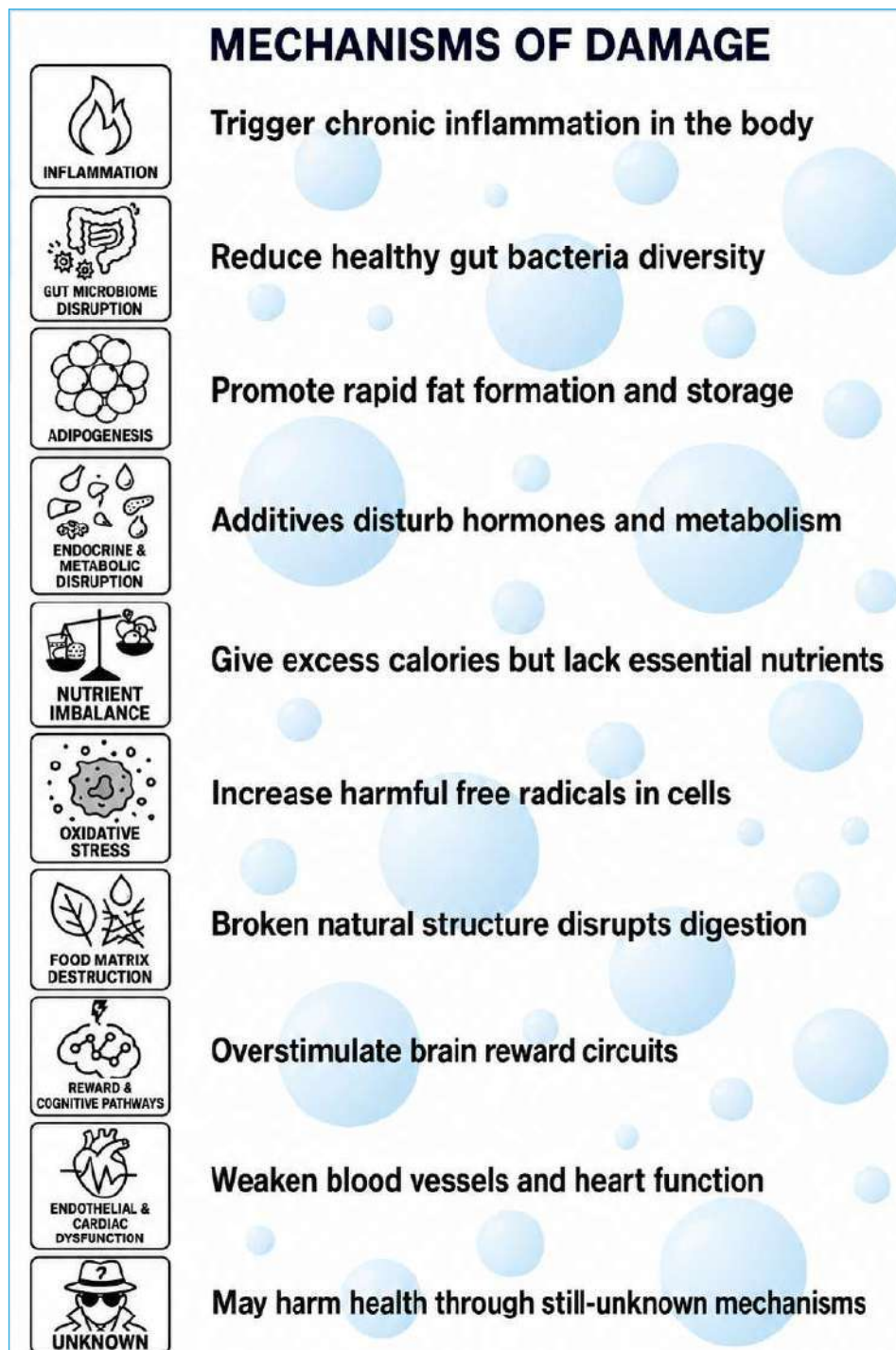
- Higher consumption of UPFs has been associated with increased risk of obesity, metabolic syndrome, type 2 diabetes, cardiovascular disease, some cancers, poorer mental health outcomes, and higher all-cause mortality.
- These associations are strong across many observational studies, although the degree of causality may vary by outcome and study design.
- UPF intake may adversely affect cardiovascular health by increasing blood pressure, worsening lipid profiles, and promoting endothelial dysfunction. Each additional daily serving is associated with an approximately 7% higher risk of cardiovascular disease
- Higher UPF intake has also been linked with higher fasting glucose, greater insulin resistance, and progression toward type 2 diabetes, independent of total energy intake in some analyses.
- Associations have additionally been reported with risk of colorectal, breast, and pancreatic cancers.
- Mental-health associations, including anxiety, depression, sleep disturbance, and impaired cognition in children, have also been reported. These may be mediated by microbiome changes, glycaemic instability, inflammation, and overall poorer diet quality, although the evidence in this area continues to evolve.

Specific Vulnerabilities of Children to Ultra-Processed Foods

- Young population → long lifetime exposure
- Cheaper UPFs compared to healthy foods, hence easy access even in poor socio economic status
- Focussed marketing to children and adolescents
- Penetration into schools, canteens, hostels, festivals and other celebrations
- Displacement of diverse, nutrient-rich traditional foods
- Front-of-pack labeling policy awaited, regulatory gaps.

How can Ultra-Processed Foods Harm Health?

Infographic 1. Mechanism of damage caused by the consumption of ultra-processed foods



- The harmful effects of UPFs may arise through multiple overlapping biological pathways, many of which extend beyond calories alone. UPFs are typically high in free sugars, refined starches, sodium, and unhealthy fats, while being low in fibre, micronutrients, and phytochemicals. This nutrient imbalance may reduce satiety, promote overeating, and displace more diverse and nutritious traditional diet.
- Additives such as certain emulsifiers and stabilizers may impair gut-barrier integrity and contribute to low-grade inflammation. Diets rich in UPFs have also been associated with reduced microbial diversity, lower short-chain fatty acid production, and changes in the gut microbiome that may contribute to metabolic dysfunction.
- Alteration of the food matrix may influence eating behaviour and metabolism through changes in fibre integrity, viscosity, texture, and water content. This may result in faster gastric emptying, blunted satiety responses, faster eating, and passive overconsumption.
- High-heat processing produces neo-formed contaminants such as acrylamide, advanced glycation end-products (AGEs), and lipid oxidation products, all of which are linked to an increased risk of cancer, endothelial dysfunction, and inflammation.
- Phosphate additives increase fibroblast growth factor 23 (FGF-23) and parathyroid hormone (PTH), promoting vascular calcification and endothelial injury. High glycaemic loads accelerate insulin resistance and hepatic lipogenesis.
- Hyper-palatable formulations activate dopaminergic reward circuits, encouraging compulsive eating patterns, especially among children and adolescents.

Identification of Ultra-Processed Foods

- Ready-to-eat/heat packaged products
- Long ingredient lists
- Presence of industrial additives
- Long shelf-life
- Health claims masking high sugar/salt content

For the masses to identify UPF quickly, it can largely be simplified as “If you find in a food, even one Ingredient which is never or rarely found in traditional kitchens, it is likely to be a UPF.”

Strategies to Reduce Ultra-Processed Food Intake

Individual Level

- Replace UPFs with minimally processed foods: fruits, vegetables, pulses, millets/cereal-based
- homemade snacks, nuts
- Join family meals
- Avoid eating while watching the screen
- Don't get carried away by health claims/taglines. Verify them by reading and understanding the labels first.

Family Level

- Parental modelling
- Limit purchasing and availability at home
- Encourage home-based healthy cooking.

School level

- Healthy canteen policies with availability of traffic light-based foods
- Avoid sponsorship of school programs by the food industry.

Unhealthy food should not be available in and preferably 200 metres around the schools

Systems Level

Evidence-based front-of-pack warning labels need to be given preference over other labelling policies due to their proven efficacy in Chile, Mexico, Peru, Uruguay and Israel etc.

- Restriction of child-targeted UPF marketing
- High taxation of UPF products which are also high in fats, sugars or salt
- Subsidies for whole foods.
- Restriction of corporate influence in food systems
- Enforcement of healthy food environments in schools
- Inclusion of hazards and identification points for UPFs in nutrition guidelines
- Responsible media and media personalities' behaviour.

-Unhealthy food marketing, especially the marketing directed at children should be regulated far more strictly because of its public-health consequences.

Key Messages

- UPFs are industrially formulated products having a long ingredient list, additives, and a long shelf life; they are often ready-to-eat or ready-to-heat products which are often marketed aggressively.
- They are strongly associated with several adverse health outcomes
- Children and adolescents are particularly vulnerable because of early and longer exposure, aggressive marketing, easy availability, and long duration of cumulative intake.
- India is an important setting for early public-health action because of rapid UPF market growth and a high burden of diet-related non-communicable diseases.
- Reducing UPF intake requires coordinated action at the individual, family, school, community, and policy levels. Front-of-pack warning labels, improved nutrition literacy, healthier food environments, and age-appropriate cooking skills may all contribute to long-term risk reduction.

Suggested Reading

- Monteiro CA, Cannon G, Levy RB, et al. Ultra-processed foods: what they are and how to identify them. *Public Health Nutr.* 2019;22(5):936-941. doi:10.1017/S1368980018003762.
- Khoury N, Martínez MÁ, Garcidueñas-Fimbres TE, et al. Ultraprocessed food consumption and cardiometabolic risk factors in children. *JAMA Netw Open.* 2024;7(5):e2411852. doi:10.1001/jamanet-workopen.2024.11852.
- National Institute of Nutrition. *Dietary Guidelines for Indians*. Revised ed. National Institute of Nutrition; 2024. Accessed January 20, 2026. https://nin.res.in/dietaryguidelines/pds/locale/DGI_2024.pdf
- Juul F, Vaidean G, Parekh N. Ultra-processed foods and cardiovascular diseases: potential mechanisms of action. *Adv Nutr.* 2021;12(5):1673-1680. doi:10.1093/advances/nmab049.
- Monteiro CA, Louzada MLC, Steele EM, et al. Ultra-processed foods and human health: the main thesis and the evidence. *Lancet.* 2025;406(10520):2667-2684.





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Label Literacy: Teaching Children and Parents to Decode Packaged Foods

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Label Literacy: Teaching Children and Parents to Decode Packaged Foods

04

Authors: Jai Prakash Dadhich, Swati Bhutada

Introduction

- Label literacy is the ability to understand and apply information provided on food labels of packaged foods.
- Label literacy includes understanding serving size, energy value, sugar, fat, sodium content, ingredient list and nutrition related claims.
- Correct and factual nutritional information on food labels, when systematically interpreted, enables consumers to make informed choices regarding product use.
- Strengthening label literacy is a key preventive strategy for addressing childhood noncommunicable diseases (NCDs)

Algorithm 1. Understanding label literacy

Label literacy is the ability to understand and apply information provided on food labels of packaged foods.

Nutrition Facts

Amounts Per Serving

Calories

Total Fat

Saturated Fat

Cholesterol

Sodium

Total Carbohydrate 10% 18%

Dietary Fiber 50%

Sugars

Protein 10%

*Percent DV are based on a diet of 2,000 calories.

Label literacy includes understanding:

Serving Size | Calories | Sugar | Fats

Sodium | Ingredients | Nutrition Claims

LOW FAT | HIGH FIBER

Interpreting food labels helps consumers to:

Know Nutritional Content | Make Healthy Choices | Avoid Excess Intake

Strengthening Label Literacy is Essential to Prevent Childhood Noncommunicable Diseases

Heart | Syringe | Tooth | Scale

Doctor | Child | Overweight Child

What Are the Mandatory Labelling Requirements for Packaged Foods in India?

The Food Safety and Standards Authority of India (FSSAI) regulations for labelling mandate specific information on pre-packed food labels.

A food label should depict the following information on the front and back of the label:

A. Product Name/Identity

- On the front of the pack
- May also have "trade name" or "Brand"
- Brand name/logo of FSSAI, fortified organic etc.

B. Nutritional Information

• Nutrition Information Panel

- Net Quantity - weight/volume/number
- Calories/Energy - kJ/kcal
- Protein
- Total fat, saturated fat, trans-fat, monounsaturated fat, polyunsaturated fat
- Carbohydrates, total sugars, added sugars
- Sodium/Salt
- Additional nutrients if claims are made (e.g. minerals, fibre, vitamins)
- Serving size and number of servings
- Calculated nutrient values per 100 g/100 mL and per serving,
- including the percentage contribution to the Recommended Dietary Allowance (RDA) (applicable only to individuals aged 10 years and above).
 - Nutrients to be declared include:
 - Energy
 - Protein
 - Carbohydrates (total and added sugars)

- Total fat
- Saturated fat
- Sodium
- Calculate the percentage contribution using the following reference intake values:
 - Energy: 2,000 kcal
 - Total fat: 67 g
 - Saturated fat: 22 g
 - Added sugars: 50 g
 - Sodium: 2,000 mg (equivalent to 5 g salt)
- Added water should be declared.

C. Ingredients and Composition

- List of ingredients in decreasing order of quantity
- Food additives and International Numbering System for Food Additives (INS) numbers - Additives must be identified by class and INS code, their role or function like anticaking agent, colour, flavour enhancer, stabiliser etc
- Allergen Information - Declaration if present (wheat, nuts, milk).

D. Manufacturing and Traceability

- Name and full address of manufacturer, packer, marketer, importer etc
- Batch/lot/code Number
- Date details - Date of manufacture/packing and best before or use-by/expiry date.

E. Usage and Safety

- Instructions for use/preparation/storage conditions (e.g. store in a cool, dry place)
- Country of origin/Imported product details
- Net quantity, retail sale price
- Consumer care details (optional but recommended)-Toll free number, website, e-mail for feedback or queries.

F. Vegetarian /Nonvegetarian symbol

G. Food Safety and Standards Authority of India Logo/License Number.

Figure 1. Different common types of sugars added to the pre-packaged foods



- List of commonly added sugars
 - Cane Sugar
 - Beet Sugar
 - Honey
 - Molasses
 - Malt Syrup/ Barley Malt
 - Rice Syrup
 - Maple Syrup
 - Fruit Juice Concentrates
 - Dextrose
 - Agave
 - Date paste
 - Treacle
 - Nector
 - Ethyl maltol
 - Caramel
 - Corn Syrup
 - Corn Sweetener
 - Maltodextrin
 - Lactose
 - Fructose

What Are the Marketing Traps on Food Labels?

- Deceptive or incorrect information and misleading claims on the labels only to increase the saleability of packaged foods.
 - Keeping serving size small and writing them in very small fonts and appearing falsely healthy decrease space of RDA per serving being provided
 - Using misleading terms like natural, fresh, active, pure etc.
 - Hiding the harmful ingredients or writing them in very small prints often within the folds of the pack
 - Selective highlighting of favourable claims while omitting potentially unfavourable information. For example, products labelled as “sugar-free” may still contain artificial sweeteners or excessive amounts of fat or sodium. Similarly, products marketed as “baked” may contain high levels of fat and, consequently, be high in calories.
- Violating FSSAI regulations 2018 on advertising and claims
 - Health/nutrition claims which are not scientifically substantiated
 - Mentioning suitability of the food for use in the prevention, alleviation, treatment or cure of a disease, disorder or particular physiological condition
 - Writing endorsement by professionals e.g. “recommended by the medical or nutrition or health professionals”
 - Putting reduction of disease risk claims which are not in accordance with the prescribed conditions.
 - Putting non-addition of sugar claim although the food package have added sugar (sucrose, glucose, honey, molasses, corn syrup, etc) and/or contain any ingredient (jams, jelly etc.) which has added sugar.

How to Read and Analyse the Food Labels

The framework below can be used for awareness and counselling.

- Read the product name, net quantity, manufacturing and expiry date.
- Check for logos such as vegetarian/non-vegetarian, organic certification or fortification marks.
- Screen for allergens (e.g. milk, nuts, soya, and gluten) declared in the ingredient list or allergen statement.
- Read and interpret the percentage of the recommended dietary allowance (RDA).
- Percent RDA values on food labels are calculated on a reference intake of 2000 kcal which is applicable to children aged 10 years and above.
 - 20% Daily Value (DV) or more is considered high meaning a single serving contributes a large amount of that nutrient relative to daily requirements.
 - For younger children interpretation should rely on absolute nutrient amounts per serving rather than % RDA alone.
- Check the serving size and number of servings per packet. Serving size indicates the quantity of food to which the nutritional information applies.
 - As many packaged foods contain multiple servings, consuming more than one serving may lead to excessive intake of sugar, salt, fat, and additives.
- Be cautious of taglines and claims like “healthy” or “sugar free”. Sugar-free products may contain artificial sweeteners and still be high in fat or sodium.
- Read the Ingredient list, written in descending order of quantity. While reading ingredient list you may notice coded numbers (International numbering system for food additives/European food additive codes [INS/E-Numbers]) that indicate food additives (preservatives, colours, flavour enhancers).

Common examples include:

- INS 211 (sodium benzoate) is used as a preservative, which may trigger hyperactivity or allergies in some children and it has carcinogenic potential as well.
- INS 621(monosodium glutamate), a flavour enhancer associated with headaches or palpitations in sensitive individuals.
- INS 102 (tartrazine) a colour linked to behavioural issues.
- Food additives Apps like Open Food Facts, Food Additive Scanner, Pure Check provide details after entering INS numbers.
- Labels should be used to assess specific risks: added sugars and acids increase the risk of dental enamel erosion, artificial colours and flavour enhancers may contribute to hyperactivity, high sugar content is unsuitable for children with diabetes, high sodium and phosphate additives are unsuitable for children with kidney disorders and artificial additives for children with atopic or skin disorders.

Healthy Alternatives and Smart Shopping Strategies

- Encourage home-made snacks such as fruit salad, nuts, boiled corn, roasted chana, and home-made laddoos.
- Look for natural and minimally processed foods, which may be identified by short ingredient lists with minimal or no sugar, salt, fats or additives.
- Ultra-processed foods typically have long ingredient lists with added sugars, refined oils, colours, multiple INS numbers.

Tips for Paediatricians to Promote Food Label Literacy

- Use simple visuals in waiting areas.
- Demonstrate with real or empty packs during diet counselling.
- Encourage families to make reading food labels a daily habit by playing small games such as “Spot the Sugar,” “Find the First Three Ingredients,” etc. If sugar, refined flour, or oil appear in first three ingredients, teach them to refrain from buying such products.
- Encourage families to involve children in grocery shopping and explore food labels with them.
- Paediatricians can provide anticipatory guidance to school canteens by advocating for restrictions on high-sugar beverages and ultra-processed food (UPF), and encouraging the availability of minimally processed, clearly labelled, healthier alternatives.
- Paediatricians can get into the habit of linking certain symptoms to frequent UPF intake by patients and help them identify the offending agent in the food they consume.

Key Messages

- Paediatricians and caregivers play a critical role in shaping children's eating habits.
- Frequent consumption of ultra-processed foods high in sugar, salt, unhealthy fats, and additives increases the risk of childhood NCDs.
- Understanding food labels is an essential life skill for both parents and children.
- Label literacy enables families to interpret ingredient lists, nutrition information, and serving sizes, and identify foods high in fat, sugar, and salt.

Suggested Reading

- Food Safety and Standards Authority of India. *Food Safety and Standards (Labelling and Display) Regulations, 2020. Version VIII*. Published September 9, 2025. Accessed January 20, 2026. https://fssai.gov.in/upload/uploadfiles/files/Comp_Labelling.pdf
- Codex Alimentarius Commission. Food Additives Database (GSFA Online): Codex General Standard for Food Additives (CXS 192-1995). Food and Agriculture Organization of the United Nations; World Health Organization. Accessed January 20, 2026. <https://www.fao.org/fao-who-codexalimentarius/codex-texts/dbs/gsfa/en/>
- Food Safety and Standards Authority of India. Food Safety and Standards (Advertising and Claims) Regulations, 2018. Published 2018. Accessed January 20, 2026. https://www.fssai.gov.in/upload/uploadfiles/files/Compendium_Advertising_Claims_Regulations_14_12_2022.pdf
- Sidharth G, Jiya. Exploring deceptive food labelling in India: buying behaviour, awareness, and perspectives of Gen Z consumers in context of online food purchases. *Int J Res Mark Manage Sales*. 2024;6(2):50-61. doi:10.33545/26633329.2024.v6.i2a.176



IAP PEDIATRIC PRACTICE GUIDELINES

IAP Presidential Action Plan 2026

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NON-COMMUNICABLE DISEASES

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Obesity and Related Diseases in Children: Diagnosis and Evaluation

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Obesity and Related Diseases in Children: Diagnosis and Evaluation

05

Authors: Ankita Goel Sharma, Preeti Singh

Introduction

- Childhood obesity has emerged as a major public health problem globally. It is a chronic condition that impairs health, leading to long-term morbidity and even early mortality.
- It results from a complex interplay of genetic, environmental, lifestyle, sociocultural, and behavioural factors.
- Early diagnosis is critical because comorbidities and associated diseases begin early and track into adulthood.

Definitions and Conceptual Framework

What is Obesity?

Defined as “a chronic complex disease characterised by excessive adiposity, with or without abnormal distribution or function of adipose tissues.”

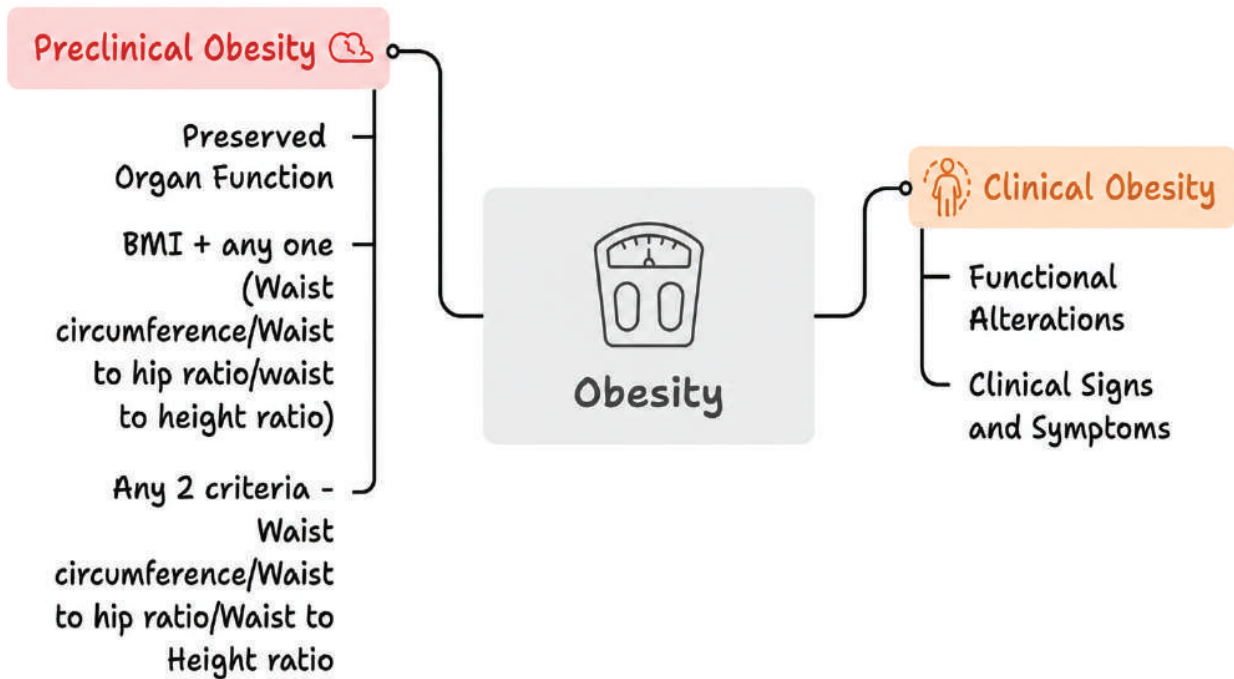
Pre-Clinical versus Clinical Obesity

The classification of childhood obesity into preclinical and clinical obesity is illustrated in Figure 1.

- **Pre-clinical Obesity**
 - Excess adiposity, documented by anthropometry or direct fat measures, with preserved organ function and normal day-to-day activities.
 - It may also represent a remission stage of clinical obesity when previous organ dysfunction has resolved and sustained remission (typically assessed over ≥ 6 months) without ongoing pharmacotherapy.
- **Clinical Obesity**

Excess or abnormal adiposity with demonstrable organ dysfunction and/or age-appropriate functional limitation.

Figure 1. Obesity classification: pre-clinical vs clinical obesity

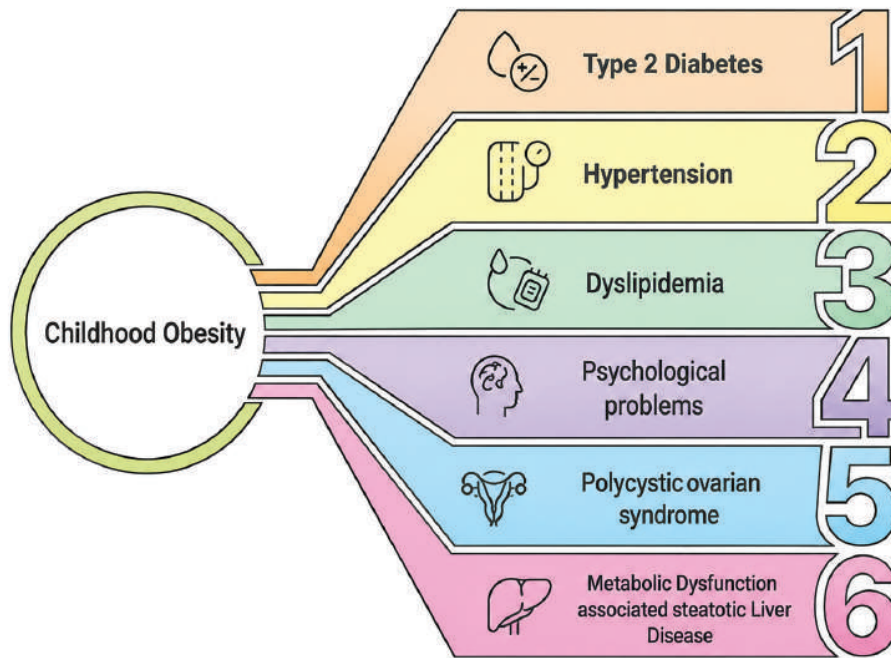


Obesity Related Diseases Include

(Refer to Figure 2)

- Non-communicable cardiometabolic disorders (type 2 diabetes, hypertension, dyslipidaemia, metabolic dysfunction-associated steatotic liver disease (MASLD))
- Polycystic ovary syndrome (PCOS)
- Obstructive sleep apnoea (OSA)
- Slipped capital femoral epiphysis (SCFE), and
- Psychological impairment or reduced health-related quality of life, including low self-esteem, bullying, school difficulties and reduced participation in physical activity.

Figure 2. Obesity related diseases



Comorbidities vs Obesity-Related Diseases and Complications

Co-morbidities

- Use “comorbidities” only for conditions that coexist by chance, with no direct causal or pathophysiologic link to obesity, e.g., epilepsy, thalassemia.

Obesity-Related Diseases

- For conditions such as type 2 diabetes, hypertension, dyslipidemia, PCOS, MASLD, OSA, depression (Figure 2), and others, it is appropriate to refer to them as “obesity-related” or “overlapping” diseases, as they frequently share common risk factors and underlying pathophysiological mechanisms with obesity.

Complications

Complications represent severe, often serious or life-threatening consequences of prolonged clinical obesity:

- Marked left ventricular hypertrophy (LVH) or early cardiomyopathy
- Stroke or advanced vascular changes (rare but possible later)
- Advanced MASLD/metabolic dysfunction-associated steatohepatitis (MASH) with fibrosis,
- Severe sleep apnoea with growth, learning, or behaviour impact
- Severe orthopaedic damage (SCFE with disability).

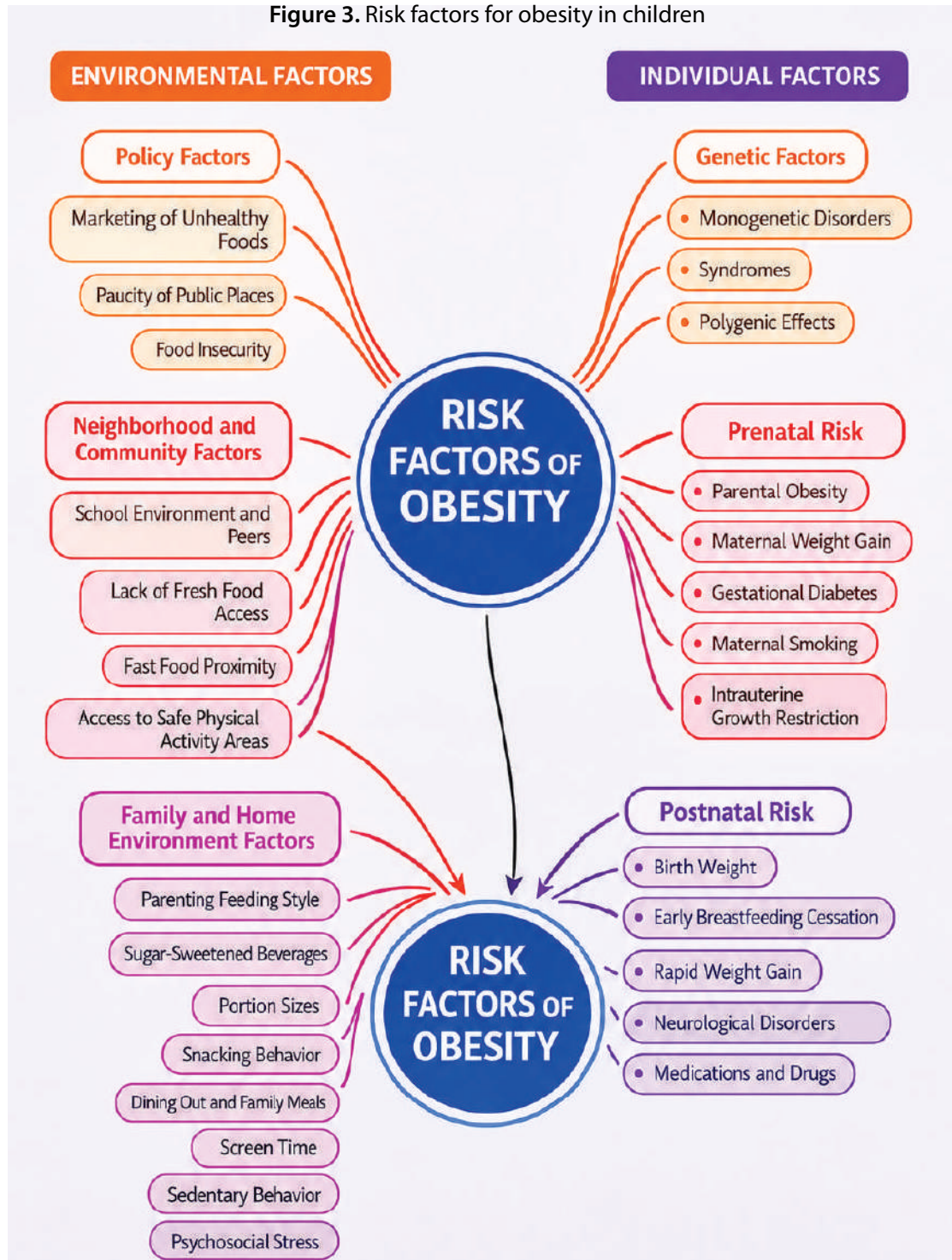
Aetiology of Obesity: Primary (Exogenous) vs Secondary (Pathological)

Primary (exogenous) obesity accounts for ~95% of paediatric cases.

- Results from chronic energy imbalance without an identifiable organic cause
- **Growth pattern**
 - Typically tall for age
 - Growth appropriate for mid-parental height
 - Normal growth velocity
- **Contributing factors**
 - **Genetic susceptibility**
 - **Obesogenic environment**
 - Sedentary lifestyle
 - Energy-dense/high-calorie diet
 - Sugar-sweetened beverages
 - Excessive screen time
 - Parental obesity
 - **Psychosocial factors**
 - Stress
 - Poor sleep
 - Emotional eating
 - **Biological factors**
 - Appetite regulation
 - Energy metabolism
 - Leads to dysregulation of fat mass, distribution, and function.

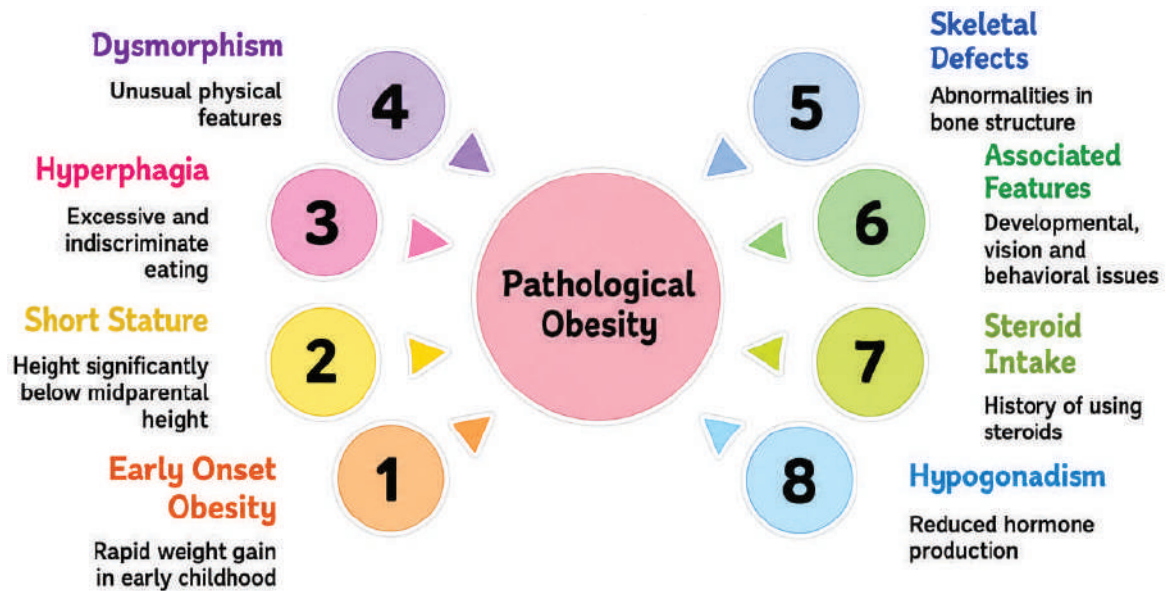
Causes and risk factors are summarised in Figure 3.

Figure 3. Risk factors for obesity in children



- **Secondary (endogenous) obesity** accounts for <5% of cases and is due to an underlying genetic, endocrine, or other medical disorder, requiring early recognition and targeted management.
- The red flag signs for suspecting a pathological cause of obesity are shown in Figure 4.

Figure 4. Red flags for pathological obesity



Diagnostic Criteria of Overweight and Obesity in Children

Age- and sex-specific growth charts are essential for identifying overweight and obesity in children.

Table 1. Definition of paediatric obesity

Age Group	Guideline	Anthropometric Indicator	Overweight	Obesity
<5 years	WHO growth standards	Weight-for-length/height	$\geq +2$ SD to $< +3$ SD	$\geq +3$ SD
5–18 years	IAP 2015 growth references	BMI-for-age (adult equivalent)	$\geq 23 \text{ kg/m}^2$ adult-equivalent	$\geq 27 \text{ kg/m}^2$ adult-equivalent
5–19 years	WHO growth charts	BMI-for-age (Z-scores)	$> +1$ SD	$> +2$ SD
2–18 years	AAP (CDC-based growth references)	BMI-for-age percentiles	$\geq 85\text{th}$ to $< 95\text{th}$ percentile	$\geq 95\text{th}$ percentile

WHO: World Health Organization; IAP: Indian Academy of Pediatrics; BMI: Body mass index; AAP: American Academy of Pediatrics; CDC: Centers for Disease Control and Prevention; SD: Standard deviation

Timing of Assessment

- **<5 years:** Plot weight-for-length/height at every vaccination visit, or at least 6-monthly after the first birthday.
- **≥5 years:** Plot body mass index (BMI) -for-age at least once a year.

Severity of Obesity (5–18 years, IAP Extended Body Mass Index Charts)

- **Class 2 obesity:** BMI >120% to <140% of the IAP obesity cut-off (adult equivalent BMI 27 kg/m² for age and sex).
- **Class 3 obesity:** BMI ≥140% of the IAP obesity cut-off (adult equivalent BMI 27 kg/m² for age and sex).

Beyond Body Mass Index: Auxological Measures of Adiposity

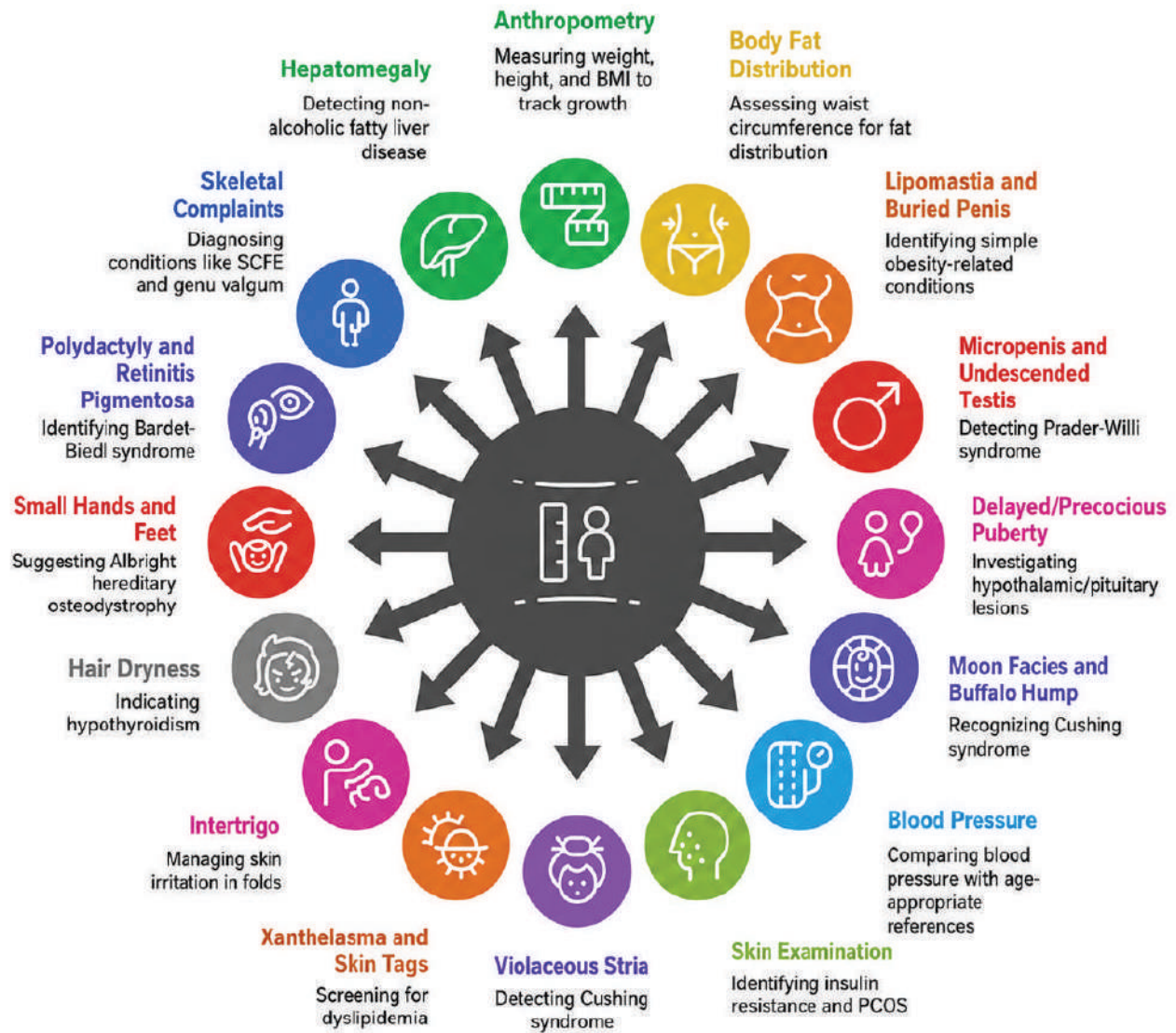
- BMI has low sensitivity for distinguishing between lean and fat mass and does not reliably reflect body composition or abdominal adiposity. Therefore, clinically, it is **recommended to:**
 - Use BMI (overweight/obesity range on age- and sex-specific charts) together with at least one additional anthropometric indicator of adiposity, such as:
 - Waist circumference >90th percentile, or
 - Waist-to-height ratio above the recommended cut-off, or
 - Increased skinfold thickness,
 - Or, use any two auxological criteria (increased waist circumference, abnormal waist-to-height ratio, increased skinfold).
 - Or, use direct measures of body fat, such as body composition analysis by dual-energy X-ray absorptiometry (DXA) or bioelectrical impedance analysis (BIA),
- All measurements should be interpreted using age-, sex-, and ethnicity-specific reference values in line with current guidelines.

Evaluation of Children with Overweight and Obesity

History and Examination

- *Detailed history* (growth pattern, diet, activity, sleep, family history of noncommunicable diseases (NCDs), psychosocial issues).
- Assess for *risk factors* like positive family history of obesity, dyslipidemia, premature coronary artery disease, diabetes, or hypertension
- *Focused physical examination is highlighted in Figure 5.*

Figure 5. Focussed physical examination in overweight and obese children



Laboratory Evaluation

- All obese children ≥ 10 years (irrespective of risk factors) and obese children aged 2-10 years (with any one risk factor – like positive family history of obesity, diabetes, hypertension, dyslipidaemia, premature coronary artery disease), or waist circumference greater than 70th percentile, should be evaluated for

- hypertension
 - dyslipidaemia (fasting lipid profile)
 - diabetes (fasting blood glucose and or oral glucose tolerance test [OGTT])
 - Metabolic dysfunction associated fatty liver disease (metabolic dysfunction-associated steatotic liver disease [MASLD]- liver function test, ultrasonography [USG] and transient elastography) and
 - other obesity related diseases if needed.
- All overweight children ≥ 10 years of age in the presence of risk factors or waist circumference greater than the 70th percentile should be evaluated for hypertension, dyslipidaemia, diabetes, MASLD, and other related diseases if needed.
 - If history, examination, or initial labs suggest organ dysfunction or obesity-related disease, consider:
 - Echocardiography – Suspected cardiac involvement or long-standing hypertension
 - Sleep study – Symptoms of obstructive sleep apnoea
 - OGTT, extended lipid profile, or imaging – based on individual risk and clinical findings
 - Psychosocial and mental health screening – Including depression, anxiety, low self-esteem, social stigmatisation, and bullying
 - Orthopaedic complications – Slipped capital femoral epiphysis, Blount disease, flat feet, musculoskeletal pain.
 - Targeted evaluation for secondary causes should be undertaken only when clinically indicated, i.e., endocrine or genetic tests in the presence of red-flag features on history or examination.

Obesity-Related Diseases and Their Screening Recommendations

- Childhood obesity is associated with the early onset of obesity-related diseases, and the recommended screening protocols for these conditions are summarised in Table 1.

Table 2. Screening for obesity-related diseases in children and adolescents

S. No	Obesity Related Diseases	Screening Test	Age to Begin Screening/Frequency	Diagnostic Cutoff
1.	Dyslipidaemia	Fasting lipid profile	2–10 yrs (risk-based), all ≥10 yrs/Every 2 yrs	Total cholesterol: ≥200 mg/dL LDL cholesterol: ≥130 mg/dL Triglycerides: • ≥100 mg/dL at 0–9 years • ≥130 mg/dL at 10–19 years HDL cholesterol: <40 mg/dL
2.	Diabetes mellitus	Fasting plasma glucose OR 2-hour plasma glucose on OGTT	≥10 yrs or puberty (whichever is earlier), presence of symptoms or risk factors/every 1–2 yrs	Diabetes: Fasting glucose ≥126 mg/dL OR 2-hour plasma glucose on oral GTT >200 mg/dL
3.	MASLD	ALT (± AST)	All obese and overweight children >10 years in the presence of risk factors/yearly	ALT >26 U/L (boys), >22 U/L (girls), persistent >3 months; USG or Fibroscan to confirm
4.	Hypertension	BP measurement	>3 yrs/every visit	BP >90th to <95th percentile (or ≥120/80 mmHg) in children <13 years, and 120– 129/<80 mmHg in those ≥13 years
5.	OSA	Sleep symptoms; polysomnography if suspected	Any age/as and when needed	Apnoea–hypopnoea index (AHI) ≥1 event/hour on overnight polysomnography
6.	PCOS/PMOS (girls)	Irregular menstrual cycles, clinical signs of hyperandrogenism	>2 yrs post-menarche/ as and when indicated	Persistent ovulatory dysfunction plus clinical and/or biochemical hyperandrogenism

TC: Total cholesterol; LDL: Low-density lipoprotein cholesterol; TG: Triglycerides; HDL: High-density lipoprotein cholesterol; OGTT: Oral glucose tolerance test; MASLD: Metabolic dysfunction–associated steatotic liver disease; ALT: Alanine aminotransferase; AST: Aspartate aminotransferase; BP: Blood pressure; OSA: Obstructive sleep apnoea; PCOS: Polycystic ovary syndrome; PMOS: Polyendocrine metabolic ovarian syndrome (Now new terminology for PCOS is PMOS)

Sex-specific upper limit of normal (ULN); persistent elevation on two occasions ≥3 months apart is preferred before proceeding to imaging

Long-Term Monitoring

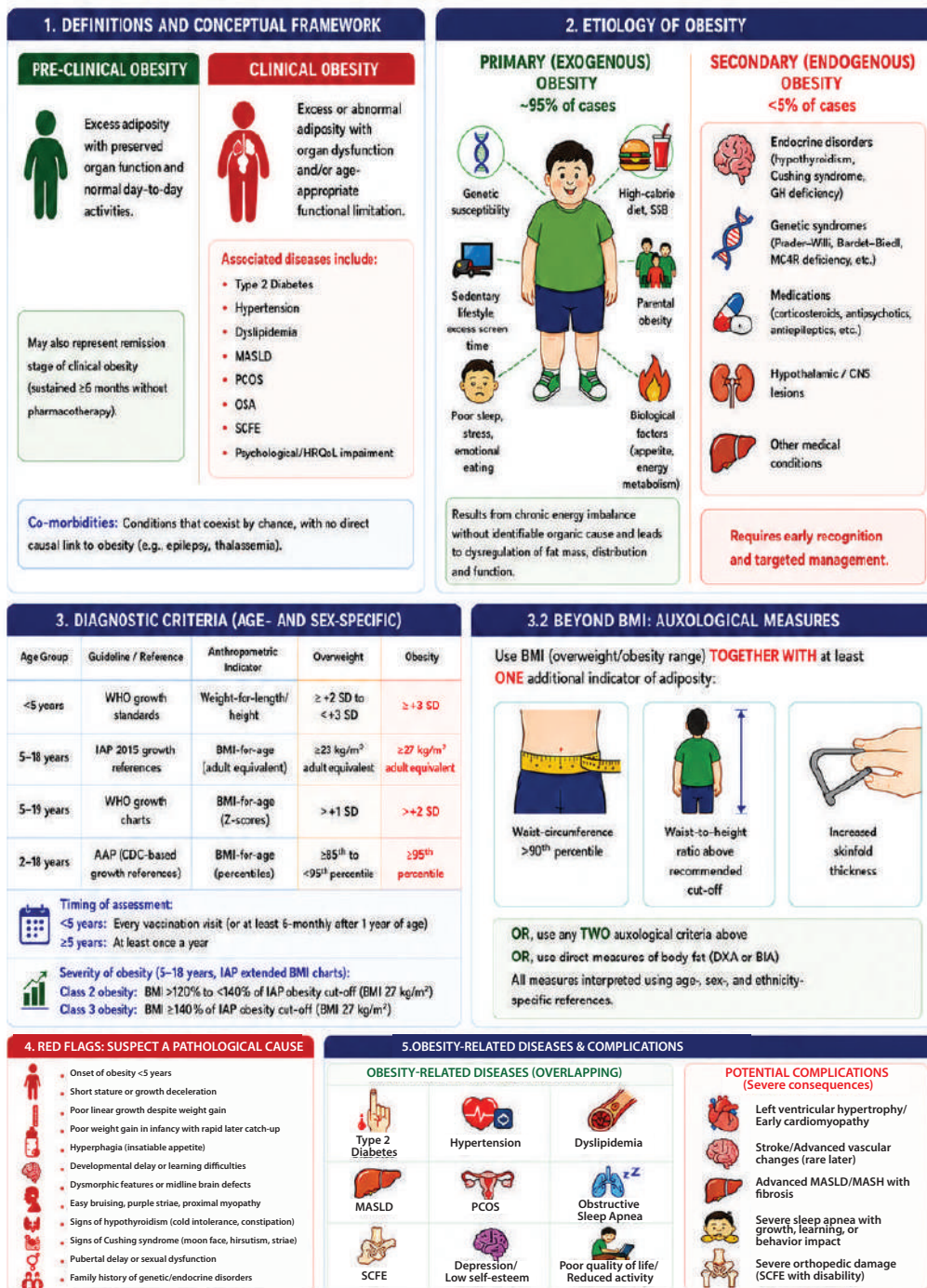
Both pre-clinical and clinical obesity require regular follow-up, every 6 months:

- **Monitor**
 - Weight
 - Height
 - Body mass index (BMI) z-score
 - Waist circumference
 - Blood pressure (BP)
 - Sexual maturity rating (SMR)
- **Re-screen for**
 - type 2 diabetes
 - dyslipidemia
 - fatty liver
 - hypertension
 - sleep problems
 - puberty/PCOS
 - psychosocial issues
- **according to age and risk**
- **Reassess progression**
 - from pre-clinical vs clinical obesity (appearance of organ dysfunction), or
 - towards remission of organ dysfunction with effective treatment.

Infographic 1. Obesity and related diseases in children: diagnosis and evaluation



EARLY DIAGNOSIS • TIMELY EVALUATION • PREVENT COMPLICATIONS • IMPROVE LIFELONG HEALTH



2. ETIOLOGY OF OBESITY

PRIMARY (EXOGENOUS) OBESITY

~95% of cases

Results from chronic energy imbalance without identifiable organic cause and leads to dysregulation of fat mass, distribution and function.

SECONDARY (ENDOGENOUS) OBESITY

<5% of cases

Requires early recognition and targeted management.

3. DIAGNOSTIC CRITERIA (AGE- AND SEX-SPECIFIC)

Age Group	Guideline / Reference	Anthropometric Indicator	Overweight	Obesity
<5 years	WHO growth standards	Weight-for-length/height	$\geq +2$ SD to $< +3$ SD	$\geq +3$ SD
5–18 years	IAP 2015 growth references	BMI-for-age (adult equivalent)	≥ 23 kg/m ² adult equivalent	≥ 27 kg/m ² adult equivalent
5–19 years	WHO growth charts	BMI-for-age (Z-scores)	$> +1$ SD	$> +2$ SD
2–18 years	AAP (CDC-based growth references)	BMI-for-age (percentiles)	$\geq 85^{\text{th}}$ to $< 95^{\text{th}}$ percentile	$\geq 95^{\text{th}}$ percentile

Timing of assessment:

- <5 years: Every vaccination visit (or at least 6-monthly after 1 year of age)
- ≥ 5 years: At least once a year

Severity of obesity (5–18 years, IAP extended BMI charts):

- Class 2 obesity: BMI $> 120\%$ to $< 140\%$ of IAP obesity cut-off (BMI 27 kg/m²)
- Class 3 obesity: BMI $\geq 140\%$ of IAP obesity cut-off (BMI 27 kg/m²)

3.2 BEYOND BMI: AUXOLOGICAL MEASURES

Use BMI (overweight/obesity range) **TOGETHER WITH** at least **ONE** additional indicator of adiposity:

Waist-circumference $> 90^{\text{th}}$ percentile

Waist-to-height ratio above recommended cut-off

Increased skinfold thickness

OR, use any TWO auxological criteria above

OR, use direct measures of body fat (DXA or BIA)

All measures interpreted using age-, sex-, and ethnicity-specific references.

4. RED FLAGS: SUSPECT A PATHOLOGICAL CAUSE

- Onset of obesity <5 years
- Short stature or growth deceleration
- Poor linear growth despite weight gain
- Poor weight gain in infancy with rapid later catch-up
- Hyperphagia (insatiable appetite)
- Developmental delay or learning difficulties
- Dysmorphic features or midline brain defects
- Easy bruising, purple striae, proximal myopathy
- Signs of hypothyroidism (cold intolerance, constipation)
- Signs of Cushing syndrome (moon face, hirsutism, striae)
- Pubertal delay or sexual dysfunction
- Family history of genetic/endocrine disorders

5. OBESITY-RELATED DISEASES & COMPLICATIONS

OBESITY-RELATED DISEASES (OVERLAPPING)

POTENTIAL COMPLICATIONS (Severe consequences)

MASLD: Metabolic dysfunction–associated steatotic liver disease; PCOS: Polycystic ovary syndrome; OSA: Obstructive sleep apnoea; SCFE: Slipped capital femoral epiphysis; HRQoL: Health-related quality of life; GH: Growth hormone; CNS: Central nervous system; WHO: World Health Organization; SD: Standard deviation; IAP: Indian Academy of Pediatrics; AAP: American Academy of Pediatrics; BMI: Body mass index; DXA: Dual-energy X-ray absorptiometry; BIA: Bioelectrical impedance analysis; MASH: Metabolic dysfunction–associated steatohepatitis

Key Messages

- Childhood obesity is a chronic, complex disease characterised by excess adiposity that begins early in life, with both pre-clinical and clinical stages, and is associated with significant long-term morbidity if not recognised and treated promptly.
- It is primary (exogenous) in 95% of cases, driven by lifestyle, environmental, and psychosocial factors, while secondary (pathological) causes account for <5% of cases and should be suspected in the presence of specific red-flag features.
- Age and sex-specific growth charts are essential for defining overweight and obesity; BMI should be complemented by at least one additional auxological measure (waist circumference, waist-to-height ratio, skinfolds) to improve assessment of adiposity and cardiometabolic risk.
- Systematic evaluation for obesity-related diseases, including dyslipidemia, type 2 diabetes, MASLD, hypertension, OSA and PCOS, should follow risk- and age-based screening protocols to enable early detection and intervention.
- Both pre-clinical and clinical obesity require regular long-term follow-up, to track progression, detect organ involvement early and assess response or remission with treatment.

Suggested Reading

- NCD Risk Factor Collaboration (NCD-RisC). Worldwide trends in underweight and obesity from 1990 to 2022: a pooled analysis of 3663 population-representative studies with 222 million children, adolescents, and adults. *Lancet*. 2024;403(10431):1027-1050. doi:10.1016/S0140-6736(23)02750-2
- Khadilkar V, Shah N, Harish R, et al. Indian Academy of Pediatrics Revised Guidelines on Evaluation, Prevention and Management of Childhood Obesity. *Indian Pediatr*. 2023;60(12):1013-1031.
- Hampl SE, Hassink SG, Skinner AC, et al. Clinical Practice Guideline for the Evaluation and Treatment of Children and Adolescents With Obesity. *Pediatrics*. 2023;151(2):e2022060640.
- Rubino F, Cummings DE, Eckel RH, et al. Definition and diagnostic criteria of clinical obesity. *Lancet Diabetes Endocrinol*. 2025;13(3):221-262. doi:10.1016/S2213-8587(24)00316-4
- Expert Panel on Integrated Guidelines for Cardiovascular Health and Risk Reduction in Children and Adolescents; National Heart, Lung, and Blood Institute. Expert panel on integrated guidelines for cardiovascular health and risk reduction in children and adolescents: summary report. *Pediatrics*. 2011;128 (Suppl 5):S213-S256. doi:10.1542/peds.2009-2107C
- Khadilkar A, Ekbote V, Chiplonkar S, et al. Waist circumference percentiles in 2-18 year old Indian children. *J Pediatr*. 2014;164(6):1358-62.e2. doi:10.1016/j.jpeds.2014.02.018
- Indian Academy of Pediatrics Growth Charts Committee, Khadilkar V, Yadav S, et al. Revised IAP growth charts for height, weight and body mass index for 5- to 18-year-old Indian children. *Indian Pediatr*. 2015;52(1):47-55. doi:10.1007/s13312-015-0566-5
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IAP Presidential Action Plan 2026

Neelam Mohan
National President, IAP 2026

Core Academic and Executive Team:
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Section

NON-COMMUNICABLE DISEASES

Chief Editors: Rekha Harish, Upendra kinjawadekar, Deepak Pande

Section Editors: Devendra Mishra, Ashima Dabas, C Nirmala

Hidden Hunger in Obesity: Identifying and Tackling Micronutrient Deficiencies

Authors: Shailaja Mane, Vaishali Madkaikar

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Introduction

The increasing rates of overweight and obesity, especially among young people, have become a public health issue. Excess intake of calories contributes to obesity and obese children may consume this excess energy through foods having poor micronutrient density, leading to hidden hunger.

“Hidden Hunger”:

- Global Hunger Index report - Micronutrient deficiency also termed as “Hidden Hunger” to be a form of undernutrition.
- Eighty percent Indian adolescents face multiple micronutrient deficiencies as per Global hunger Index 2025.
- Intake or absorption of vitamins and minerals is too low to sustain good health and development in children and normal physical and mental function in adults.
- It can be attributed to poor diet, disease, or increased micronutrient needs not met during pregnancy and lactation.
- “Hidden Hunger” refers to the compelling desire for food and the distress arising from a lack of it, which is easily resolved by a few mouthfuls of conventional nutriment.
- ‘Hidden Hunger’, refers to overt or subtle micronutrient deficiencies of either minerals (like iron, iodine, or zinc) and/or
 - vitamins (like vitamin-A, vitamin-D, folate, and vitamin-B, which arise from chronic consumption of a relatively monotonous diet that lacks a balanced combination of grains, vegetables, lentils, fruits, and animal-source foods (meats, seafood, dairy-products).

“Triple Burden”:

- India faces a “triple burden” of undernutrition, overnutrition, and micronutrient deficiencies which is a serious public health concern.
- **Over-nutrition** is inevitable in an obesogenic environment.
 - The physiological and metabolic controls are disrupted by highly processed, energy-dense foods, which activate craving related neural circuits and suppress satiety responses.
 - The major culprits being the saturated fats and simple sugars, pertaining to endocannabinoid precursors and rapidly absorbed carbohydrates which trigger hedonic hunger and demanded eating.

- Disturbed circadian harmony and sleep deprivation impair glucose and lipid homeostasis, increasing the risk of weight gain and con-sequencing metabolic dysfunction.
- **Glucose metabolism and oxidation of fat** in a counter-regulatory synchronization, is a critical determinant of energy balance.
 - Diets enriched with whole grains, low glycaemic index high fibre foods, antioxidant containing food and unsaturated fats are protective.
 - Refined carbohydrates, sugar-sweetened beverages, and saturated fats are empty calorie foods with negligible micronutrients present negative impact
 - **Growth and cognitive development** are negatively influenced by the prevalent shortages in vital micronutrients, including vitamin D, iron, zinc, folate, B-complex vitamins and vitamin A. A thorough understanding about obesity and micronutrient status is crucial to comprehend their contradicting co-existence as overnutrition and deficiency
 - **A multidimensional strategy** is needed to address this burden, which includes enacting efficient public health policies, encouraging regular physical exercise, and promoting balanced meals adequate in vital nutrients. Preventing obesity and improving nutritional status require community activities, school-based interventions, and awareness campaigns.

The Hidden Hunger and Obesity Paradox

- Hidden hunger can be attributed to the poor consumption of micronutrients such as vitamin D, iron, zinc, magnesium, and B complex vitamins, as a result of a poor diet high in processed foods, sugars, and saturated fats
- In obese children, hidden hunger creates a paradox where; despite consuming a large amount of food, the calorie input lacks proper “nutrient density”.
 - It leads to a poor supply of vital nutrients necessary for the proper functioning of body’s immunity and metabolism. The poor nutrition density in obese children makes them prone to deficiencies in iron, zinc, and vitamin D etc.
 - Paediatric obesity represents a paradoxical state with energy excess and simultaneous nutritional inadequacies which can cause long-term health repercussions.
- Obesity-related malnutrition is a consequence of poor dietary quality. This can lead to gut dysbiosis, systemic inflammation, impaired nutrient utilization and ultimately disrupted metabolism.
- Vitamin D, zinc, folic acid, B-complex vitamins, vitamin A and copper deficiencies represent the most common deficient micro-elements which play a significant role in obesity-related metabolic comorbidities.
 - Obesity among children may be accompanied by micronutrient deficiencies, especially in the low socioeconomic classes of the Indian population.

Reasons for Micro-Nutrient Deficiencies in Children with Obesity

- **Poor Diet Quality:** Fast food, sugary drinks, and processed foods are often devoid of vitamins and minerals despite being rich in calories
- **Increased Metabolic Needs:** The higher the body mass of obese children, the higher the need for certain nutrients, and the demand cannot be fulfilled only through daily intake. Evidence-based individualised paediatric micronutrient targets are limited and need more exploratory studies
- **Chronic Inflammation:** It is associated with obesity and can interfere with the absorption, transportation, and utilisation of various micronutrients. e.g., the production of hepcidin can interfere with iron metabolism
- **Altered Gut Microbiome:** The gut microbiome plays a vital role in the absorption of nutrients as well as the production of vitamins, but gets affected in obese individuals consequently reducing their absorption and production of vitamins, especially B12 and Vitamin K.
 - Vitamin B12 deficiency, common in small intestinal bacterial overgrowth (SIBO) due to bacterial competition, impairs lipid metabolism, protein synthesis, and neuromuscular function
- **Unhealthy Weight Loss Methods:** Restrictive or fad diets, sometimes practiced by obese children, can further exacerbate micronutrient deficiencies because such dietary regimes are not based on scientific nutrition principles and at times can eliminate many important food groups from daily diet.

Consequences of Hidden Hunger in Obesity

- It negatively impacts the immune system and increases vulnerability to infections. It may lead to inflammation eventually posing a risk of lifestyle disorders such as type 2 diabetes, cardiovascular diseases, etc.
- Coexisting multiple micronutrient deficiencies can influence even the cognitive abilities and academic performance leading to poor educational attainment.

Vitamin Deficiencies

- **Fat-soluble vitamins deficiencies like** vitamin A, D and E can cause eye and vision related issues, low immunity and affect bone density and strength
- **Severe vitamin D deficiency** can present as rickets. In obese children vitamin D is one of the contributing factors to insulin resistance

- **Water soluble vitamins** especially Vitamin B complex deficiency can influence energy metabolism, leads to fatigue and can cause neuropathy. Vitamin B12 deficiency can elevate homocysteine levels and ultimately contributes to inflammation
- **B-complex deficiencies** are prevalent in obesity due to poor diet quality and increased metabolic demands. Thiamine (B1) acts as a coenzyme for transketolase and the pyruvate dehydrogenase complex.
 - Deficiency of it impairs glucose oxidation, increases lactate accumulation, and worsens insulin resistance status
 - High-sugar diets accelerate thiamine depletion, compounding hyperglycaemia risk, folate (B9) and vitamin B12, crucial for DNA synthesis and methylation, are often suboptimal in obesity
- **Vitamin C** can negatively affect iron absorption, wound healing and immune function.
 - Being an antioxidant, its deficiency can increase oxidative stress and reduced ability of body to scavenge free radicals indirectly increasing inflammation.

Mineral Deficiencies

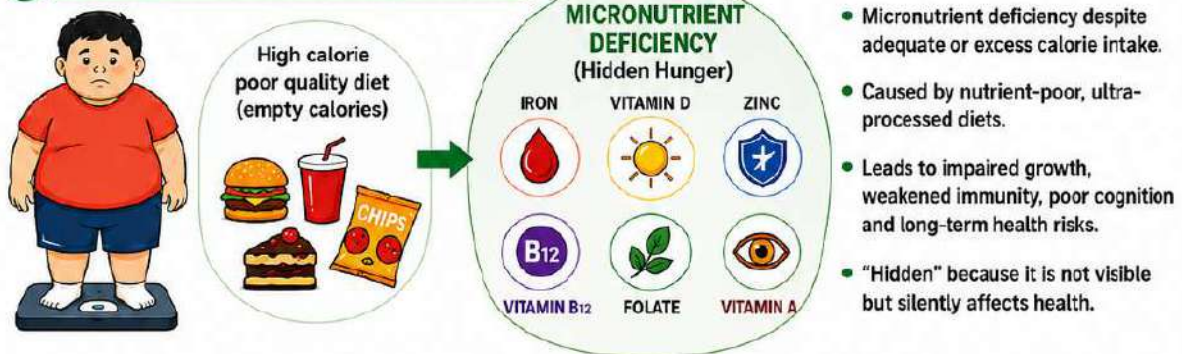
- **Iron Deficiency** causes anaemia presenting as tiredness, weakness, pallor and shortness of breath
 - Systemic inflammation in obese children sequesters iron and impairs its transport. It can lead to reduced immunity, spooning of nails or koilonychia and increased brittleness in nails
 - In children, pica and reduced appetite are commonly seen symptoms. It can also impair cognitive skills.
- **Zinc deficiency** can affect immune function by disturbing protective gut barrier. It influences the process of metabolism in obese children.
- **Copper deficiency** can affect nerve function, metabolism. It also can cause neurological issues, fatigue, weakness and reduced immunity.

Diagnosis

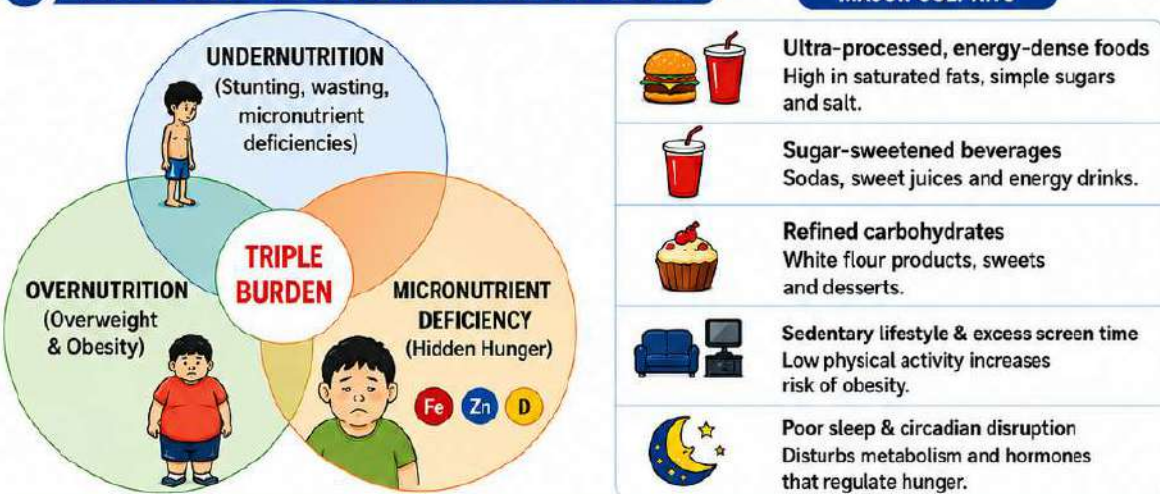
- **Clinical signs** like anaemia, hyperpigmented knuckles, poor attention, platynychia, koilonychia, bald tongue etc
- **Routine blood screening** for continuous nutritional monitoring among obese children for the diagnosis of micronutrient deficiencies
- **Screening for serum levels** of iron, zinc, vitamin D and vitamin B12 may be considered in appropriate settings
 - The serum micronutrient tests can be influenced by inflammation, so interpretation should be cautious in obese children.

Infographic 1. Hidden hunger in obesity: identifying and tackling micronutrient deficiency

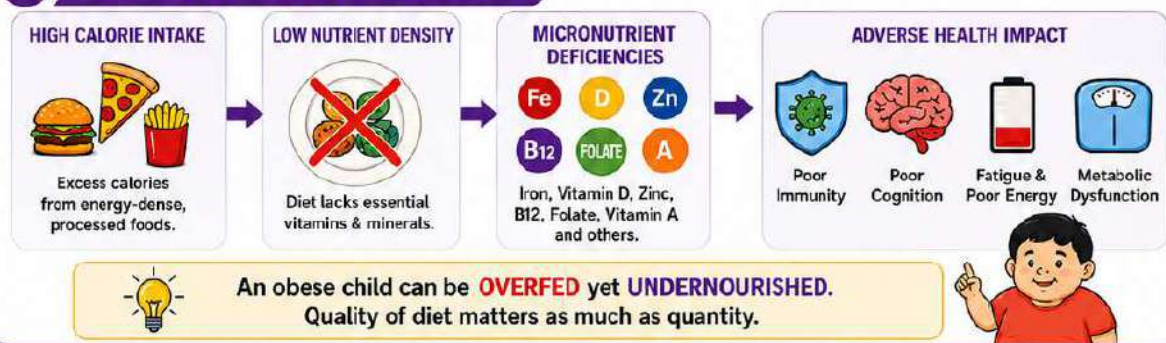
1 WHAT IS HIDDEN HUNGER?



2 INDIA'S TRIPLE BURDEN OF MALNUTRITION



3 THE HIDDEN HUNGER PARADOX



Strategies to Overcome Hidden Hunger in Obesity

A holistic approach with a focus on high-nutrient density diets instead of simple calorie restriction along with targeted supplementation will be useful.

- **Improving Diet Quality:** Nutrient-dense foods like fruits, vegetables, whole grains, lean meats, and dairy products improve micronutrient intake .
- **Micronutrient Supplementation:** Vitamin and mineral supplementation for treatment must be done under the guidance of healthcare professionals considering age-appropriate requirements as per Recommended Dietary Allowance (RDA) by ICMR and paediatric age group therapeutic dosage.
- Emphasis must be on improving dietary quality, encouraging and integrating physical activity in daily routine, and selective supplementation, in obese children with clinical evidence.

Infographic 2. Key micronutrients and their food sources



Public Health Interventions

- **Promotion of healthy lifestyle;** nutrition education, food fortification, and school-based interventions are important for prevention of hidden hunger and obesity.
- **Reading and interpretation of food labels** on packets of foods to know the nutritive value and information regarding its safe consumption.
- **Ban of fast-food** availability in school premises and forbidding food vendors in the nearby vicinity can also be an important initiative.
- **Public health programs** like fortification of rice, edible oil, and salt with iron, folic acid, and iodine have given encouraging outcomes in combating micronutrient deficiencies in targeted groups.
- **Fortification** of key foods like maize, wheat, rice with micronutrients along with iron-rich beans, fortified oil, iodized salt is useful.
- **Promoting Healthy Weight-Loss Practices:** Adopting a healthy lifestyle consisting of a well-balanced diet in daily routine and regular exercise can be helpful.

Conclusion

- **Hidden hunger** is an important yet often neglected aspect of obese children. Micronutrient deficiencies despite consuming an excessive number of calories in obese children appears to be a paradox.
- **Addressing hidden hunger** requires a comprehensive approach, including improving diet quality, targeted supplementation, and public health interventions.
- **Prevention and management** of the hidden hunger, will be helpful in improving the overall health and well-being of obese children and reduce the risk of chronic diseases.
- **Management of paediatric obesity** should focus not only on weight reduction but also on improving diet quality, identifying micronutrient deficiencies, and monitoring growth and metabolic health.

Key Messages

- **Paediatric obesity** is often accompanied by malnutrition and micronutrient deficiencies, creating a paradox of excess energy intake alongside inadequate nutrition.
- **India faces a triple burden** of undernutrition, overnutrition, and micronutrient deficiencies, with a high prevalence of hidden hunger among adolescents.
- **Hidden hunger**, characterised by chronic deficiencies of essential vitamins and minerals, often results from monotonous, nutrient-poor diets and remains an overlooked aspect of paediatric obesity.
- **Management of paediatric obesity** should combine lifestyle modification, improved diet quality, micronutrient assessment and correction, and regular monitoring to reduce current and future health risks.

Suggested Reading

- Antony AC, Vora RM, Karmarkar SJ. The silent tragic reality of hidden hunger, anaemia, and neural-tube defects (NTDs) in India. *Lancet Reg Health Southeast Asia*. 2022;6:100071. doi:10.1016/j.lansea.2022.100071.
- United Nations Children's Fund (UNICEF). *Child Stunting, Hidden Hunger and Human Capital in South Asia: Implications for Sustainable Development Post-2015*. Kathmandu, Nepal: United Nations Children's Fund; 2018. Accessed January 20, 2026.
- Clemente-Suárez VJ, Mielgo-Ayuso J, Martín-Rodríguez A, Ramos-Campo DJ, Redondo-Flórez L, Tornero-Aguilera JF. The burden of carbohydrates in health and disease. *Nutrients*. 2022;14(18):3809.
- Corvalán C, Garmendia ML, Jones-Smith J, et al. Nutrition status of children in Latin America. *Obes Rev*. 2017;18(suppl 2):7-18. doi:10.1111/obr.12571
- Dargenio VN, Sgarro N, Grasta GL, et al. Hidden hunger in pediatric obesity: Redefining malnutrition through macronutrient quality and micronutrient deficiency. *Nutrients*. 2025;17(22):3601. doi:10.3390/nu1722360.



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From Tummy Time to Teen Sports: Suggested Activities for Children of All Ages

Authors: Paula Goel, Afreen Khan

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From Tummy Time to Teen Sports: Suggested Activities for Children of All Ages

07

Authors: Paula Goel, Afreen Khan

Introduction

- Physical activity is essential for healthy growth from infancy through adolescence. According to the World Health Organization (WHO), age-appropriate movement strengthens bones and muscles, supports brain development, improves emotional well-being, and establishes lifelong healthy habits.
- The sections below summarise age-specific activity recommendations, suitable exercises, and key safety considerations.

Infants (0–12 Months): Laying the Foundation for Movement

- Tummy time: Start with 2–3 minutes several times daily, gradually increasing to 15–30 minutes by 4 months.
- Infants (<1 year) should be physically active several times a day through interactive floor-based play.
- Minimise prolonged use of prams, car seats, or swings.
- **Activities:** Gentle tummy time, soft limb movements, visual tracking (0–3 months); longer tummy sessions with toys, supported sitting, rolling (4–6 months); crawling, pulling to stand, cruising, push-and-pull toys (7–12 months).
- **Safety:** Clear play areas of hazards, supervise floor play, support head and neck, never leave on high surfaces.

Toddlers (1–3 Years): Exploration and Independence

- 180 minutes of daily activity: 30–60 minutes of guided play, with the remainder as free exploration.
- **Activities:** Running, chasing, dancing, playground climbing, ball play, tricycle riding, hopping, stomping, animal-movement games.
- **Safety:** Close supervision near water and stairs, safety gates, helmets for ride-ons, clutter-free spaces.

Preschoolers (3–5 Years): Skill Development and Social Play

- ≥180 minutes daily, which is mostly light and includes some moderate -vigorous physical activity.
- **Activities:** Running, hopping, skipping, throwing, catching, cycling, group games, dancing, beginner gymnastics, outdoor play.
- **Safety:** Close supervision, helmets for cycling, guards for skating, hydration, safe play surfaces.

Early School Age (5–8 Years): Sports Readiness

- 60 minutes moderate-to-vigorous activity daily, with vigorous, muscle-strengthening, and bone-loading activities ≥3 days/week.
- **Activities:** Swimming, cycling, jogging, dance, gymnastics, martial arts, skating, tennis, badminton, football, cricket, basketball, hockey, volleyball, tag games, obstacle courses, climbing, yoga.
- **Safety:** Pre-sports check-up, proper gear, 10-minute warm-ups and cool-downs, hydration, limit organised sports to 1 hour per week per year of age, 1–2 rest days weekly.

Preteens (9–12 Years): Building Strength and Self-Belief

- ≥60 minutes moderate-to-vigorous activity daily, with vigorous, muscle and bone-strengthening activities ≥3 days/week.
- **Activities:** Team sports, racquet sports, swimming, athletics, martial arts, climbing, cycling and seasonal sports. Strength training: Bodyweight exercises, resistance bands, medicine balls, light weights (1–5 kg), plyometrics and core training. Fitness: Circuit training, high-intensity interval training (HIIT), yoga and pilates.
- **Safety:** Annual physical assessment, reduce repetitive overhead loads during growth spurts, prioritise technique, 10–15 min warm-ups and 10 min cool-downs, hydration, limit load increases to ≤10%/week, keep total activity within 12–15 hours/week.

Teens (13–18 Years): Performance and Lifelong Fitness

- ≥60 minutes physical activity daily, with vigorous and muscle-strengthening activity ≥3 days/week.
- **Activities:** Team/individual sports, endurance activities (running, cycling, rowing), skill-based sports (archery, golf, fencing), climbing, skateboarding, parkour, seasonal sports.
- **Fitness:** Strength training 3–4 days/week using compound lifts, cardio (HIIT or steady state), and daily flexibility.
- **Safety:** Annual medical screening, baseline concussion testing for contact sports, progressive training with adequate recovery, 15–20 min warm-ups, ~15 min cool-downs, hydration, appropriate footwear and protective gear.
 - Protein powders, creatine, or supplements not recommended; balanced diet suffices.
 - Medical clearance by school teams/primary care for most; sports-medicine specialists for competitive athletes, contact sports, or those with comorbidities.

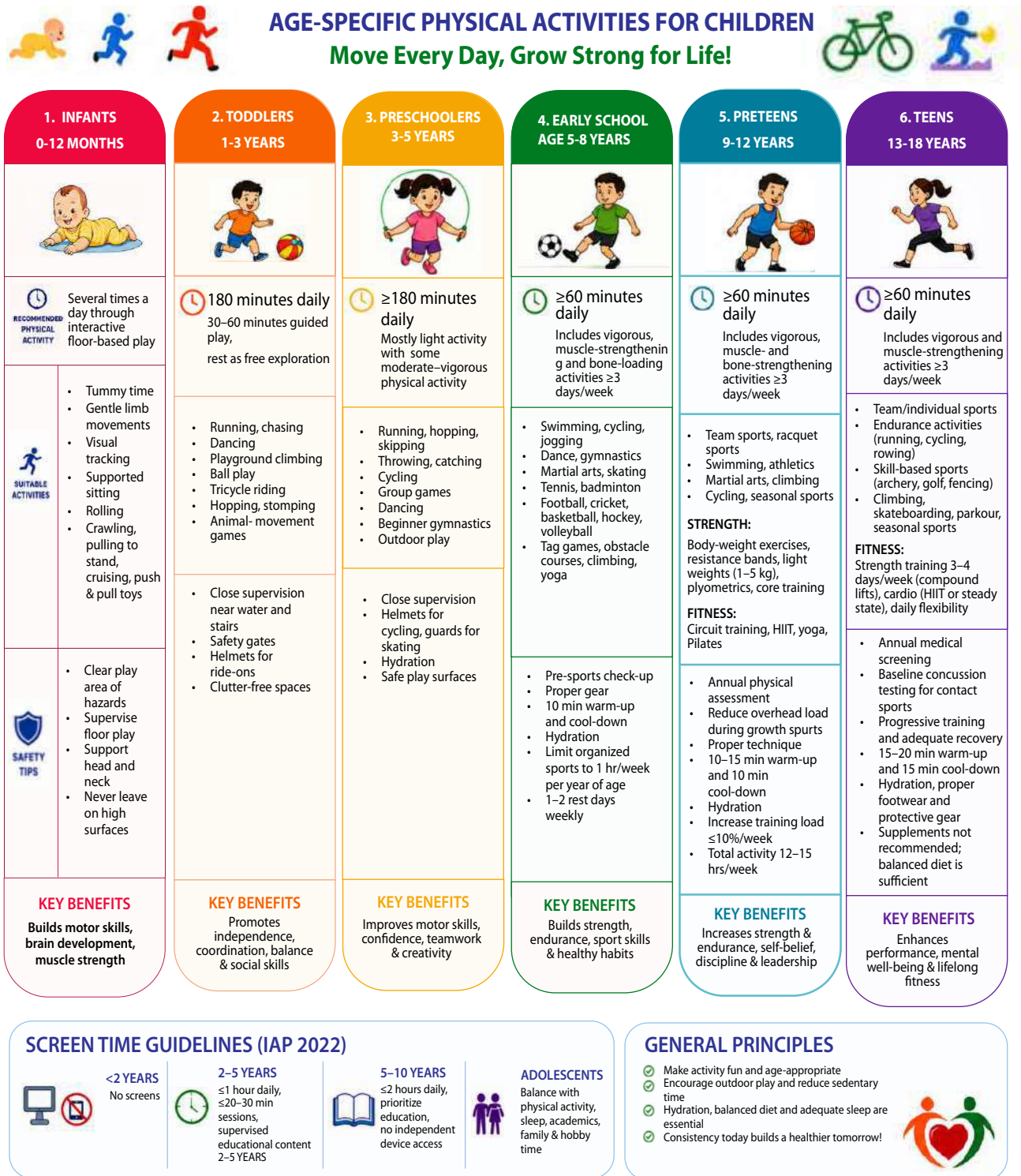
- **Screen Time:**
 - **0-2 years:** No screens
 - **2-5 years:** ≤1 hour daily
 - **5-10 years:** <2 hours daily
 - **Teens:** Limit recreational screen time.

- **Yoga:** Yoga can be introduced from age 3-5 years in a playful, short format (10-20 minutes).
 - Structured practice with asanas, breathing, and meditation is suitable from age 5-6 onwards under qualified guidance
 - Yoga for 5-10 yrs: asanas (butterfly pose, cat-cow pose), mantra chanting and yogic games and a small component of pranayama and Surya namaskar
 - Adolescents can practice different asanas along with meditation
 - Focus: Physical development, increasing attention span, sitting tolerance, bonding among peers

- Children with epilepsy should not practice fast breathing exercises. Sick children shouldn't practice however certain poses are to be avoided by children with back problems and heart diseases

- Children with special needs can practice with close assistance.

Figure 1. Age-specific physical activities for children



Scheme

- Physical activity during childhood is essential for physical, cognitive, emotional, and social development
- Infants need 30+ minutes of active play daily; toddlers require 180 minutes; children and teens need 60+ minutes of moderate-to-vigorous activity daily with muscle and bone strengthening ≥ 3 times weekly
- Universal benefits include strengthened body systems, enhanced brain development, improved mental health, social skills, and lasting active lifestyle habits.

Table 1. Physical activity from tummy time to teen sports: stepwise framework for promoting safe, age-appropriate physical activity

STEP 1 — Identify Child’s Age Group: Determine which category the child falls into:

STEP 2 — Check Daily Activity Requirement

For the identified age group, follow the minimum activity duration.

Age Group	Minimum Daily Activity
0–12 months	30 min (floor play) + tummy time sessions
1–3 years	180 min spread across the day
3–5 years	180 min (≥ 60 min moderate–vigorous)
5–8 years	60 min moderate–vigorous
9–12 years	60 min moderate–vigorous
13–18 years	60 min moderate–vigorous

STEP 3 — Choose Age-Appropriate Activities

Pick movements appropriate for the child's developmental abilities.

Age Range	Activities
0–12 months	Tummy time, Rolling, crawling, Pulling to stand
1–3 years	Running, climbing, Ball play, Dancing, toddler yoga
3–5 years	Skipping, hopping, Cycling (tricycle/pedal bike), Group play (relays, parachute)
5–8 years	Swimming, cycling, Beginner sports, Obstacle courses
9–12 years	Team/individual sports, Strength training (body weight), HIIT, agility drills
13–18 years	Competitive sports, Strength + endurance training, Skill-based activities

HIIT: High-intensity interval training

STEP 4 — Add Strength & Bone-Loading Work (if ≥5 years)

For children ≥5 years, include **3 days/week** of:

- Jumping
- Hopping
- Body-weight exercises
- Light resistance

STEP 5 — Apply Safety Rules

Age	Key Safety Points
Infants	Constant supervision, safe surfaces, avoid soft bedding
Toddlers	Gates, helmets for ride-ons, water supervision
Preschoolers	Warm-ups, protective gear, safe surfaces
5–8 yrs	Medical check before organised sport, hydration
9–12 yrs	Avoid overuse during growth spurts, technique first
Teens	Periodised training, concussion care, proper recovery

STEP 6 — Manage Screens

STEP 7 — Ensure Warm-Up & Cool-Down

- **Warm-up:** 5–20 minutes depending on age
- **Cool-down:** 10–15 minutes

STEP 8 — Monitor Fatigue, Hydration, Recovery

- Provide rest days
- Avoid extreme heat/cold
- Increase training gradually ($\leq 10\%$ per week)

STEP 9 — Adjust During Illness, Injury, or Growth Spurts

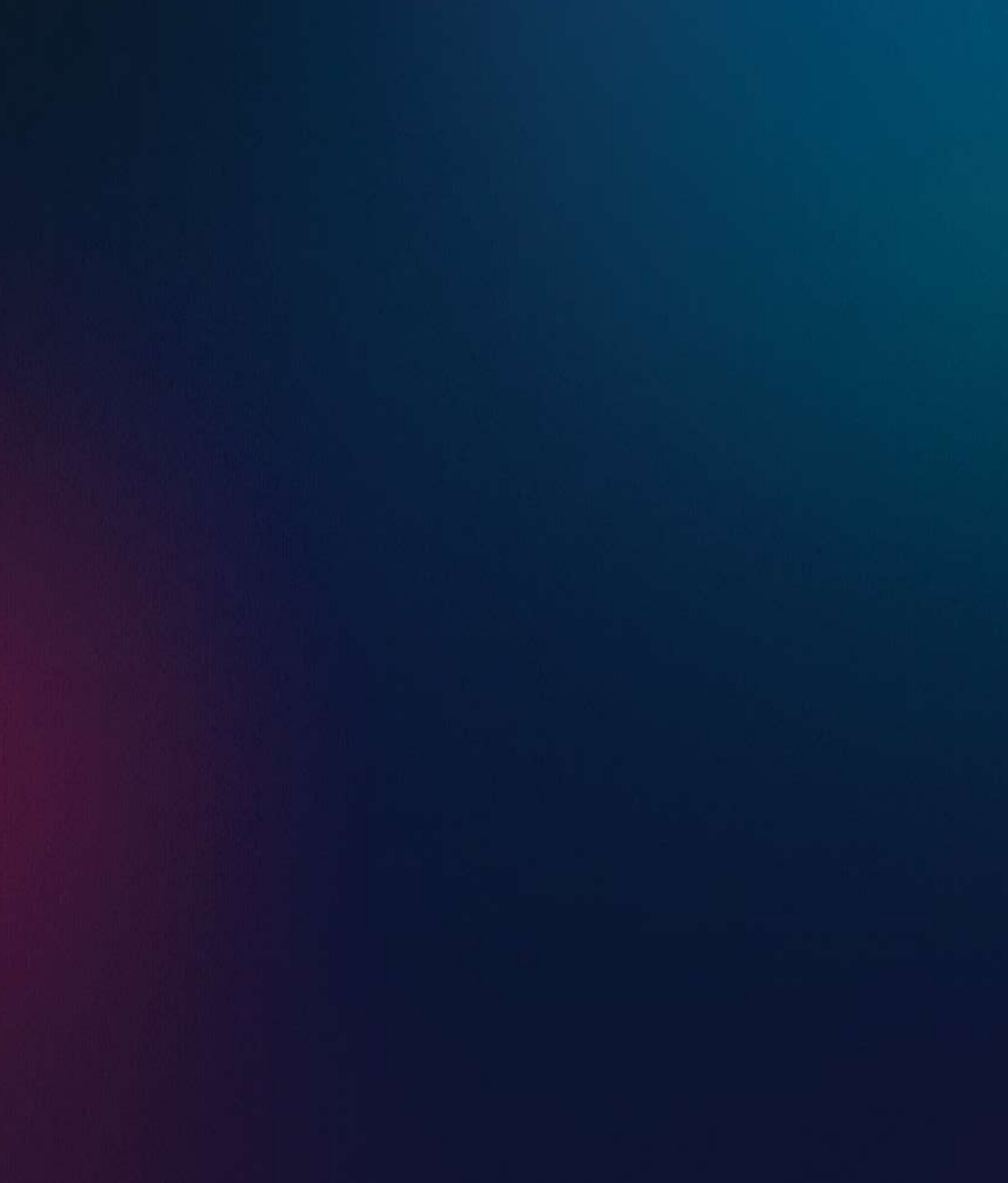
STEP 10 — Reassess Monthly

Key Messages

- **Movement starts at birth:** Tummy time and floor play build strength, coordination, and lifelong healthy habits.
- **Meet age-specific activity goals:** Toddlers need 180 min/day; kids and teens need 60+ min of moderate-to-vigorous exercise, plus strength work 3×/week.
- **Safety first, always:** Use age-appropriate precautions — supervision, helmets, warm-ups — to prevent injury at every stage.
- **Limit screens, prioritise movement:** No screens under 2; max 1 hr for ages 2–5; max 2 hrs for ages 5–12. Activity always comes first.
- **Yoga complements every stage:** From age 3, yoga builds flexibility, focus, and emotional well-being — adaptable for all needs.

Suggested Reading

- World Health Organization. Guidelines on *Physical Activity, Sedentary Behaviour and Sleep for Children Under 5 Years of Age*. World Health Organization; 2019.
- World Health Organization. *WHO Guidelines on Physical Activity and Sedentary Behaviour*. World Health Organization; 2020.
- Brenner JS; Council on Sports Medicine and Fitness. Sports specialization and intensive training in young athletes. *Pediatrics*. 2016;138(3):e20162148. doi:10.1542/peds.2016-2148
- National Health Service. *Physical Activity Guidelines for Children (Under 5 Years)*. National Health Service; 2019.
- Bhawra J, Chopra A, Harish R, et al. The 2022 India Report Card on physical activity for children and adolescents. *J Exerc Sci Fit*. 2023;21(1):74-82. doi:10.1016/j.jesf.2022.11.002





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Bones Under Burden: Orthopaedic Red-Flags in Obese Children

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Bones Under Burden: Orthopaedic Red-Flags in Obese Children

08

Authors: Akash Kumar Ghosh, Gaurav Gupta

Introduction

- Childhood obesity is a growing concern in India.
- The prevalence of childhood obesity in India is estimated to be around 8%-10% and is steadily increasing.
- India is expected to account for a tenth of the global burden of childhood obesity by the year 2030.
- Although there are a few orthopaedic conditions like slipped capital femoral epiphysis (SCFE) and Blount's disease which have a well-established association with childhood obesity, it is imperative for the treating clinicians to be aware of the other generalised implications obesity has on bone health and the growing skeleton.

Effects of Obesity on the Growing Skeleton

- **Reduced peak bone mass:** 40% of the peak bone mineral accrual occurs within 2 years of the adolescent growth spurt; skeletal deficiencies that occur at this stage can persist even into adulthood
 - The hormonal imbalances caused by obesity have a strong negative effect on the peak bone mass.
- **Increased bone resorption:** Though physiologic Leptin levels promote bone formation, the increased levels of leptins due to increased adipose tissue cause an end receptor resistance and lead to increased bone resorption by osteoclasts due to increased RANK ligand expression.
- **Weakening of physis:** Leptins act as a skeletal growth factor on the physis.
 - This leads to widening of the proliferative zone, thus weakening it and making it prone to injury (for example, SCFE), and also leads to early skeletal maturation.
- **Increased systemic inflammation:** Tumour necrosis factor alpha and interleukin-6 are released from dysfunctional adipocytes and increase bone resorption.

- **Sequestration of Vitamin D:** Fat-soluble vitamins like vitamin D are sequestered in the adipose tissue, and decreased Vitamin D is available for bone metabolism
 - Vitamin D deficiency has been found in 35-50% of obese children.
- **Mechanical loading of growing skeleton:** According to the Heuter Volkmann law (Figure 2), compressive forces across the physis inhibit growth
 - The Delpech law, reduced compression or tensile forces across the physis, accelerates growth
 - In obesity, in the growing skeleton, this exaggerates physiological deformities like genu valgum and genu varum.

Figure 1. Effect of obesity on bone metabolism

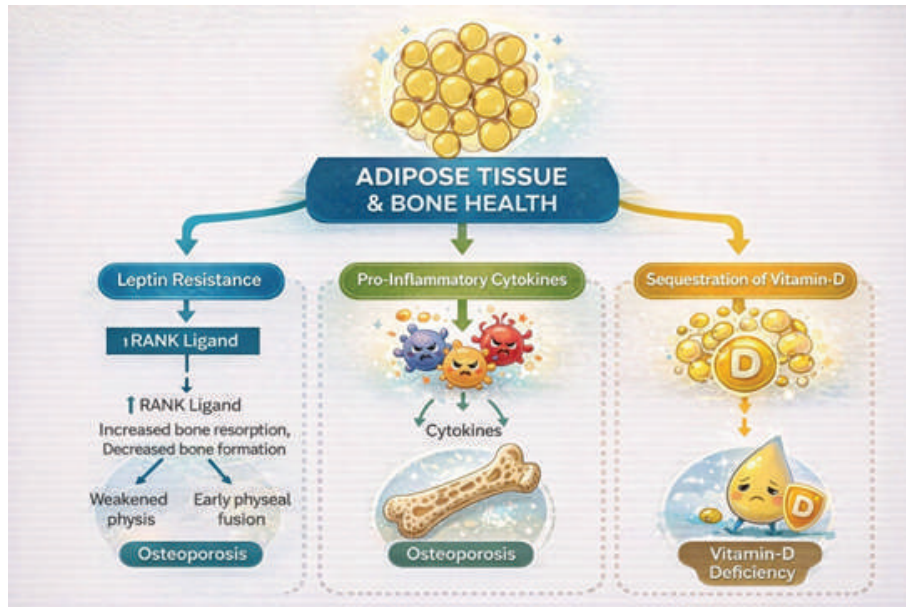
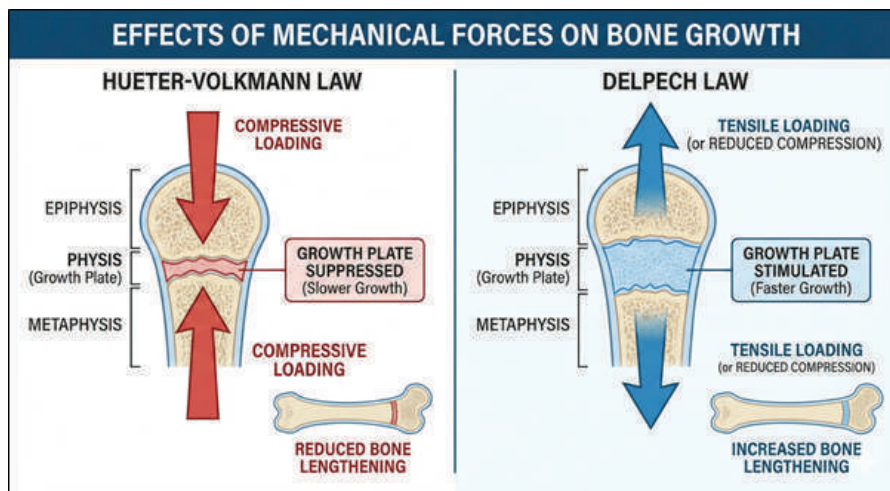


Figure 2. Effects of mechanical forces on bone growth



Obesity and the Lower Extremity

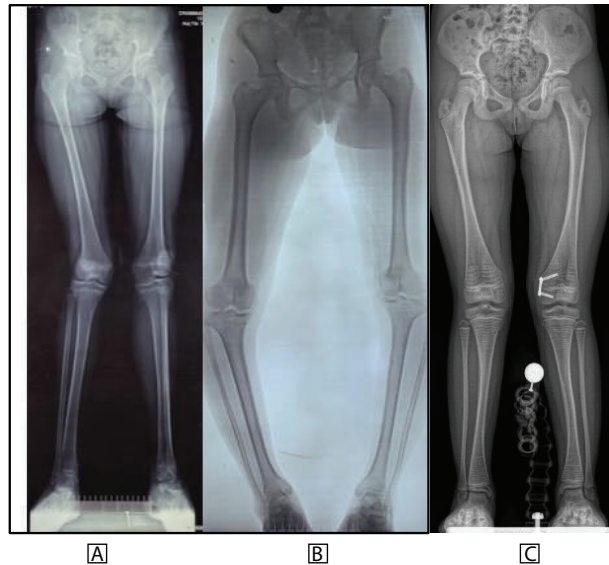
Foot

- It has been observed that children with obesity have a higher incidence of bilateral pes planovalgus or flat feet
- Normally, around 54% of children below 3 years and around 25% children below 6 years have pes planovalgus
 - However, research. noted a prevalence of 50-60% for bilateral flat feet in overweight or obese children.
- Flatfeet do not warrant any surgical intervention until symptomatic or painful.

Knee

- The incidence of angular deformities around the knee (genu varum/ genu valgum)(Figure 3) are higher in overweight or obese children
- Decreased bone mineral density, increased mechanical load, vitamin D deficiency, and asymmetrical loading across the physis contribute to these angular deformities.
- **Blount's disease**
 - Progressive disorder causing varus, procurvatum and internal rotation deformity of the tibia
 - It can be unilateral or bilateral. It is thought that there is a mechanical basis behind this deformity, as it commonly occurs in obese or overweight children
 - It is hypothesised that the increased weight causes increased weight transmission through the medial physis, thus, inhibiting growth of the medial physis and causing progressive varus deformity
 - It can be classified as infantile or adolescent Blount's based on whether it occurs before or after the age of 4 years
 - Conservative treatment with orthoses is usually not very effective. Based on the age and severity of the deformity, surgical options such as guided growth or corrective osteotomies can be offered to the patient.
- Guided growth (Figure 3) can be offered to children with genu valgum or varum who have more than 2 years of growth remaining
 - However, it is important to keep in mind that the risk of recurrence is high in this population, and they may also have precocious puberty due to hormonal imbalance, which may affect the efficacy of this procedure.
- Obese children with angular deformities of lower limbs should be kept under close follow-up to assess for progression or resolution of deformity
 - If deformity is progressive, the threshold for intervention should be kept low.

Figure 3. (A) Genu valgum (B) genu varum and (C) guided growth surgery. The surgery shows an “8-plate application” which acts as a tether on the convex side of deformity and leads to gradual correction of the deformity as the child grows



Hip Pain

- Hip pain, knee pain or limping in an otherwise well child or adolescent with obesity should immediately alert the clinician to the possibility of (SCFE)

Slipped Capital Femoral Epiphysis

- SCFE is the separation of the proximal femoral epiphysis from the metaphysis, and usually occurs during the rapid adolescent growth spurt (11-15 years)
- 50% of the cases are bilateral
- Bilaterality is more common in children with obesity
- These children may have an antecedent history of hip pain, knee pain or groin pain with or without history of antecedent trauma
- Children may or may not be able to bear weight
- The treatment is commonly unilateral or bilateral in-situ fixation with a screw and may require osteotomies in severe cases
- This is an orthopaedic urgency and should be referred to an orthopaedic surgeon for urgent management.

Legg Calve Perthes Disease

- Another hip disorder, that the clinician should be alert to, in the obese child, is Legg Calve Perthes disease
- Though the cause of the association has not been established, obese children have a higher
- relative risk of Perthes disease and clinical suspicion for this condition should be kept high.

Obesity and the Spine

- Obesity has a negative effect on children with spinal deformities
- Bracing is the first modality of treatment in children with spinal deformities. However, the outcomes of bracing are worse in obese children
- Obesity also delays the detection of spinal asymmetry and thus, the severity of scoliosis at detection, is higher in obese children
- It has also been reported that the risk of curve progression is higher in obese children and thus, a high proportion of these children may end up requiring surgery for their deformity.

Obesity and Traumatic Injuries

- Obese children are at a higher risk of suffering fractures as compared to the normal weight-matched age controls due to poor bone quality, impaired balance and mobility
- The force generated from a comparable mechanism of injury increases as body mass increases, thus, obese children are more prone to low energy fractures and also have more complex and severe injury patterns as compared to their non obese peers
- Conservative management with a plaster cast has higher rates of failure due to bulbous extremities and they usually need surgical management
- Physeal injuries are more common in obese children as compared to children with normal weight.

Table 1. Orthopaedic red flags in obese children

Orthopaedic	Effect of Obesity
Flat feet	Higher chance of being symptomatic and less likelihood of normal resolution.
Angular deformities around knee	Close follow up needed, likely to progress and may need surgery
Hip pain/ Knee pain/ Limping	Refer immediately to orthopaedic surgeon, can be SCFE or Perthes disease
Spine Asymmetry	Scoliotic curve likely to progress
Trauma	Higher likelihood of fractures, which may need surgical fixation

SCFE: Slipped capital femoral epiphysis.

Key Messages

- **Systemic Bone Weakening:** Obesity negatively impacts bone metabolism by reducing peak bone mass, increasing bone resorption through hormonal imbalances (like leptin resistance), and sequestering vitamin D in adipose tissue, which leaves the skeleton more fragile.
- **Mechanical Stress and Deformity:** Excess weight applies abnormal pressure on growth plates (physis). Following the **Heuter-Volkmann Law**, this mechanical loading can inhibit bone growth and exacerbate angular deformities like genu valgum (knock knees), genu varum (bow legs), and Blount's disease.
- **Orthopaedic Urgencies:** Clinicians must maintain a high index of suspicion for (SCFE) in obese children presenting with hip, knee, or groin pain. This is an orthopaedic urgency that often requires surgical fixation to prevent permanent damage.
- **Complications in Injury Management:** Obese children are more prone to complex fractures and physeal (growth plate) injuries even from low-energy trauma. Furthermore, traditional treatments like plaster casts are more likely to fail, often necessitating surgical intervention.
- **Challenges in Screening and Treatment:** Obesity can mask the early detection of spinal deformities like scoliosis, leading to greater severity at diagnosis. Additionally, conservative treatments like bracing for the spine or orthoses for the feet are generally less effective in this population.

Suggested Reading

- Nowicki P, Kemppainen J, Maskill L, Cassidy J. The role of obesity in pediatric orthopedics. *JAAOS Glob Res Rev.* 2019;3(5). doi:10.5435/JAAOSGlobal-D-19-00036
- Singh S, Awasthi S, Kapoor V, Mishra P. Childhood obesity in India: a two-decade meta-analysis of prevalence and socioeconomic correlates. *Clin Epidemiol Glob Health.* 2023;23:101390. doi:10.1016/j.cegh.2023.101390
- Gettys FK, Jackson JB, Frick SL. Obesity in pediatric orthopaedics. *Orthop Clin North Am.* 2011;42(1):95-vii. doi:10.1016/j.ocl.2010.08.005
- Tisano B, Anigian K, Kantorek N, Kenfack YJ, Johnson M, Brooks JT. The insidious effects of childhood obesity on orthopedic injuries and deformities. *Orthop Clin North Am.* 2022;53(4):461-472. doi:10.1016/j.ocl.2022.06.008



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Prevention Of Obesity: Building Shields - The Life Cycle Approach

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Prevention Of Obesity: Building Shields - The Life Cycle Approach

09

Authors: Vaman Khadilkar, Nikhil Shah

Introduction

- Childhood obesity has become a global health crisis, with 35.5 million children below 5 years of age and 390 million children between 5-19 years being overweight respectively.
- In 2022, 160 million children (5-19 years) were living with obesity.
- For the first time, the global prevalence of overweight and obese children has surpassed the prevalence of underweight children aged 5-19 years.
- It is a known fact that childhood obesity tracks into adulthood, so prevention and management of obesity in children is paramount.

Life Cycle Stages

- The components of the life cycle perspective encompass maternal and fetal stage, infant, childhood and puberty stages
- At each of these critical stages of the life cycle, different factors are operative leading to development of overweight and obesity
- Hence, various preventive strategies for obesity should be employed at the various life cycle stages.

Algorithm 1. Childhood obesity is a global health problem



Pregnancy or Foetal stage

- Numerous factors during the pregnancy can affect the foetus, resulting in either large for gestational age (LGA) or small for gestational age (SGA) infants, both of which are at a risk of developing obesity later on in life.
- The potential interventions at this stage that may help to prevent obesity include.
- Monitoring of gestational weight gain and ensuring steady, appropriate weight gain during pregnancy
 - Monitoring weight gain and BMI in adolescent girls and women pre-pregnancy and prevention of excess weight gain and BMI in pre-pregnancy also
 - Reinforcing the importance of prenatal nutrition
 - Avoidance of tobacco or smoking
 - Diagnosing and controlling gestational diabetes and/or hypertension and type 2 diabetes.

Infancy Stage

The following precautions or measures should be undertaken during the infancy stage to prevent childhood obesity.

Growth Monitoring

- Regular growth monitoring (measure height, weight, weight-for-height and head circumference at well baby and vaccine visits) and plotting on age and gender appropriate WHO charts (for preterm babies, INTERGROWTH-21 charts can be used)
- Avoid excess or inappropriate rapid catch-up weight gain and rapid upward crossing of weight percentiles.

Optimum Feeding Practices

- Exclusive breastfeeding till 6 months of age, continue breastfeeding till at least 2 years of age
- Avoid formula feeds as far as possible, encourage donors pasteurised milk until the infant reaches a safe weight or gestational age or until the mother's own milk supply is established in cities where it is feasible
- Avoid bottle feeding
- Complementary (home-made) foods should be started at 6 months of age, and avoid packaged foods
- Avoid salt for the first year of life and added sugar for the first 2 years of life
- Avoid sugar-sweetened beverages (e.g., packaged fruit juices)
- Avoid force feeding (baby-led complementary feeding).

- Zero screen time is recommended for children below 2 years of age.
- Infants are encouraged to remain active throughout the day (e.g., floor play like crawling or creeping, etc) under parental supervision. They should not be restrained for more than an hour (strollers, high chairs, or strapped to parents)
- Parents are encouraged to start tummy time right after birth, within a day or two of coming from the hospital.
 - In infants (0-3 months), start with 3-5 minutes 2-3 times a day and gradually increase to 15-30 minutes daily by 2 months of age.
 - By 3-4 months, they should be able to spend at least 60-90 minutes of tummy time daily, which promotes motor activity, improves motor patterns, and supports motor milestones; hence, it is part of a multi-component obesity prevention approach.

Childhood and Puberty Stage

Preventive strategies to prevent obesity in childhood and puberty include the following

Growth Monitoring

- Growth monitoring (height, weight, BMI, and waist circumference measurements every 6 months - 1 year) and plotting on appropriate growth charts (WHO charts for children under 5 years and IAP 2015 charts for children 5-18 years)
- Prevent inappropriate catch-up growth in weight (especially in SGA children) as it leads to early adiposity rebound and thus culminates in childhood obesity.

Dietary Role

- Healthy eating environment (including set times for meals and set daily routine) should be provided to the children
- Balanced diet should be encouraged (mixture of diverse, culturally acceptable foods which provide adequate amount of energy, protein, fats, micronutrients and vitamins)
- Children should be encouraged to determine their own portion sizes over a period of time so as to prevent overfeeding
- Avoid consumption of JUNKS (junk foods—high in fat, salt and sugar with very low nutrient content; ultra-processed foods [NOVA Classification 4]; nutritionally inappropriate foods; caffeinated, coloured and carbonated foods and beverages; and sugar-sweetened foods and beverages)

- Food should be prepared with low salt, no added trans-fat and no added free sugars
- Dietary fibre intake should be encouraged (encourage consumption of whole fruits and vegetables).
- Children should be involved by parents and caregivers in shopping for foods and meal preparation at home so they start learning all the above pointers from a younger age
- Children should be taught to read and understand food labels
- Implementing sugar boards in school will help children make informed and healthy food choices
- School environment should be supportive (school canteens should include healthy, freshly made foods, school events should not be sponsored by companies of unhealthy drinks or foods)
- Parents should set role model for healthy eating and active lifestyle
- Avoid unnecessary usage of antibiotics as it may influence the gut microbiome and gut dysbiosis has been strongly linked to obesity.

Screen Time

- Recreational screen time should be limited to < 1 hour in children aged 2-5 years and < 2 hours in children aged 5-10 years. Children aged 10-18 years should balance screen time with other age-appropriate developmental goals (includes time spent doing school work along with recreational screen time)
- Avoid use of social media in children below 16 years of age
- Screen time should be strongly discouraged at meal times.

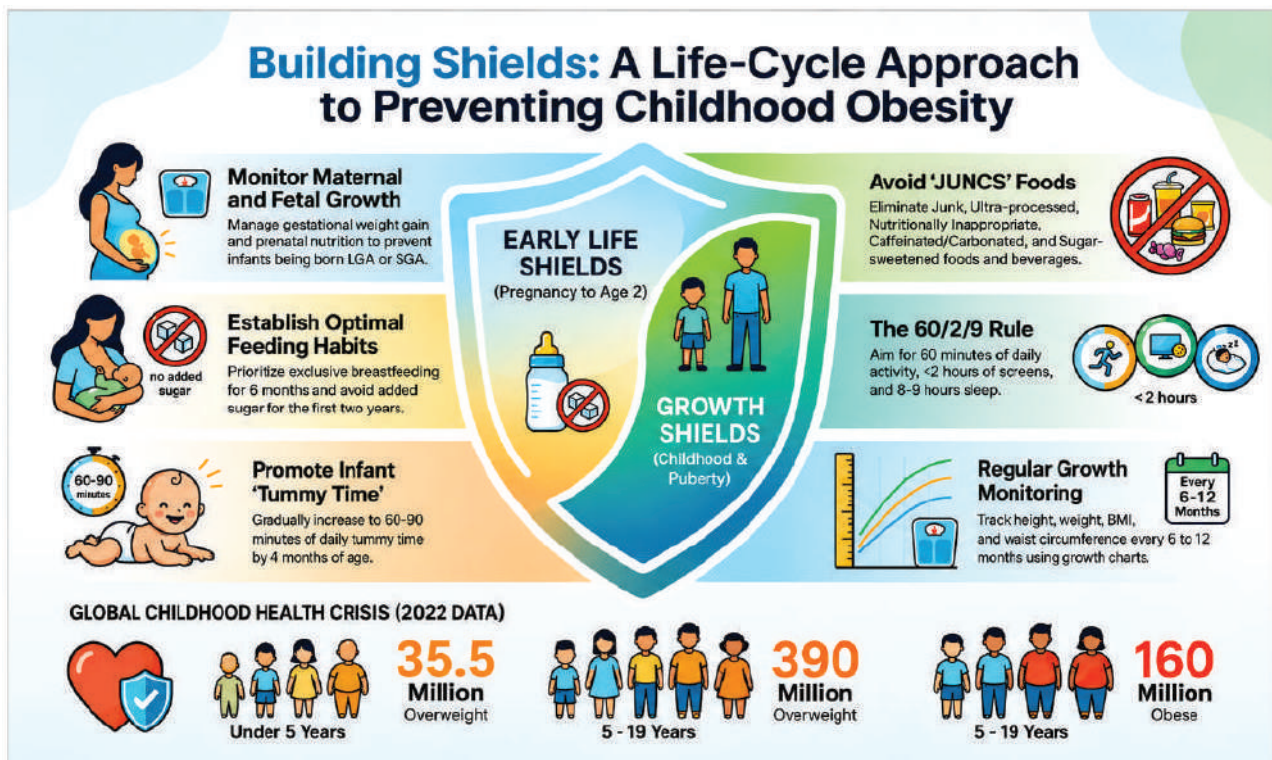
Physical Activity and Sleep Hygiene

- Age-specific physical activity (focus on aerobic exercises like walking, cycling, swimming) for at least 60 minutes every day should be encouraged
- Schools should have at least 30 minutes of physical activity or play everyday
- Children should be encouraged to sleep at least 8-9 hours of sleep daily. They should be encouraged to go to bed early and get up early
- In overweight children screening for comorbidities to prevent complications should be performed.

Key Practice Points

- Rising childhood obesity is driving early onset of serious co-morbidities — including type 2 diabetes, dyslipidaemia, metabolic dysfunction-associated steatotic liver disease (MASLD), polycystic ovarian syndrome, metabolic syndrome, hypertension, psychological disorders — and increasing premature mortality
- Paediatric obesity prevention is a life-course approach: it begins before birth and continues through infancy, childhood, and adolescence, requiring active involvement of families and society
- Breaking the inter-generational cycle of obesity is essential — and the most effective strategy is early, stage-wise prevention across the entire life span.

Figure 1. A life-course strategy for the prevention of childhood obesity



Key Messages

- Childhood obesity tracks into adulthood, so preventive strategies for obesity should be employed at the various life cycle stages (maternal and foetal stage, infant, childhood, and puberty stages).
- Interventions in the maternal or foetal stage include ensuring adequate maternal nutrition and gestational weight gain.
- Measures to be undertaken during the infancy stage to prevent childhood obesity include growth monitoring and optimum feeding practices (exclusive breastfeeding, avoid bottle feeding, avoid sugar till 2 years).
- Preventive strategies to prevent obesity in childhood and puberty include regular growth monitoring, good dietary practices (balanced diet, portion control, avoid JUNCs), limited screen time, and regular physical activity according to the prescribed recommendations.
- Breaking the inter-generational cycle of obesity is essential — and the most effective strategy is early, stage-wise prevention across the entire life span.

Suggested Reading

- Johnson DB, Gerstein DE, Evans AE, Woodward-Lopez G. Preventing obesity: A life cycle perspective. *J Am Diet Assoc.* 2006;106:97-102
- Khadilkar V, Shah N, Harish R, et al. Indian Academy of Pediatrics Revised guidelines on evaluation, prevention and management of childhood obesity. *Indian Pediatr.* 2023;60:1013.
- Styne DM, Arslanian SA, Connor EL, et al. Pediatric obesity-assessment, treatment, and prevention: An Endocrine Society clinical practice guideline. *J Clin Endocrinol Metab.* 2017;102:709.
- Verma M, Kapoor N, Senapati S. et al. Comprehending the epidemiology and aetiology of childhood obesity: Integrating life course approaches for prevention and intervention. *Diabetes Ther.* 2025;16:1177



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Catching Non-Communicable Diseases Early: Integrating Prevention into Every Paediatric Contact

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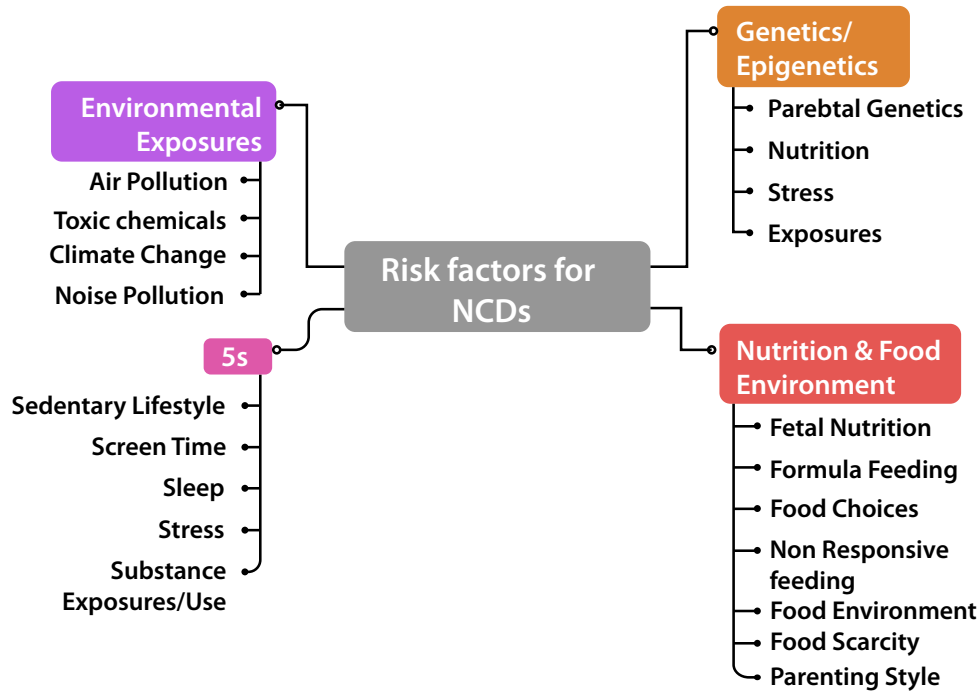
Introduction

- Non-communicable diseases (NCDs) viz., obesity, type 2 diabetes mellitus, hypertension, dyslipidaemias, cardiovascular diseases, asthma, chronic kidney disease, and mental health disorders are becoming a major public health problem.
- As per the WHO NCD India Profile 2018, 63% of all deaths in India are attributable to NCDs, with cardiovascular diseases at the top.
- Although clinical manifestations may appear later, the underlying biological, behavioural, and environmental risk factors are often established during childhood.
- According to WHO (2022) statistics, globally, NCDs account for over 70% of annual deaths, and risk factors emerging during the first two decades of life significantly contribute to this burden
- Paediatric healthcare encounters, ranging from immunisation visits to sick-care consultations, offer critical opportunities to identify early markers of NCD risk and provide preventive counselling and interventions.
- Utilising every paediatric interaction as “NCD risk screening and counselling” is a practical, low-cost approach to curb this silent epidemic. Early identification and interventions are not an option but a necessity.

Risk Factors for Non-Communicable Diseases

- The risk factors span genetic predispositions, nutritional influences, lifestyle choices, and environmental exposures, highlighting the complex interplay that contributes to the burden of NCDs. Understanding these risk factors is crucial for developing effective prevention and intervention strategies (Figure 1).

Algorithm 1. Risk factors for non-communicable diseases



NCDs: Noncommunicable diseases

Clinical Screening for Non-Communicable Diseases

- NCD screening must be built into the clinic visits for all paediatric patients
- Table 1 outlines the aspects of the clinical work-up and the assessment frequency that should be incorporated into regular clinic visits.

Table 1. Clinical assessment framework and frequency of evaluation during regular visits

Work up	Elements	Frequency	Note/ Comment
Preconception and natal history	Maternal weight and antenatal weight gain, stress, environmental exposures	Once	
Family history	NCDs in parents/grandparents	Annual update	
Nutrition	Consumption of ultra-processed foods, HFSS/SSB consumption: Amount and frequency	Every visit	Reinforce appropriate nutrition
Anthropometry < 5 years age	Weight, height, weight - for - height	Every vaccine visit	Use age and gender appropriate IAP charts
>5 years age	BMI, waist circumference monitor BMI trajectory	Every 6 -12 months	Use Age and gender appropriate IAP charts Counsel parents for BMI trajectory crossing over to higher levels
Blood pressure	Use appropriate BP apparatus and cuff size	Annually, after 3-year age, more frequent for underlying systemic diseases	Use age, gender, and height appropriate Indian charts
5S screen	Sedentary behaviour: Physical activity-type, duration, frequency	Every 3 months	Recommended: 60 minutes daily
	Screen time: Type, duration, frequency	Every 3 months	Recommended: As per IAP guidelines
	Sleep: Timings, duration, sleep disorders esp. Snoring	Every 3 months	
	Stress: Type of family - nuclear/- joint/single parent, family discord, family loss or stress	Every year	
	Substance exposure/use: Type and amount	Every year	
HEEADSS and CRAFFTS	For adolescents	Every 6 months	

NCDs: Non-communicable diseases; HFSS: High fat, salt and sugar foods; SSB: Sugar-sweetened beverages; IAP: Indian Academy of Pediatrics; BMI: Body mass index

Age-Group Wise Screening Guide

Screen the children with the following at risk behaviours to look for early markers of non-communicable diseases.

Infancy and Toddler

D: Breastfeeding/formula-feeding details; introduction of semi-solid/solid foods (age, frequency and amount); introduction of high fat, salt and sugar (HFSS) foods/sugar-sweetened beverages (SSB); history of non-responsive feeding

P: Physical activity (180 min/24 hr required)

S: Screen time (0 - <2 hr)

Anthropometry Screen: Weight, height - at every vaccine visit/at least once in 6 months

School-Going Child

D: Intake of HFSS/SSB, unmindful eating

P: Physical activity (moderate to vigorous physical activity for 60 minutes)

S: SS every 6 months

Anthropometry Screen: Weight, height, body mass index (BMI), every 6-12 months

Annual blood pressure (BP)

Adolescents

D and P as above

SS every 3-6 months

Anthropometry Screen: Weight, height, BMI, every 6 months

Annual BP

Preventive Counselling

- Every visit should include simple preventive communication, following the **5A Model** (Ask–Assess–Advise–Assist–Arrange). Some simple advice that may be given, include:
 - Replacing sugary beverages with water, coconut water, milk or non-sweetened buttermilk
 - Encouraging daily family meals, where the entire family enjoys home-cooked meals together. The menu must incorporate a variety of healthy food items, including salads and whole grains
 - Promoting outdoor play for at least 60 minutes per day
 - Limiting screen time to <2 hours/day for not just the child, but for all the family members
 - Ensuring age-appropriate sleep routines.
- **Even 2–3 minutes of counselling per visit has been shown to improve parental awareness and health behaviours.**

Screening for Dyslipidaemia, Hyperglycaemia, and Metabolic Dysfunction-Associated Steatotic Liver Disease

- All obese children ≥ 10 years (irrespective of risk factors),
- Obese children aged 2–10 years
- Overweight children ≥ 10 years of age (with risk factors, such as positive family history of obesity, dyslipidaemia, premature coronary artery disease, diabetes or hypertension), or waist circumference greater than 70th percentile
- Targeted screening for glucose abnormalities alone in children with one or more of the following: obesity, acanthosis nigricans, hypertension, dyslipidaemias, family history of type 2 diabetes mellitus, or maternal history of gestational diabetes. HbA1c, fasting glucose, or oral glucose tolerance test may be used, depending on the risk profile

Early Identification of at-risk Situations

Family and Perinatal History:

- Parental obesity
- Family history of NCDs
- Low birth weight or large-for-gestational-age
- Maternal gestational diabetes

Lifestyle issues:

- Dietary pattern- Type of foods/ JUNCs/ /SSBs/HFSS/ frequency/Grazing/ Snacking
- Physical inactivity
- Excessive screen time
- Stressful life

Leveraging School and Community Partnerships

Paediatricians can reinforce school-based interventions such as:

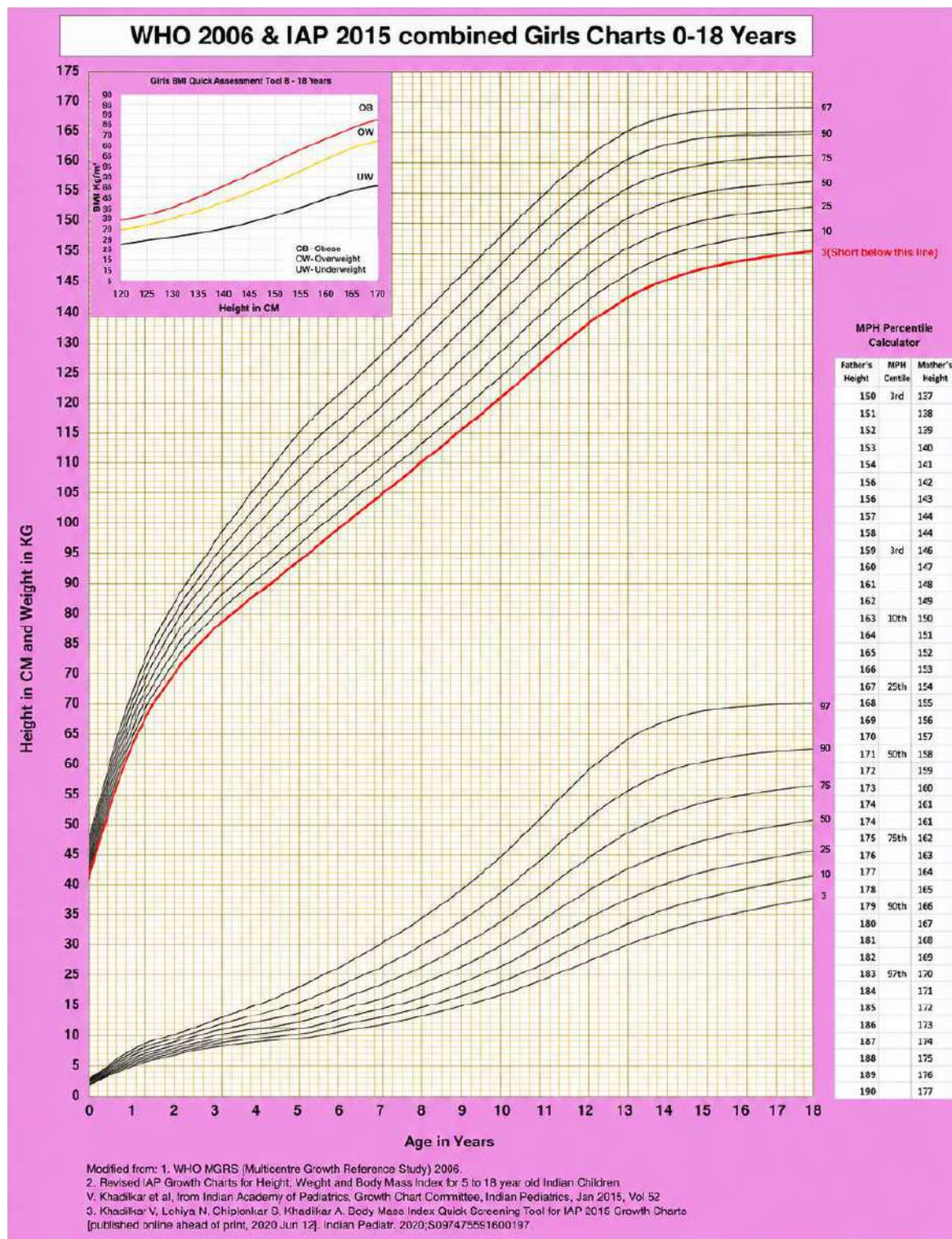
- Regular physical education
- Nutrition education programs
- Growth monitoring
- Anti-tobacco and substance-use campaigns
- Mental-health support initiatives

Health camps can be conducted in collaboration with various organisations to ensure better community participation.

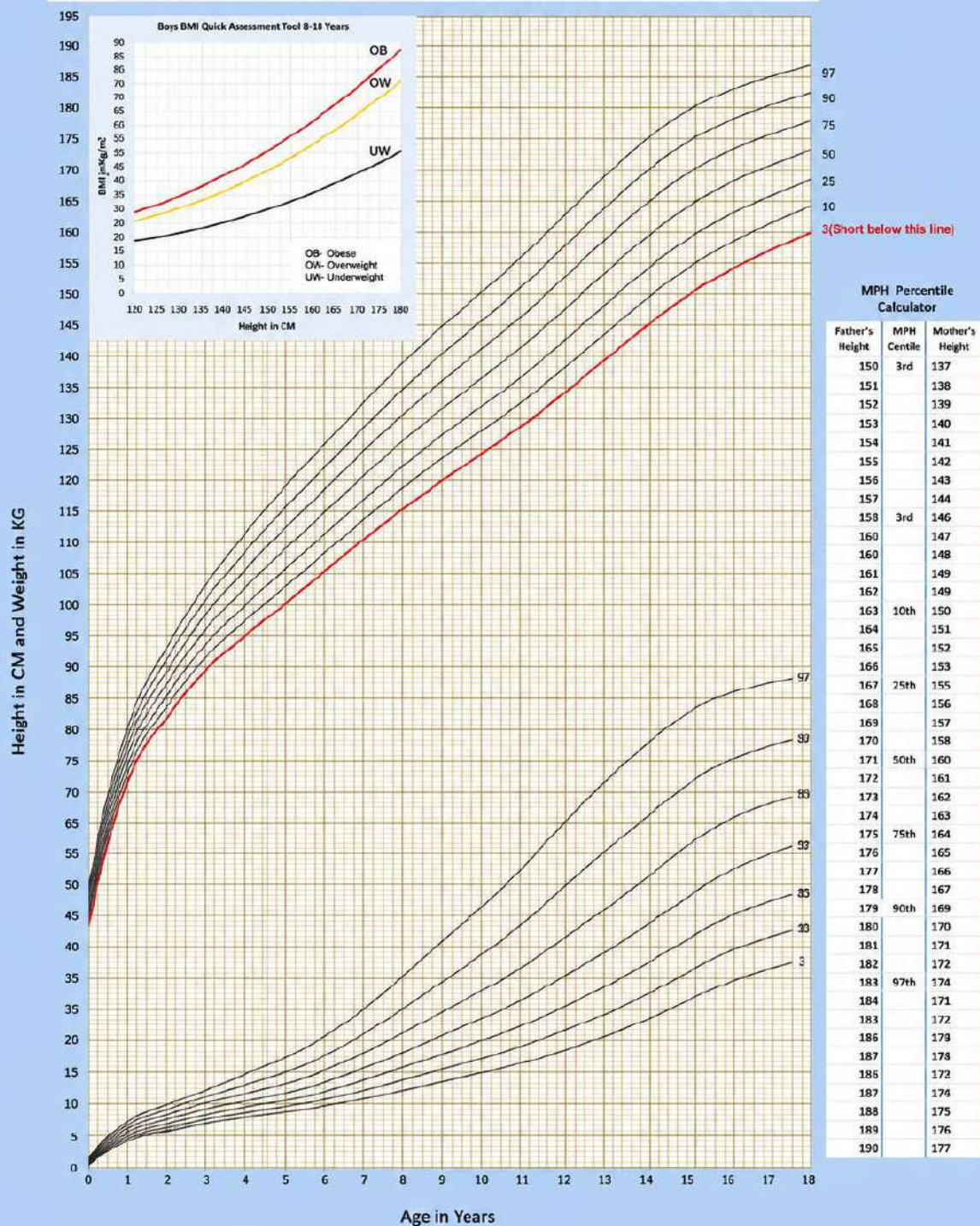
Digital Tools and Clinical Decision Support

- Electronic health record prompts, growth-chart alert systems, and digital risk-assessment questionnaires improve screening rates and the quality of lifestyle counselling
- Mobile apps promoting physical activity, nutrition, and sleep hygiene can complement clinic-based advice, especially among adolescents.

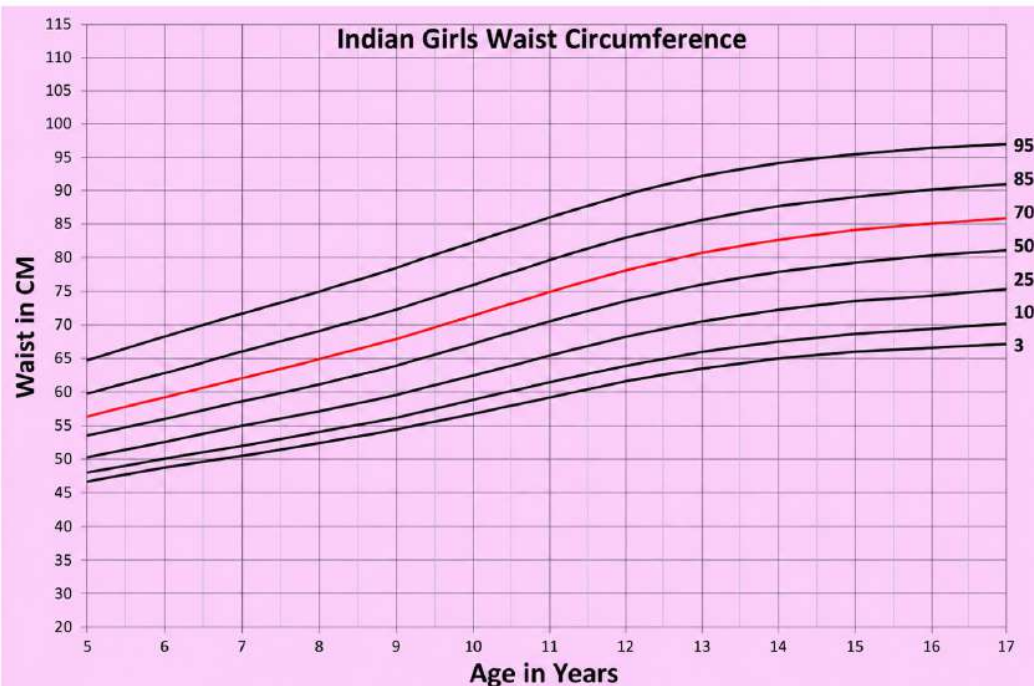
Annexure 1. World Health Organization and Indian Academy of Pediatrics charts for height, weight, and waist for girls and boys in the 0-18 years age group



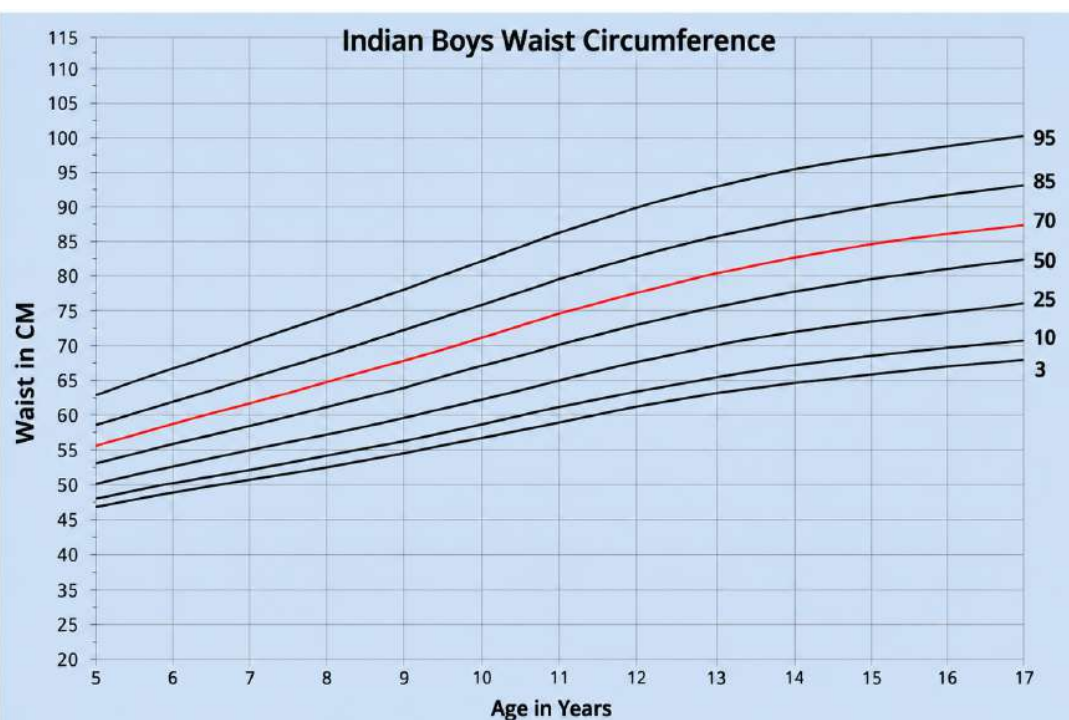
WHO 2006 & IAP 2015 combined Boys Charts 0-18 Years



Modified from: 1. WHO MGRS (Multicentre Growth Reference Study) 2006.
 2. Revised IAP Growth Charts for Height, Weight and Body Mass Index for 5 to 18 year old Indian Children.
 V. Khedilkar et al, from Indian Academy of Pediatrics, Growth Chart Committee, Indian Pediatrics, Jan 2015, Vol 52
 3. Khedilkar V, Lohiya N, Chiplonkar S, Khedilkar A. Body Mass Index Quick Screening Tool for IAP 2015 Growth Charts [published online ahead of print, 2020 Jun 12]. Indian Pediatr. 2020;S097475501600197.



Khadlikar A, Ekbote V, Chiplonkar S, Khadlikar V, Kajale N, Kulkarni S, Parthasarathy L, Arya A, Bhattacharya A, Agarwal S. Waist circumference percentiles in 2-18 year old Indian children. *J Pediatr.* 2014 Jun;164(6):1358-62.



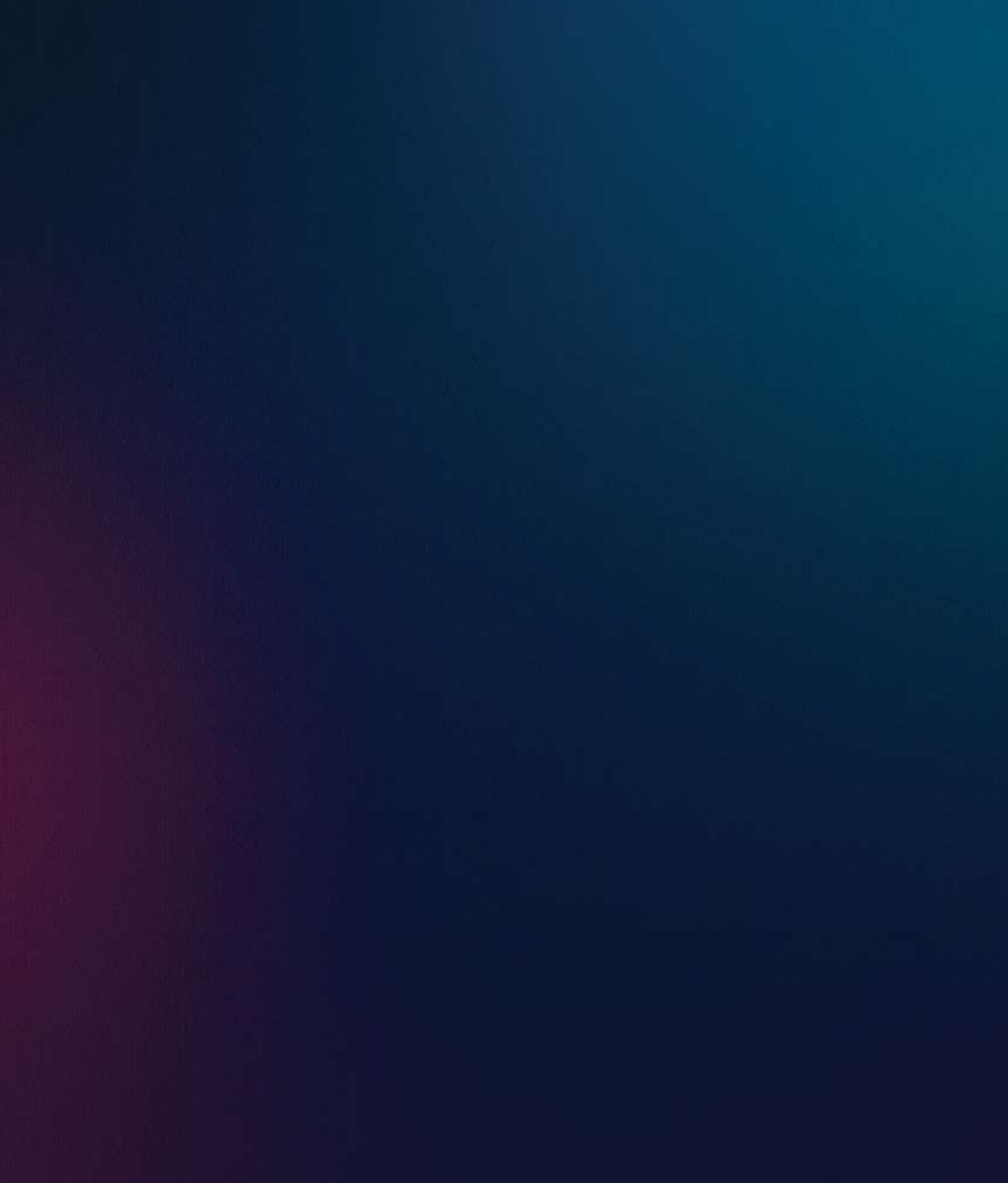
Khadlikar A, Ekbote V, Chiplonkar S, Khadlikar V, Kajale N, Kulkarni S, Parthasarathy L, Arya A, Bhattacharya A, Agarwal S. Waist circumference percentiles in 2-18 year old Indian children. *J Pediatr.* 2014 Jun;164(6):1358-62.

Key Messages

- Counselling for NCD prevention should be integrated into every paediatric contact as a valuable opportunity.
- Measuring and interpreting anthropometry with lifestyle counselling is an important step in NCD prevention.
- The thrust in lifestyle counselling includes the following:
 - Nutrition
 - 5S - Sedentary Habits, Sleep, Screen, Stress, Substance use
 - Targeted metabolic screening
 - Risk-stratification into daily paediatric practice.

Suggested Reading

- World Health Organization. *Noncommunicable diseases: key facts*. Geneva: WHO; updated 2023. Accessed January 2026. <https://www.who.int/news-room/fact-sheets/detail/non-communicable-diseases>
- Khadilkar V, Shah N, Harish R, et al. Indian Academy of Pediatrics Revised Guidelines on Evaluation, Prevention and Management of Childhood Obesity. *Indian Pediatr.* 2023;60(12):1013-1031.
- Khadilkar VV, Khadilkar AV. Revised Indian Academy of Pediatrics 2015 growth charts for height, weight and body mass index for 5-18-year-old Indian children. *Indian J Endocrinol Metab.* 2015;19(4):470-6. doi: 10.4103/2230-8210.159028
- Sarna A, Porwal A, Acharya R, et al. Waist circumference, waist-to-height ratio and BMI percentiles in children aged 5 to 19 years in India: A population-based study. *Obes Sci Pract.* 2021;7(4):392-404. doi: 10.1002/osp4.493
- Gupta P, Shah D, Kumar P, et al. Indian Academy of Pediatrics Guidelines on the fast and junk foods, sugar sweetened beverages, fruit juices, and energy drinks. *Indian Pediatr.* 2019;56(10):849-863.





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Movement Medicine in Growing Bodies: Benefits and Red Flags

11

Authors: Nirmala C, P Sreelekha

Introduction

- "Movement medicine" for growing bodies refers to the use of physical activity as a health-promoting, therapeutic, and developmental tool to support the physical, mental, social, and emotional well-being of children and adolescents.
- Children should engage in a variety of structured activities (aerobic, balance, stretching, muscle-strengthening, and bone-strengthening exercises) and unstructured activities every day in a safe, supervised environment.
- The World Health Organization (WHO) provides recommendations for age-specific physical activity, which are endorsed by the Indian Academy of Pediatrics (IAP) guidelines for parents on physical activity (Box 1).

Box 1. Guidelines for physical activity are age-appropriate

- Infants need 30 minutes of "tummy time" and active play
- Toddlers need 3 hours daily
- Children aged 3 to 5 years require at least 3 hours (180 minutes) of physical activity per day, including 60 minutes of moderate-to-vigorous physical activity such as skipping, hopping, running, and ball games in group play
- Children aged 5–18 years need to participate in moderate-to-vigorous activity at least 60 minutes per day, such as cycling, jumping rope, and games in the playground and they should be encouraged to perform muscle-strengthening, and bone-strengthening exercises, at least 3 days a week

Fundamental Movement Skills

- Fundamental movement skills (FMS) are foundational, essential actions that serve as building blocks for intricate physical activities and for lifelong sports participation.

Table 1. Categories of fundamental movement skills

Category	Example
Locomotor skills	Running, jumping
Object control skills	Catching, throwing
Stability skills	Balancing, twisting

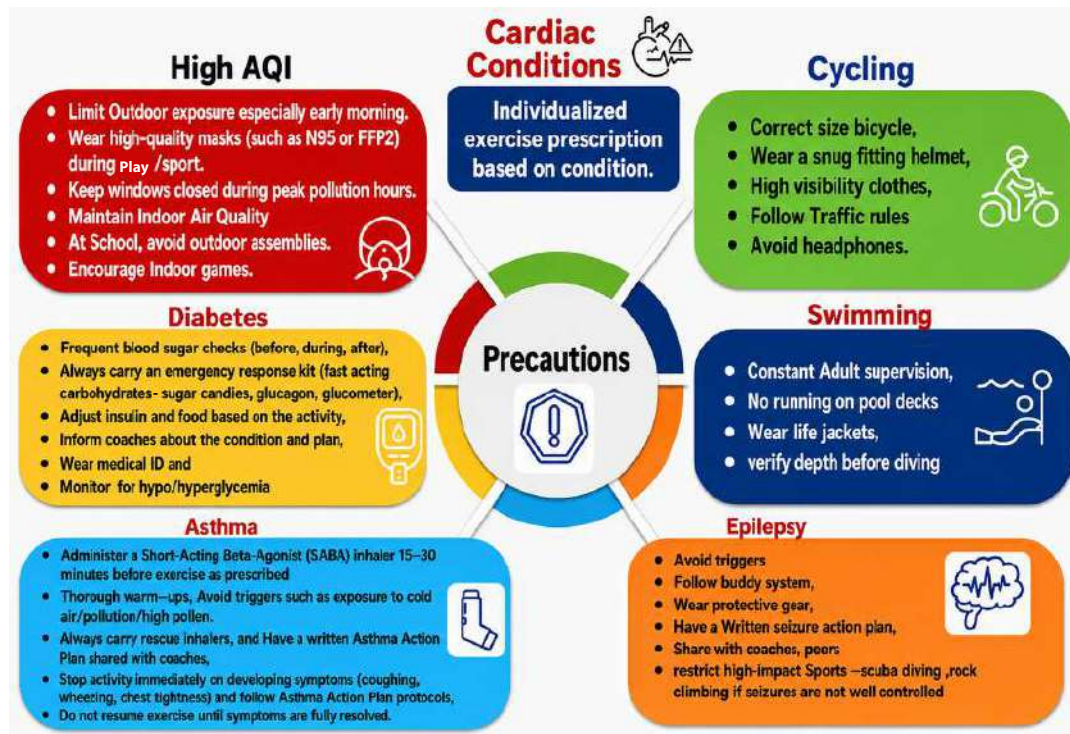
- Parents can support FMS by
 - Providing safe spaces for unrestricted exploration
 - Engaging in active play such as running and throwing
 - Offering varied toys such as blocks and puzzles
 - Incorporating movement into daily routines.
- A Pre-Participation Physical Evaluation (PPE)
 - PPE is crucial for promoting safe athletic involvement rather than excluding participants
 - It includes a comprehensive health screening to identify potential health risks
 - ECG (electrocardiogram) and ECHO (echocardiography) are done only in the presence of medical concerns
 - Ideally performed 6 weeks prior to sports event, then annually or as needed.

Box 2. Key points to consider during movement of growing bodies

Safety and Precautions

- Safety is paramount. Children should wear well-fitting protective gear during sports and activities to prevent injuries
- Warm-ups before exercise improve performance by warming muscles, increasing blood flow, and improving flexibility
- To prevent burnout, it is essential to prioritise rest and recovery
- Extra precautions are necessary during periods of poor air quality and for children with medical conditions such as epilepsy, asthma, and cardiac illness (Infographic 1).
- Children with known medical history should exercise under supervision, after medical clearance
- Children with cardiac conditions may face restrictions in sports participation due to the significant risk of sudden cardiac death
- Individualised exercise programs should be tailored to each child, considering the underlying heart defect, development, and family resources, targeting 60 minutes of daily moderate activity
- These children need medical clearance before engaging in competitive sports, often guided by cardiopulmonary exercise testing (CPET) supervised by a paediatric cardiologist.

Figure 1. Precautions during cycling, swimming and in special conditions



Formal Strength Training

- Formal strength training can begin at 7–8 years as balance and postural skills reach adult levels by this age, while structured weightlifting is safe from 11–13 years
- The focus should be on mastering proper technique rather than lifting heavy weights to build strength and fitness.

Protein Supplements

- Protein supplements are not routinely recommended for children and adolescents unless clinically indicated, and should complement rather than replace a balanced diet
- When combined with proper exercise or training, protein supplements can help your child build muscle mass and strength, with long-term metabolic benefits
- Animal-based protein supplements, such as whey, casein, and egg white protein powders, are generally safe for children and adolescents when used in moderation to address specific nutritional gaps
- Plant-based protein supplements made from pea, soy, nuts, pumpkin seeds, and flax seeds offer concentrated nutrition
- Overconsumption of protein, along with intake of an unhealthy or restricted diet, adversely affects digestion and overall body function
- Unsupervised use of protein and amino acid supplements by teens, often driven by social media and gym, is associated with risk of overdose or inefficacy due to a lack of regulation.

Benefits of Fundamental Movement Skills

Physical Health

- Helps build strong bones, muscles, and joints
- Reduces body fat, controls weight and significantly lowers the risk of developing obesity, type 2 diabetes, and hypertension
- Engaging in moderate-to-vigorous daytime activity (sports/play- cricket,kho-kho) and relaxing bedtime activities (light stretching, yoga) enhances sleep by boosting melatonin production.

Motor Skills

- Movement promotes child's physical development and aids both gross and fine motor skills.

Cognitive Development

- Movement boosts brain plasticity and overall cognition by stimulating the neural connections.

Sensory Integration

- Movement improves focus, attention, and behaviour by effective sensory integration.

Social and Emotional Well-being

- Physical activity lowers stress and improves mood by boosting endorphins and serotonin
- Social relations created during play are strong and impart key life competencies
- Movement enhances self-confidence and self-efficacy.

Red Flags

Any red flag should alert referral to a paediatrician for further evaluation as discussed below:

Pain

- **Any persistent pain or discomfort during activity and rest is a red flag**
- Growing bodies are prone to repetitive injuries such as stress fractures, tendinitis, and apophysitis.

Limitation of Movement

- Difficulty in extending or flexing a limb, or decreased range of motion.

Swelling or Redness

- Unexplained swelling and warmth around a joint or bone is due to inflammation or injury.

Limping or Changes in Gait

- Any noticeable change in the child's gait, such as limping, dragging a foot.

Asymmetry

- Discrepancy in limb length, shoulder, or hip alignment.

Neurological Symptoms

- Headache, blurring of vision, unsteadiness, and loss of coordination
- Progressive limb weakness
- Loss of previously attained motor skills.

Excessive Force or Aggression

- Unwarranted force or aggression during play indicates underlying behavioural disorders.

Extreme Fatigue and Burnout

- Burnout or persistent fatigue that impacts daily activities may indicate overexertion or an underlying disorder.

Systemic Symptoms

- Unexplained fever or night sweats; significant weight loss (not due to diet or activity) or persistent fatigue that impacts daily activities.

Psychological/Behavioural Issues

- Fear or avoidance of movement, obsessive focus on performance, and exhibiting social withdrawal are symptoms of performance anxiety.

Focused OPD Assessment

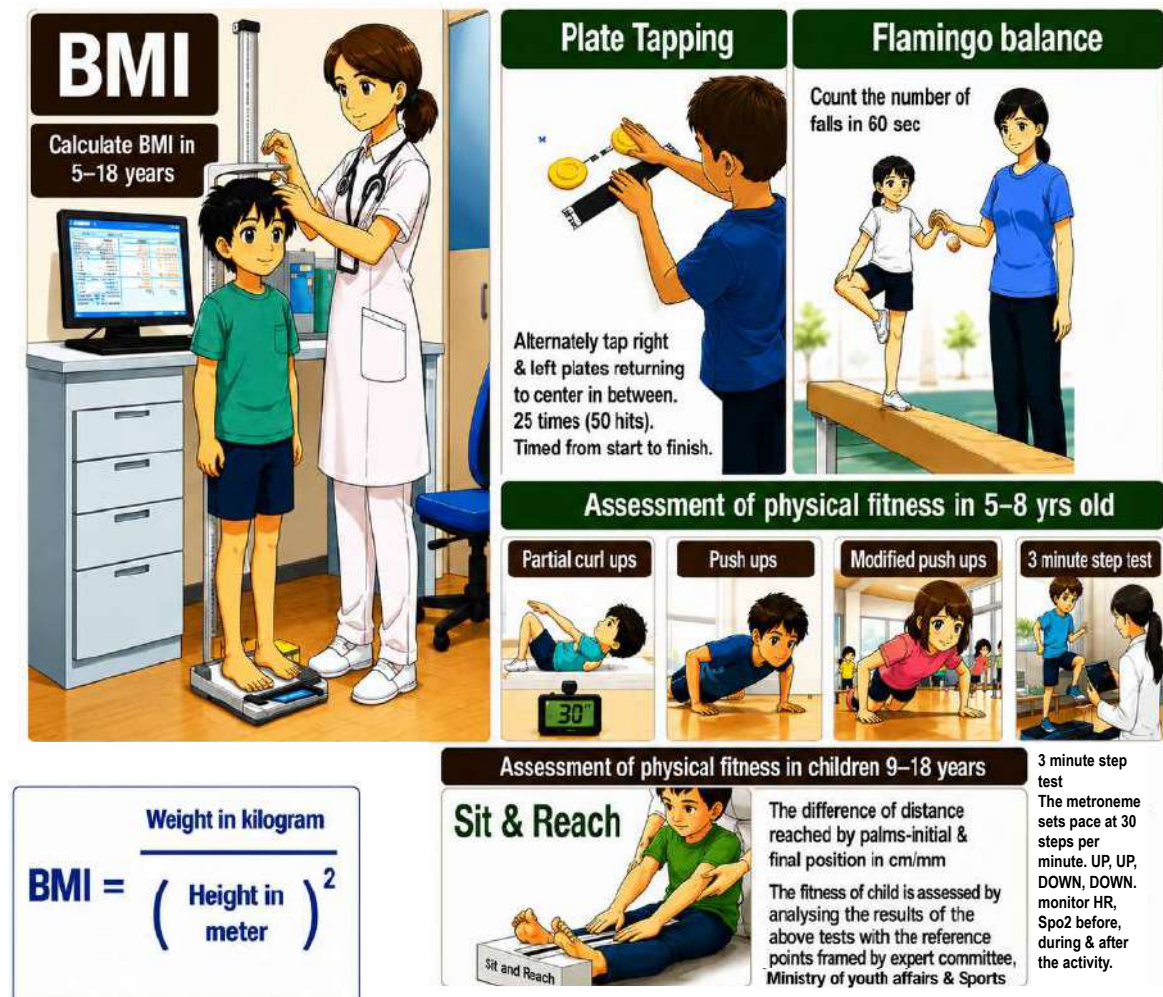
History Taking

- A detailed history about the onset of complaints, associated symptoms, comorbidities, developmental history, and family history should be obtained.

Physical Examination

- Observe the child's gait, movement, posture, and comfort levels during activity
- The level of activity in children is assessed by inquiring about screen time, type, duration of physical activity, and age-appropriate fitness testing (Infographic 2 and Annexure 1)
- Conduct a comprehensive examination of the musculoskeletal and neurological system
- Evaluate Development by using standardised tools
- Evaluate and certify children participating in sports competitions.

Figure 2. Assessment of physical fitness in children (5-18 years old)



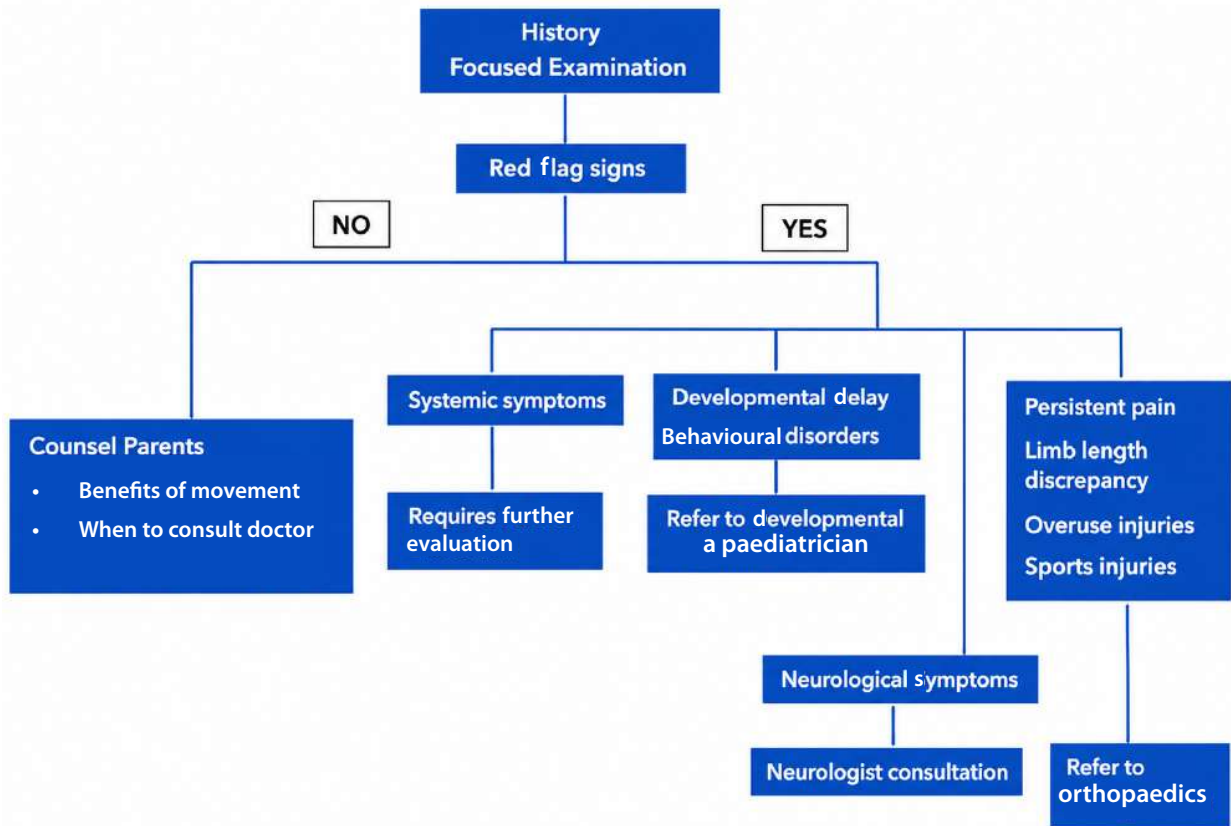
What To Do?

- In the absence of red flags, provide reassurance and encourage healthy activity
- In case any red flags are identified, refer for further diagnostic evaluation in consultation with concerned specialists (e.g., developmental paediatricians, neurologists, orthopaedics)
- R.I.C.E. (rest, ice, compression, and elevation) are advised for overuse injury
- Provide anticipatory guidance about fitness with a focus on promoting recommended age-appropriate physical activity, limiting screen time, consistent sleep hygiene, and a balanced diet.

Tips for Parents

- Encourage the child's movement by making it a fun-filled shared experience
- Provide proper equipment, prioritise health and recovery
- Encourage the child to maintain a positive attitude.

Algorithm 1. Approach to movement medicine-related concerns in paediatric OPD



Annexure 1. Fitness indicators

Coordination Test- Plate Tapping

Boys

Age	L1 (Work Harder)	L2 (Must Improve)	L3 (Can do Better)	L4 (Good)	L5 (Very Good)	L6 (Athletic)
5	< 00 m 25 s 250 ms to 00 m 19 s 290 ms	< 00 m 19 s 290 ms to 00 m 16 s 700 ms	< 00 m 16 s 700 ms to 00 m 15 s 60 ms	< 00 m 15 s 60 ms to 00 m 14 s 340 ms	< 00 m 14 s 340 ms to 00 m 13 s 600 ms	< 00 m 13 s 600 ms to 00 m 12 s 720 ms
6	< 00 m 21 s 550 ms to 00 m 18 s 190 ms	< 00 m 18 s 190 ms to 00 m 16 s 310 ms	< 00 m 16 s 310 ms to 00 m 14 s 970 ms	< 00 m 14 s 970 ms to 00 m 13 s 330 ms	< 00 m 13 s 330 ms to 00 m 12 s 650 ms	< 00 m 12 s 650 ms to 00 m 11 s 800 ms
7	< 00 m 19 s 480 ms to 00 m 16 s 680 ms	< 00 m 16 s 680 ms to 00 m 15 s 70 ms	< 00 m 15 s 70 ms to 00 m 13 s 900 ms	< 00 m 13 s 900 ms to 00 m 12 s 350 ms	< 00 m 12 s 350 ms to 00 m 11 s 750 ms	< 00 m 11 s 750 ms to 00 m 10 s 0 ms
8	< 00 m 17 s 310 ms to 00 m 15 s 510 ms	< 00 m 15 s 510 ms to 00 m 14 s 100 ms	< 00 m 14 s 100 ms to 00 m 13 s 70 ms	< 00 m 13 s 70 ms to 00 m 12 s 580 ms	< 00 m 12 s 580 ms to 00 m 11 s 50 ms	< 00 m 11 s 50 ms to 00 m 10 s 370 ms

Girls

Age	L1 (Work Harder)	L2 (Must Improve)	L3 (Can do Better)	L4 (Good)	L5 (Very Good)	L6 (Athletic)
5	< 00 m 25 s 250 ms to 00 m 19 s 290 ms	< 00 m 19 s 290 ms to 00 m 16 s 700 ms	< 00 m 16 s 700 ms to 00 m 15 s 60 ms	< 00 m 15 s 60 ms to 00 m 14 s 340 ms	< 00 m 14 s 340 ms to 00 m 13 s 600 ms	< 00 m 13 s 600 ms to 00 m 12 s 720 ms
6	< 00 m 22 s 350 ms to 00 m 17 s 770 ms	< 00 m 17 s 770 ms to 00 m 15 s 640 ms	< 00 m 15 s 640 ms to 00 m 14 s 250 ms	< 00 m 14 s 250 ms to 00 m 13 s 620 ms	< 00 m 13 s 620 ms to 00 m 12 s 970 ms	< 00 m 12 s 970 ms to 00 m 11 s 190 ms
7	< 00 m 19 s 930 ms to 00 m 16 s 380 ms	< 00 m 16 s 380 ms to 00 m 14 s 630 ms	< 00 m 14 s 630 ms to 00 m 13 s 450 ms	< 00 m 13 s 450 ms to 00 m 12 s 910 ms	< 00 m 12 s 910 ms to 00 m 11 s 350 ms	< 00 m 11 s 350 ms to 00 m 10 s 660 ms
8	< 00 m 18 s 410 ms to 00 m 15 s 530 ms	< 00 m 15 s 530 ms to 00 m 14 s 40 ms	< 00 m 14 s 40 ms to 00 m 13 s 10 ms	< 00 m 13 s 10 ms to 00 m 12 s 530 ms	< 00 m 12 s 530 ms to 00 m 11 s 30 ms	< 00 m 11 s 30 ms to 00 m 10 s 410 ms

Flamingo Balance Test

Boys

Age	L1 (Work Harder)	L2 (Must Improve)	L3 (Can do Better)	L4 (Good)	L5 (Very Good)	L6 (Athletic)
5	< 24 times to 18 times	< 18 times to 13 times	< 13 times to 10 times	< 10 times to 9 times	< 9 times to 7 times	< 7 times to 5 times
6	< 25 times to 18 times	< 18 times to 14 times	< 14 times to 10 times	< 10 times to 8 times	< 8 times to 7 times	< 7 times to 5 times
7	< 26 times to 18 times	< 18 times to 14 times	< 14 times to 10 times	< 10 times to 8 times	< 8 times to 7 times	< 7 times to 4 times
8	< 26 times to 18 times	< 18 times to 14 times	< 14 times to 10 times	< 10 times to 8 times	< 8 times to 7 times	< 7 times to 5 times

Girls

Age	L1 (Work Harder)	L2 (Must Improve)	L3 (Can do Better)	L4 (Good)	L5 (Very Good)	L6 (Athletic)
5	< 23 times to 17 times	< 17 times to 13 times	< 13 times to 10 times	< 10 times to 8 times	< 8 times to 7 times	< 7 times to 5 times
6	< 23 times to 17 times	< 17 times to 13 times	< 13 times to 10 times	< 10 times to 8 times	< 8 times to 7 times	< 7 times to 5 times
7	< 23 times to 17 times	< 17 times to 13 times	< 13 times to 10 times	< 10 times to 8 times	< 8 times to 7 times	< 7 times to 5 times
8	< 24 times to 17 times	< 17 times to 13 times	< 13 times to 10 times	< 10 times to 8 times	< 8 times to 7 times	< 7 times to 5 times

Abdominal/Core strength- Partial Curl-up

Boys

Age	L1 (Work Harder)	L2 (Must Improve)	L3 (Can do Better)	L4 (Good)	L5 (Very Good)	L6 (Athletic)	L7 (Sports Fit)
9	> 9 times to 13 times	> 13 times to 13 times	> 13 times to 18 times	> 18 times to 20 times	> 20 times to 21 times	> 21 times to 23 times	> 23 times
10	> 11 times to 15 times	> 15 times to 15 times	> 15 times to 20 times	> 20 times to 22 times	> 22 times to 23 times	> 23 times to 25 times	> 25 times
11	> 13 times to 16 times	> 16 times to 16 times	> 16 times to 22 times	> 22 times to 23 times	> 23 times to 24 times	> 24 times to 26 times	> 26 times
12	> 14 times to 16 times	> 16 times to 16 times	> 16 times to 22 times	> 22 times to 24 times	> 24 times to 25 times	> 25 times to 27 times	> 27 times
13	> 14 times to 18 times	> 18 times to 18 times	> 18 times to 23 times	> 23 times to 24 times	> 24 times to 26 times	> 26 times to 28 times	> 28 times
14	> 15 times to 19 times	> 19 times to 19 times	> 19 times to 24 times	> 24 times to 25 times	> 25 times to 27 times	> 27 times to 29 times	> 29 times
15	> 17 times to 20 times	> 20 times to 20 times	> 20 times to 25 times	> 25 times to 26 times	> 26 times to 28 times	> 28 times to 30 times	> 30 times
16	> 18 times to 20 times	> 20 times to 20 times	> 20 times to 26 times	> 26 times to 27 times	> 27 times to 29 times	> 29 times to 30 times	> 30 times
17	> 18 times to 22 times	> 22 times to 22 times	> 22 times to 27 times	> 27 times to 28 times	> 28 times to 29 times	> 29 times to 31 times	> 31 times
18	> 18 times to 21 times	> 21 times to 21 times	> 21 times to 28 times	> 28 times to 29 times	> 29 times to 30 times	> 30 times to 31 times	> 31 times

Girls

Age	L1 (Work Harder)	L2 (Must Improve)	L3 (Can do Better)	L4 (Good)	L5 (Very Good)	L6 (Athletic)	L7 (Sports Fit)
9	> 9 times to 13 times	> 13 times to 13 times	> 13 times to 18 times	> 18 times to 19 times	> 19 times to 21 times	> 21 times to 23 times	> 23 times
10	> 10 times to 14 times	> 14 times to 14 times	> 14 times to 19 times	> 19 times to 20 times	> 20 times to 22 times	> 22 times to 24 times	> 24 times
11	> 11 times to 15 times	> 15 times to 15 times	> 15 times to 20 times	> 20 times to 21 times	> 21 times to 22 times	> 22 times to 24 times	> 24 times
12	> 12 times to 15 times	> 15 times to 15 times	> 15 times to 20 times	> 20 times to 21 times	> 21 times to 23 times	> 23 times to 24 times	> 24 times
13	> 12 times to 15 times	> 15 times to 15 times	> 15 times to 20 times	> 20 times to 21 times	> 21 times to 23 times	> 23 times to 24 times	> 24 times
14	> 12 times to 16 times	> 16 times to 16 times	> 16 times to 20 times	> 20 times to 21 times	> 21 times to 23 times	> 23 times to 24 times	> 24 times
15	> 13 times to 16 times	> 16 times to 16 times	> 16 times to 21 times	> 21 times to 22 times	> 22 times to 23 times	> 23 times to 25 times	> 25 times
16	> 13 times to 16 times	> 16 times to 16 times	> 16 times to 21 times	> 21 times to 22 times	> 22 times to 23 times	> 23 times to 25 times	> 25 times
17	> 13 times to 17 times	> 17 times to 17 times	> 17 times to 21 times	> 21 times to 22 times	> 22 times to 23 times	> 23 times to 25 times	> 25 times
18	> 14 times to 16 times	> 16 times to 16 times	> 16 times to 21 times	> 21 times to 22 times	> 22 times to 24 times	> 24 times to 25 times	> 25 times

Muscular Endurance

Push-Up for Boys

Age	L1 (Work Harder)	L2 (Must Improve)	L3 (Can do Better)	L4 (Good)	L5 (Very Good)	L6 (Athletic)	L7 (Sports Fit)
9	> 4 times to 5 times	> 5 times to 6 times	> 6 times to 7 times	> 7 times to 8 times	> 8 times to 9 times	> 9 times to 10 times	> 10 times
10	> 5 times to 6 times	> 6 times to 7 times	> 7 times to 8 times	> 8 times to 9 times	> 9 times to 10 times	> 10 times to 11 times	> 11 times
11	> 6 times to 7 times	> 7 times to 8 times	> 8 times to 9 times	> 9 times to 10 times	> 10 times to 11 times	> 11 times to 13 times	> 13 times
12	> 7 times to 8 times	> 8 times to 9 times	> 9 times to 10 times	> 10 times to 11 times	> 11 times to 13 times	> 13 times to 13 times	> 15 times
13	> 9 times to 9 times	> 9 times to 10 times	> 10 times to 11 times	> 11 times to 13 times	> 13 times to 13 times	> 15 times to 15 times	> 16 times
14	> 9 times to 10 times	> 10 times to 11 times	> 11 times to 13 times	> 13 times to 15 times	> 15 times to 16 times	> 16 times to 17 times	> 17 times
15	> 15 times to 15 times	> 15 times to 17 times	> 17 times to 19 times	> 19 times to 21 times	> 21 times to 23 times	> 23 times to 28 times	> 28 times
16	> 15 times to 17 times	> 17 times to 17 times	> 19 times to 21 times	> 21 times to 23 times	> 23 times to 28 times	> 26 times to 33 times	> 33 times
17	> 17 times to 19 times	> 19 times to 21 times	> 21 times to 23 times	> 23 times to 28 times	> 28 times to 33 times	> 33 times to 37 times	> 37 times
18	> 19 times to 21 times	> 21 times to 23 times	> 23 times to 28 times	> 28 times to 33 times	> 33 times to 37 times	> 37 times to 43 times	> 43 times

Modified Push-Up for Girls

Age	L1 (Work Harder)	L2 (Must Improve)	L3 (Can do Better)	L4 (Good)	L5 (Very Good)	L6 (Athletic)	L7 (Sports Fit)
9	> 3 times to 4 times	> 4 times to 6 times	> 6 times to 7 times	> 7 times to 7 times	> 7 times to 8 times	> 8 times to 8 times	> 8 times
10	> 4 times to 6 times	> 6 times to 7 times	> 7 times to 7 times	> 7 times to 8 times	> 8 times to 8 times	> 8 times to 9 times	> 9 times
11	> 6 times to 7 times	> 7 times to 7 times	> 7 times to 8 times	> 8 times to 8 times	> 8 times to 9 times	> 9 times to 10 times	> 10 times
12	> 7 times to 7 times	> 7 times to 8 times	> 8 times to 8 times	> 8 times to 9 times	> 9 times to 10 times	> 10 times to 12 times	> 12 times
13	> 7 times to 8 times	> 8 times to 8 times	> 8 times to 9 times	> 9 times to 10 times	> 10 times to 12 times	> 12 times to 14 times	> 14 times
14	> 10 times to 11 times	> 11 times to 13 times	> 13 times to 15 times	> 15 times to 16 times	> 16 times to 17 times	> 17 times to 19 times	> 19 times
15	> 11 times to 13 times	> 13 times to 15 times	> 15 times to 16 times	> 16 times to 17 times	> 17 times to 19 times	> 19 times to 21 times	> 21 times
16	> 13 times to 15 times	> 15 times to 16 times	> 16 times to 17 times	> 17 times to 19 times	> 19 times to 21 times	> 21 times to 22 times	> 22 times
17	> 15 times to 16 times	> 16 times to 17 times	> 17 times to 19 times	> 19 times to 21 times	> 21 times to 22 times	> 22 times to 24 times	> 24 times
18	> 16 times to 17 times	> 17 times to 19 times	> 19 times to 21 times	> 21 times to 22 times	> 22 times to 24 times	> 24 times to 27 times	> 27 times

Flexibility Test- Sit and Reach

Boys

Age	L1 (Work Harder)	L2 (Must Improve)	L3 (Can do Better)	L4 (Good)	L5 (Very Good)	L6 (Athletic)	L7 (Sports Fit)
9	> 6.00 cm to 10.70 cm	> 10.70 cm to 14.40 cm	> 14.40 cm to 17.60 cm	> 17.60 cm to 19.40 cm	> 19.40 cm to 21.40 cm	> 21.40 cm to 26.80 cm	> 26.80 cm
10	> 6.00 cm to 10.80 cm	> 10.80 cm to 14.40 cm	> 14.40 cm to 17.70 cm	> 17.70 cm to 19.40 cm	> 19.40 cm to 21.50 cm	> 21.50 cm to 26.90 cm	> 26.90 cm
11	> 6.00 cm to 10.80 cm	> 10.80 cm to 14.40 cm	> 14.40 cm to 17.70 cm	> 17.70 cm to 19.40 cm	> 19.40 cm to 21.50 cm	> 21.50 cm to 26.90 cm	> 26.90 cm
12	> 6.00 cm to 10.80 cm	> 10.80 cm to 14.50 cm	> 14.50 cm to 17.80 cm	> 17.80 cm to 19.60 cm	> 19.60 cm to 21.70 cm	> 21.70 cm to 27.10 cm	> 27.10 cm
13	> 6.10 cm to 11.10 cm	> 11.10 cm to 14.80 cm	> 14.80 cm to 18.20 cm	> 18.20 cm to 20.00 cm	> 20.00 cm to 22.20 cm	> 22.20 cm to 27.70 cm	> 27.70 cm
14	> 6.70 cm to 12.10 cm	> 12.10 cm to 16.20 cm	> 16.20 cm to 19.90 cm	> 19.90 cm to 21.90 cm	> 21.90 cm to 24.20 cm	> 24.20 cm to 30.30 cm	> 30.30 cm
15	> 7.70 cm to 13.70 cm	> 13.70 cm to 18.30 cm	> 18.30 cm to 22.40 cm	> 22.40 cm to 24.60 cm	> 24.60 cm to 27.20 cm	> 27.20 cm to 34.00 cm	> 34.00 cm
16	> 8.40 cm to 14.60 cm	> 14.60 cm to 19.30 cm	> 19.30 cm to 23.60 cm	> 23.60 cm to 25.90 cm	> 25.90 cm to 28.60 cm	> 28.60 cm to 35.60 cm	> 35.60 cm
17	> 9.10 cm to 15.50 cm	> 15.50 cm to 20.40 cm	> 20.40 cm to 24.80 cm	> 24.80 cm to 27.20 cm	> 27.20 cm to 30.00 cm	> 30.00 cm to 37.20 cm	> 37.20 cm
18	> 9.10 cm to 15.50 cm	> 15.50 cm to 19.30 cm	> 19.30 cm to 24.80 cm	> 24.80 cm to 27.30 cm	> 27.30 cm to 30.20 cm	> 30.20 cm to 37.40 cm	> 37.40 cm

Girls

Age	L1 (Work Girls k Harder)	L2 (Must Improve)	L3 (Can do Better)	L4 (Good)	L5 (Very Good)	L6 (Athletic)	L7 (Sports Fit)
9	> 7.90 cm to 13.10 cm	> 13.10 cm to 16.90 cm	> 16.90 cm to 20.30 cm	> 20.30 cm to 22.10 cm	> 22.10 cm to 24.20 cm	> 24.20 cm to 29.60 cm	> 29.60 cm
10	> 8.50 cm to 13.70 cm	> 13.70 cm to 17.50 cm	> 17.50 cm to 20.90 cm	> 20.90 cm to 22.70 cm	> 22.70 cm to 24.80 cm	> 24.80 cm to 30.10 cm	> 30.10 cm
11	> 9.40 cm to 14.50 cm	> 14.50 cm to 18.40 cm	> 18.40 cm to 21.70 cm	> 21.70 cm to 23.50 cm	> 23.50 cm to 25.60 cm	> 25.60 cm to 31.00 cm	> 31.00 cm
12	> 10.60 cm to 15.80 cm	> 15.80 cm to 19.70 cm	> 19.70 cm to 23.10 cm	> 23.10 cm to 24.90 cm	> 24.90 cm to 27.10 cm	> 27.10 cm to 32.50 cm	> 32.50 cm
13	> 11.90 cm to 17.30 cm	> 17.30 cm to 21.30 cm	> 21.30 cm to 24.80 cm	> 24.80 cm to 26.70 cm	> 26.70 cm to 28.90 cm	> 28.90 cm to 34.40 cm	> 34.40 cm
14	> 13.10 cm to 18.60 cm	> 18.60 cm to 22.70 cm	> 22.70 cm to 26.30 cm	> 26.30 cm to 28.20 cm	> 28.20 cm to 30.40 cm	> 30.40 cm to 36.10 cm	> 36.10 cm
15	> 13.90 cm to 19.50 cm	> 19.50 cm to 23.60 cm	> 23.60 cm to 27.20 cm	> 27.20 cm to 29.10 cm	> 29.10 cm to 31.30 cm	> 31.30 cm to 37.00 cm	> 37.00 cm
16	> 14.40 cm to 20.00 cm	> 20.00 cm to 24.10 cm	> 24.10 cm to 27.60 cm	> 27.60 cm to 29.50 cm	> 29.50 cm to 31.80 cm	> 31.80 cm to 37.50 cm	> 37.50 cm
17	> 14.70 cm to 20.30 cm	> 20.30 cm to 24.40 cm	> 24.40 cm to 27.90 cm	> 27.90 cm to 29.80 cm	> 29.80 cm to 32.10 cm	> 32.10 cm to 37.80 cm	> 37.80 cm
18	> 14.90 cm to 20.70 cm	> 20.70 cm to 24.70 cm	> 24.70 cm to 28.20 cm	> 28.20 cm to 30.00 cm	> 30.00 cm to 32.30 cm	> 32.30 cm to 38.00 cm	> 38.00 cm

Cardiovascular Endurance

Aerobic Fitness:

After your step test, check where your heart rate falls

BOYS

Age (Years)	Percentile									
	5 th	10 th	15 th	25 th	50 th	75 th	85 th	90 th	95 th	
6.0	95	97	100	104	111	120	125	129	137	
6.5	94	97	99	103	110	120	125	128	135	
7.0	92	96	97	102	109	119	124	128	133	
7.5	96	99	102	107	117	132	139	140	145	
8.0	97	100	104	107	118	128	135	138	145	
8.5	97	101	104	108	118	129	136	141	148	
9.0	97	100	103	108	118	130	137	142	148	
9.5	96	98	103	108	118	129	136	140	148	
10.0	92	96	100	104	116	127	135	139	147	
10.5	91	96	97	104	116	128	135	140	147	
11.0	91	95	98	103	114	126	134	138	146	
11.5	92	100	100	104	117	129	135	140	148	
12.0	91	95	97	104	116	130	137	142	150	
12.5	92	97	98	104	115	129	138	143	149	
Total	93	97	100	104	113	124	131	136	144	

GIRLS

Age (Years)	Percentile									
	5 th	10 th	15 th	25 th	50 th	75 th	85 th	90 th	95 th	
6.0	99	103	105	110	118	127	134	137	143	
6.5	100	103	104	109	117	127	134	139	145	
7.0	98	101	104	108	116	126	132	137	145	
7.5	102	105	109	116	127	138	143	150	158	
8.0	102	107	110	116	127	139	146	150	154	
8.5	101	106	110	116	126	137	145	149	156	
9.0	101	107	109	114	125	138	144	149	154	
9.5	100	103	107	114	127	141	148	154	160	
10.0	103	104	110	115	127	137	142	147	153	
10.5	101	104	108	114	126	139	145	149	156	
11.0	103	107	111	116	129	140	145	150	155	
11.5	101	106	111	118	129	141	148	152	157	
12.0	103	108	111	116	129	142	150	155	160	
12.5	103	106	110	116	129	144	150	154	161	
Total	100	104	107	112	122	135	142	147	154	

Fitness Category of Heart Rate Scores After Step Exercise

The faster your heart rate drops after exercise the fitter you are

Fitness Category	HR Percentiles	Boys HR (6-9 years)	Boys HR (10-12 years)	Girls HR (6-9 years)	Girls HR (10-12 years)
Excellent	< 5 th	< 95	<93	<100	<102
Very Good	<25 th	95-106	93-105	100-113	102-116
Good	< 50 th	107-115	106-116	114-123	117-128
Sufficient	< 75 th	116-126	117-128	124-135	129-141
Poor	< 95 th	127-142	129-147	135-152	142-157
Very Poor	>95 th	>142	>147	>152	>157

HR: Heart rate

Key Messages

- Movement medicine is crucial for growing bodies with varied advantages.
- Protein supplements are not recommended routinely for children and adolescents, unless medically indicated, and they should only complement, not replace, a balanced diet.
- Surveillance for red flags enables early detection of potential problems.

Suggested Reading

- Nery M, Sequeira I, Neto C, Rosado A. Movement, play, and games—an essay about youth sports and its benefits for human development. *Healthcare (Basel)*. 2023;11(4):493. doi:10.3390/healthcare11040493
- Bremer E, Cairney J. Fundamental movement skills and health-related outcomes: a narrative review of longitudinal and intervention studies targeting typically developing children. *Am J Lifestyle Med*. 2018;12(2):148-159. doi:10.1177/1559827616640196
- Indian Academy of Pediatrics. *Indian Academy of Pediatrics (IAP) Guidelines for Parents: Guidelines on Normal Sleep and Physical Activity*. IAP Action Plan 2020–2021. Indian Academy of Pediatrics; 2021. Accessed June 29, 2026. <https://iapindia.org/pdf/Guidelines-for-Normal-Sleep-and-Physical-Activity.pdf>
- Beltre G, Mendez MD. Child development. In: *StatPearls* [Internet]. Treasure Island, FL: StatPearls Publishing; Updated November 13, 2023. Published January 2025. Accessed June 29, 2026. Available at: <https://www.ncbi.nlm.nih.gov/books/NBK564386/>
- Rice SG; American Academy of Pediatrics Council on Sports Medicine and Fitness. Medical conditions affecting sports participation. *Pediatrics*. 2008;121(4):841-848. doi:10.1542/peds.2008-0080
- Ministry of Youth Affairs and Sports, Government of India; Sports Authority of India. *Fit India*. Published 2020. Accessed July 10, 2026. <https://fitindia.gov.in>





IAP PEDIATRIC PRACTICE GUIDELINES

IAP Presidential Action Plan 2026

Neelam Mohan
National President, IAP 2026

Core Academic and Executive Team:
Geeta Patil | Prashant Kariya | Narmada Ashok | Gaurav Gupta

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Food Adulteration: Can We Test it at Home?

12

Authors: Deepak Pande, Upendra Kinjawadekar, Rekha Harish

Introduction

- Food adulteration is the addition to, or removal from, food of any substance that alters its natural composition or quality.
- It may occur intentionally for financial gain or unintentionally because of poor handling, storage, packaging, or environmental contamination.
- It is a common and widespread issue in India.
- Food Safety and Standards Authority of India (FSSAI), has reported the rate of food adulteration to have increased from 13% in 2011–12 to 23% in 2016–17 and 26.4% in 2018–19.
- Population growth, rising demand, limited enforcement, and low consumer awareness may all contribute to this problem.
- Any food item, whether raw or processed, is prone to adulteration.
- Staples such as milk and dairy products including paneer are frequently cited among the foods most often adulterated. Spices, oils, groundnut paste, and honey are also common targets.

Hazards of Food Adulteration

- Adulterated food is impure, unsafe, and unwholesome.
- Adulteration can lower nutritional value, cause nutrient deficiencies, poisoning, digestive disorders, allergic reactions, endocrine disruption, and other acute or chronic health problems.
- Long-term exposure to certain adulterants may contribute to damage to the nervous system, developmental impairment, and chronic diseases involving the liver, kidneys, or the cardiovascular system. Some adulterants may also increase cancer risk depending on the nature and duration of exposure.
- Children and adolescents are more vulnerable than adults to both short-term and long-term harm from food adulteration and toxins.

Major Types of Food Adulteration

- Adulteration can result from-
 - addition of inferior or cheaper ingredients
 - substitution of valuable ingredients
 - use of prohibited substances, synthetic dyes or excessive preservatives
 - sale of decomposed food.
- Mislabeling or misbranding can replicate or compound the risks of adulteration.
- Unintentional adulteration may result from inadequate facilities, poor storage hygiene, contamination with toxic chemicals such as excessive pesticide residues or inappropriate food handling and packaging practices.

Some common categories of food adulteration are-

- **Intentional adulteration:** Addition of substances such as adding water to milk, or substituting real paneer with an analogue made from starch, vegetable oils etc. without any dairy product, and projecting it as the real paneer
- **Incidental adulteration:** During production, transport, or storage, accidental contamination such as with pesticide residues or insect infestation
- **Metal contamination:** Harmful metals such as lead or arsenic appearing in the food as a result of equipment, processing, or environmental contamination
- **Biological contamination:** Introduction of microbes, parasites, or spoilage organisms that can cause foodborne disease.

Detection in Different Settings

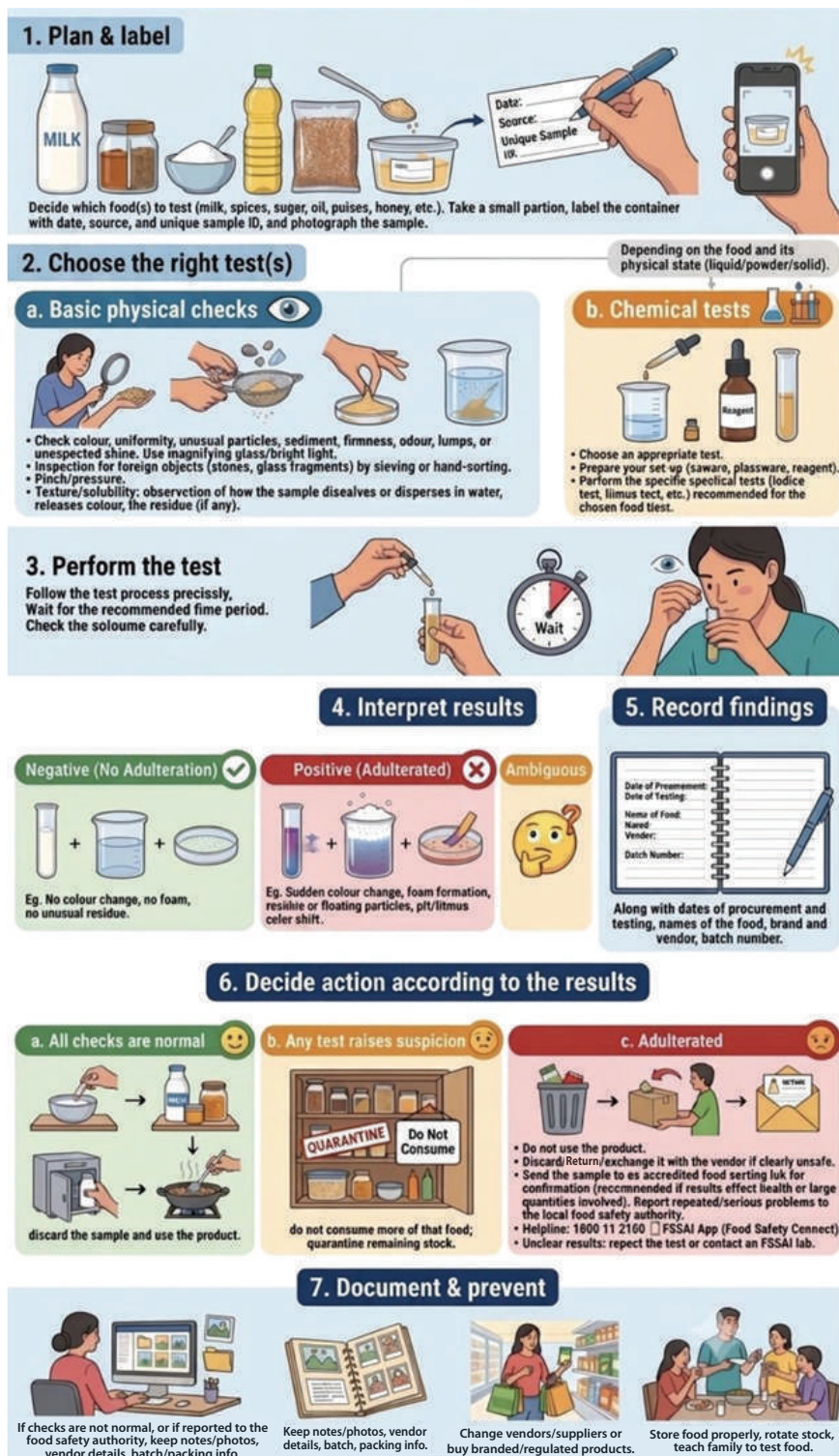
Suspected adulteration can be detected in the following two settings:

- **Household tests:** Simple, home-based fairly reliable screening tests that can be done safely and quickly, using inexpensive material that can be easily procured in any household
 - **Visual inspection:** Looking for unusual color, texture, odor, or foreign particles
 - **Chemical tests:** Use of specific reagents to detect selected adulterants
- **Advanced analytical methods:** Laboratory techniques such as chromatography, spectroscopy, mass spectrometry, enzyme-linked immunosorbent assay (ELISA), and DNA-based tests; these are more precise but often expensive and time-consuming.

Importance of Testing at Home

- Regulatory measures alone cannot ensure food safety, as enforcement is challenging. Prevention requires a combination of laws, education, responsible practices, and consumer awareness
- Home testing improves consumer awareness, encourages accountability among manufacturers and vendors, and supports official food-safety measures
- Home tests are useful for preliminary screening, and can help consumers identify suspicious products before consumption and may reduce risk when used as a preliminary screening approach.

Figure 1. Steps of testing at home for common food adulterants



Simple Home Tests for Common Adulterants

Home testing methods are available for several common adulterants of various commonly used foods. Short outlines of some such tests are presented in Table 1.

Table 1. Home testing methods for several common adulterants

FOOD	TEST(S)	METHOD
Milk	Water test	Place a drop of milk on a polished or slanted surface. Milk that flows quickly without leaving a white trail may have reduced viscosity and may be diluted with water
	Starch test	Boil the milk, allow it to cool, and add 2–3 drops of iodine solution. A blue color suggests the presence of starch
	Detergent test	Shake equal parts milk and water vigorously. Dense, persistent foam or lather may suggest detergent contamination
	Urea test	Add soybean or arhar powder to the milk, wait 5 minutes, and then dip red litmus paper into the mixture. A change of the litmus paper to blue may suggest the presence of urea
Paneer	Label check	Review the ingredients list on packaged paneer. The presence of vegetable oil, starch, or emulsifiers may indicate analogue or processed paneer rather than natural paneer
	Texture and taste test	A rubbery texture, unusual firmness, or a chemical or bitter aftertaste may suggest poor quality or adulteration

	Iodine test	Add iodine solution to a paneer sample. A blue-black color suggests starch adulteration
	Frying test	Heat paneer in a pan. Excessive melting or unusual behavior may suggest adulteration or poor-quality composition
Turmeric Powder	Artificial-colour test	Add turmeric powder to warm water. Rapid release of bright yellow color into the water may suggest added synthetic dyes such as metanil yellow
Chili Powder	Brick powder or sand test	Sprinkle chili powder in water. Gritty sediment may indicate brick powder or sand, while a soapy feel may suggest soapstone
Saffron	Water test	Soak saffron strands in warm water. Rapid release of intense color may suggest dyed material
Black Pepper	Crushing test	Press peppercorns between the fingers. Easy crushing may indicate papaya seeds or other substitutes
Ghee	Starch test	Melt the ghee and add iodine solution. A blue color suggests starch or mashed potato adulteration
Honey	Sugar syrup test	Place a drop of honey on blotting paper. Rapid spreading or absorption may suggest added sugar syrup or excess moisture, although this is only a rough screening test
Green Vegetables	Colour test	Rub the vegetable on moist white paper. A green stain on the paper may indicate artificial coloring, such as malachite green

Salt	Chalk test	Dissolve salt in water. A white haze or sediment may suggest chalk adulteration
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Limitations of Home Testing

- The tests are qualitative screening tools only—not definitive, quantitative, or free of false positives/negatives. They are not confirmatory.
- Results of home testing depend on technique, concentration of the adulterant(s), natural variation in the food, and observer judgment.
- Natural variations may mimic adulteration, so home testing can yield false-positive or false-negative results, and a negative result does not guarantee purity.
- Each home test detects only the specific adulterants tested for, and may miss others.
- Laboratory confirmation is essential, especially for hazardous adulterants such as formalin, lead compounds, lead chromate, or tri-ortho-cresyl phosphate (TOCP), and for any regulatory or health decision.
- Many advanced adulterants evade simple home checks.

Key Messages

- Food adulteration is a significant public-health issue in India and commonly affects staple foods as well as many other commonly used food products.
- Children and adolescents are more vulnerable than adults to its harmful effects.
- Consumers should learn simple ways to identify adulterated foods, adopt safe purchasing habits, and report suspected adulteration when necessary.
- Preference should be given to FSSAI-licensed manufacturers and sellers, and labels should always be checked carefully.
- Low-cost home tests are useful for awareness and preliminary screening of some common adulterants, but they are not substitutes for laboratory analysis.
- For confirmation, especially in the case of hazardous adulterants, samples should be sent to an FSSAI-notified laboratory.
- Food-safety education should begin early and be made a mandatory part of STEM activities in schools, so that children can be empowered to safeguard themselves from the huge risks of food adulteration.

Suggested Reading

- Food Safety and Standards Authority of India. *Detect Adulteration with Rapid Test (DART): A Book on Some Common Quick Tests for Detection of Common Food Adulterants at Household*. Ministry of Health and Family Welfare, Government of India; 2017. Accessed June 29, 2026. Available at: <https://eatrightindia.gov.in/dart>
- Food Safety and Standards Authority of India. *Manual for Food Safety Officers*. 3rd ed. New Delhi, India: Food Safety and Standards Authority of India; March 2024. Accessed June 29, 2026. Available at: https://www.fssai.gov.in/upload/knowledge_hub/7729566bb3f339ffbdFSO%20Manual%20final-8%20web.pdf
- Singh A, Kaur R, Kaur S. Awareness and understanding of adulteration in common household kitchen items: a study in rural communities. *J Family Med Prim Care*. 2025;14(4):1403-1408. doi:10.4103/jfmpc.jfmpc_1824_24
- Anagaw YK, Ayenew W, Limenh LW, et al. Food adulteration: Causes, risks, and detection techniques-review. *SAGE Open Med*. 2024;12:20503121241250184. doi:10.1177/20503121241250184
- Fernandes GS, Manjunatha G. Food forensics: detection of hidden toxins present in common household consumables. *J Forensic Sci Criminol Investig*. 2018;10(4):555791. doi:10.19080/JFSCI.2018.10.555791



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Accident-Free Childhood — Tips and Tricks for All Ages

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Authors: Deepa Janardhanan, Ranjith P

Introduction

- Childhood injuries pose a serious **public health challenge** globally, especially in low- and middle-income countries like India.
- Injuries remain a leading cause of **mortality and long-term disability** for children aged 0–19 years, despite improvements in healthcare access.
- Unintentional injuries account for approximately **3.5 million global emergency visits** annually, often occurring in preventable circumstances.

Prevention of Childhood Accidents

Age-wise Practical Tips (Birth→19 years)

Birth–12 months

- Follow safe-sleep guidelines strictly: supine sleep, firm mattress, no loose bedding or soft toys
- Prevent falls by avoiding beds/sofas for diaper changes; always use low, safe surfaces
- Use rear-facing car seat from birth; verify correct installation at each visit
- Prevent scalds by keeping hot drinks away while holding the baby; regulate geyser temperature
- Choking prevention: avoid nuts, small toys, and ensure age-appropriate feeding consistency
- Baby cot safety: Side grills should be sturdy and have gaps that are narrow enough to prevent tiny limbs from getting stuck.

1–4 Years (Toddlers)

- Install safety gates at stairs and ensure window grills are childproof
- Supervise constantly near buckets, tubs, ponds; keep containers empty when not in use
- Anchor heavy furniture and secure televisions to prevent tip-over injuries
- Store medicines, detergents, oils, and sharps in locked cupboards

- Use helmets for tricycles/scooters and ensure indoor play areas are clutter-free
- **Electrocution Prevention:** Secure all electrical outlets with covers and unplug devices when not in use
- **Toy Safety:** Select only Bureau of Indian Standards (BIS)-certified, age-appropriate toys; strictly avoid toys with small parts for children under 3 to prevent choking and ocular injuries
- **Charger Safety:** Keep all cables and adapters plugged into high, unreachable outlets or secure inside protective covers to prevent choking, strangulation, or electric burns.

5–8 Years (Young Children)

- Teach road rules: walk on the right side, cross at zebra crossings, avoid distractions
- Promote supervised outdoor play in safe playgrounds with shock-absorbing surfaces
- Teach early water-safety skills; supervise during swimming or water-based activities
- Discourage unsafe climbing behaviours (trees, compound walls, terraces)
- **Projectile Play:** Avoid high-risk toys like toy guns or darts which cause craniofacial and ocular injuries such as corneal abrasions or fractures
- **Protective Gear:** Ensure children use protective eyewear during play involving projectile toys.

9–12 Years (Preteens)

- Encourage safe cycling—helmet use, reflective clothing, avoiding traffic-dense routes
- Monitor safe technology use: avoidance of earphones while walking on roads
- Provide structured sports training to reduce musculoskeletal injuries
- Educate regarding firecracker safety and appropriate handling of appliances
- Discourage risky dares or peer-pressured stunts
- **Electrical Awareness:** Educate children on the dangers of household appliances, particularly during summer months when hospitalisation rates for electrical injuries peak.

13–19 Years (Teenagers)

- Enforce safe two-wheeler practices: BIS-certified helmet, no racing, no overspeeding
- Strictly enforce the minimum driving age of 18; based on the Ministry of Road Transport and Highways, Government of India report 2023-24, road accidents caused by minors averaged 16 daily
- Discourage mobile phone use while driving or crossing roads
- Educate on substance-related injury risks including impaired driving
- Promote first-aid training, CPR awareness, and knowledge of emergency helpline 112
- Encourage safe social behaviour, especially during festivals, travel, and sports events.

Key Statistics and Impact

Figure 1. Key drivers for childhood injuries in India



General Guidelines for Schools

- **School Bag Weight:** School bag weight should not be more than 10% of the child's body weight. Heavy bags can lead to back pain and posture issues
- **School Furniture:** Desks and chairs should be adjustable and ergonomic to support proper posture
- **School Sports Equipment:** Regular checks and maintenance are crucial to prevent injuries

- **School Transport Safety:** Buses should have seat belts, speed governors, and trained drivers. Regular safety drills are a must
- **Fire safety in schools:** Proactive prevention, regular evacuation drills, and maintenance of life-saving equipment to ensure a secure environment for students and staff
- **First Aid and Transport of Injured Child:** Every school should have a first aid kit and a clear protocol for emergencies
- **Training for Basic Life Support (BLS):** Essential for teachers, staff, and student cadets to respond effectively in emergencies
- **Safety Measures for Disabled Children:** Ramps, accessible toilets, and adapted sports equipment can make a big difference.

Figure 2. CBSE 2017 Guidelines for safety in school buses



GPS: Global Positioning System; CCTV: Closed-circuit television CBSE: Central Board of Secondary Education, 2017

Table 1. Common injury types and preventive actions

Injury	Typical Settings	Prevention
Road traffic injuries	Urban/rural roads; adolescents	Teach traffic rules Ensure the use of car seatbelts and helmets for two-wheelers Comply with pillion safety measures speed regulation Enforce minimum driving age
Drowning	Rural areas; open wells; buckets Urban areas; bath tub	Barriers, empty containers, swimming lessons, caregiver supervision
Falls	Homes, playgrounds, schools, selfie-points	Window grills, to keep furniture away from the window to prevent children from climbing onto the windows Edge protectors – to apply soft guards at the sharp edges of the sofas, shock-absorbent flooring, hazard removal, safe stairs, non-slip mats near bathrooms
Burns	Kitchens, festivals	Safe cooking zones, firecracker awareness
Poisoning	Homes with unlocked storage	Locked cabinets, child-resistant caps, correct labelling
Electrocution	Homes; near chargers/e-vehicles	BIS-compliant wiring, securing outlets, and supervising play near battery-powered devices
Toy Injuries	Homes; play areas	Use age appropriate toys. In toddler's, avoid toys with small parts that can be a choking hazard Use of BIS-certified toys, discarding damaged items, and using protective eyewear for projectiles Avoid baby walkers

BIS: Bureau of Indian Standards

Quick Checklist for Paediatricians

- Discuss about home environment for falls, burns, drowning, and poisoning risks
- Review transport safety: helmets, seatbelts, car seats
- Discuss age-appropriate supervision levels
- Promote safe technology and sports habits
- Offer anticipatory guidance and printed safety materials
- Document safety counselling at each age transition
- Create community awareness.

First Aid

- Ensure the scene is safe before approaching the child
- Check responsiveness and breathing; call emergency services (112) immediately if unresponsive
- Control bleeding by applying firm direct pressure with a clean cloth
- For burns, cool the affected area under cool running water for 20 minutes; avoid applying ice or home remedies
- Immobilise suspected fractures using a splint or soft padding to prevent further injury
- Spinal Safety: Stabilise the child with neck and spine injuries, by immobilising the head and neck with a splint or soft padding to prevent movement, ensuring they remain in a neutral position while being transported rapidly to a medical facility
- For choking in children >1 year, give alternating back blows and abdominal thrusts; for infants, use back blows and chest thrusts
- Monitor for red-flag signs such as vomiting, drowsiness, seizures, difficulty breathing, or worsening pain
- Ensure rapid and safe transport to the nearest medical facility after administering first aid.

Algorithm 1. Initial approach to childhood injuries in India



CPR: Cardiopulmonary resuscitation

Way Forward

- Inclusion of accidents prevention interventions in school health programs
- Celebration of special day on the theme of accident prevention.

Health Promoting Schools

As per WHO Health Promoting Schools (HPS) should have a formal commitment to school safety and health as a policy

- Environment: Safe physical infrastructure and inclusive social climates
- Curriculum: Skill-based health education (e.g., first aid)
- Services: Access to emergency protocols and BLS
- Community: Active parent and local engagement
- Indian Academy of Pediatrics National Childhood Diabetes Prevention and Awareness (IAP-NCDPA) have proposed a ten point accreditation plan for practical implementation of HPS in our country.

Guidelines for Accident Prevention in Schools and Community Areas

School-Based Educational Interventions

- **Guideline:** Schools should implement structured, culturally adapted safety education modules (such as the Burns Awareness, Prevention, and First Aid for School children (BAPFAS) program or Indian Council of Medical Research (ICMR)-supported modules) delivered by trained teachers.

Infrastructure and Road Safety in School Zones

- **Guideline:** Priority must be given to environmental modifications around schools, including traffic-calming measures, designated crossings, and speed limits restricted to 30 km/h.

Community-Based Caregiver Training

- **Guideline:** Community health programs must target mothers and primary caregivers to reduce home and community-area injuries, as more than 50% of childhood accidents occur in domestic or immediate community settings.

Burn Prevention and First Aid

- **Guideline:**
 - Specific "Burns Awareness" programs (like BAPFAS) should be integrated into school curricula to address the high incidence of thermal and electrical burns.
 - Teach the "Stop, Drop and Roll" technique and immediate first aid (cooling the burn with running water for 20 minutes) as part of standard physical education.

Sports Safety and Overuse Prevention

- **Guideline:** Community sports programs must include structured warm-up protocols and coach/parent education to prevent gradual-onset "specialisation" injuries.

Key Messages

- Most injuries are preventable, not inevitable.
- Tailor safety to the child's developmental stage.
- Road and water safety are non-negotiable.
- Immediate first aid saves lives.
- Teach children age appropriate measures to save lives.

Suggested Reading

- Nooyi SC, Sonaliya KN, Dhingra B, et al. Descriptive Epidemiology of Unintentional Childhood Injuries in India: An ICMR Taskforce Multisite Study. *Indian Pediatr.* 2021;58(6):517-524.
- National Crime Records Bureau. *Accidental Deaths and Suicides in India 2023*. Ministry of Home Affairs, Government of India. Published September 30, 2025. Accessed February 2026. <https://www.ncrb.gov.in/accidental-deaths-suicides-in-india-ads.html>
- Ministry of Road Transport and Highways. *Road Accidents in India 2023*. Government of India. Published August 24, 2025. Accessed January 2026. <https://morth.gov.in/backend/documents/uploaded/Road-Accident-in-India-2023-Publications.pdf>
- Clinicoetiological profile and outcomes of acute poisoning in children: experience in a tertiary care centre in North India. *Int J Contemp Pediatr.* 2025;12(3):409-415.
- World Health Organization. *World Report on Child Injury Prevention*. Geneva, Switzerland: World Health Organization; 2008. Accessed January 2026. <https://www.who.int/publications/i/item/9789241563574>
- Tse E, Plakitsi K, Voulgaris S, Alexiou GA. The role of a first aid training program for young children: A systematic review. *Children (Basel).* 2023;10(3):431. doi:10.3390/children10030431



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Type 2 Diabetes in Childhood - Burden, Risk Factors, Screening, Prevention, Referral Triggers

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Type 2 Diabetes in Childhood - Burden, Risk Factors, Screening, Prevention, Referral Triggers

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Authors: IPS Kochar, Smita Ramachandran

Introduction

- Diabetes mellitus is a metabolic disorder characterised by impaired carbohydrate metabolism.
- It results in impaired glucose utilisation as an energy source.
- Hyperglycaemia occurs due to increased glucose production through defective regulation of gluconeogenesis and glycaemic management.
- The condition requires continuous care and comprehensive risk-reduction strategies beyond glycaemic management.
- *"Type 2 Diabetes Mellitus (T2DM) in children is a metabolic condition where the body either does not produce enough insulin or cannot use it effectively (insulin resistance), leading to high blood sugar (glucose) levels because sugar can't get into cells for energy. Once considered "adult-onset," it's increasingly seen in youth, often linked to obesity and sedentary lifestyles".*

Definition

- Diagnostic criteria for diabetes in non-pregnant individuals (American Diabetes Association 2025)
- Haemoglobin A1c (HbA1c) $\geq 6.5\%$ (≥ 48 mmol/mol) (Measured in a laboratory using a method certified by the National Glycohemoglobin Standardization Program [NGSP])
OR
- Fasting plasma glucose ≥ 126 mg/dL (≥ 7.0 mmol/L). Fasting is defined as no caloric intake for at least 8 hours
OR
- 2-h plasma glucose ≥ 200 mg/dL (≥ 11.1 mmol/L) during oral glucose tolerance test. Use a glucose load containing the equivalent of 75 g anhydrous glucose in water
OR
- In an individual with classic symptoms of hyperglycaemia or hyperglycaemic crisis, a random plasma glucose ≥ 200 mg/dL (≥ 11.1 mmol/L)

(Children with acute onset of symptoms and hyperglycaemia should undergo pancreatic autoantibody testing to rule out type 1 diabetes).

Burden

- The global incidence of T2DM in children continues to rise. It is projected that the number of individuals under 20 years living with diabetes will increase fourfold over the next 40 years
- In 2021, the incidence of T2DM in India was 397 per 100,000, the second highest worldwide.

Risk Factors

- Children and adolescents are at higher risk of T2DM or progression from prediabetes to T2DM if they have:
 - Obesity or excess body fat (being overweight can also increase the likelihood of T2DM if not appropriately managed)
 - One parent with T2DM doubles the risk; if both parents have T2DM, the risk is fourfold
 - High-risk race, ethnicity, and ancestry (African American, Latino, Native American, Asian American, Southeast Asians, especially Indians)
 - Lifestyle and environmental factors (poor diet and physical inactivity)
 - Female sex
 - Exposure to maternal gestational diabetes
 - Associated conditions (with polycystic ovary syndrome, acanthosis nigricans, metabolic dysfunction-associated steatotic liver disease)
 - Born small for gestational age (SGA) or born large for gestational age (LGA).
- Compared with adult-onset T2DM, paediatric T2DM often shows:
 - A faster decline in β -cell function
 - Earlier and quicker development of diabetes-related complications.
- Clinical assessment should include:
 - Weight, height, body mass index (BMI), central adiposity measures
 - Dysmorphism (may suggest genetic or syndromic causes of diabetes)
 - Features of insulin resistance (acanthosis nigricans, skin tags)
 - Psychosocial assessment
 - Systemic assessment for complications of morbid obesity/metabolic syndrome.

Screening

- Screening for prediabetes or T2DM should begin at age 10 years or at puberty, whichever occurs first, in children who:
 - Have at least one additional risk factor
- If screening is normal, testing should be repeated every 2 years, or sooner if BMI continues to increase
- Diagnosis is based on the American Diabetes Association (ADA) 2025 criteria (as above).

Prevention

T2DM is a result of the interplay of genetics and environment, and its occurrence and progression can be modified or delayed in some cases by the following interventions:

Dietary Interventions

- Encourage children to adopt a diet high in plant foods and low in salt and saturated fats
- Children should incorporate at least five servings of fruits and vegetables each day
- Limit intake of foods with high sugar and fat or ultra-processed, late-night meals, and snacking on non-nutritious food items
- Adopt healthy cooking practices: baking, broiling, roasting, grilling, steaming, and boiling instead of frying foods, carbohydrates 45-55% of meal
- Sucrose should contribute <10% of total energy intake; salt intake should be similar to that of healthy children
- Support consistent mealtimes and portion control
- Teach culturally appropriate, healthy snacking (e.g., fruits, nuts, low-fat dairy, vegetables, whole-grain low-sugar cereals).

Lifestyle Strategies

- Children and adolescents should perform 60 minutes of moderate-to-vigorous physical activity daily, with muscle- and bone-strengthening exercises at least 3 times per week, and be encouraged to reduce sedentary behaviour
- Screen time should be limited to <2 hours/day, and avoided during meals and to be avoided before bedtime
- Family-wide lifestyle changes are encouraged to support sustainable habits
- Ensure a healthy sleep pattern.

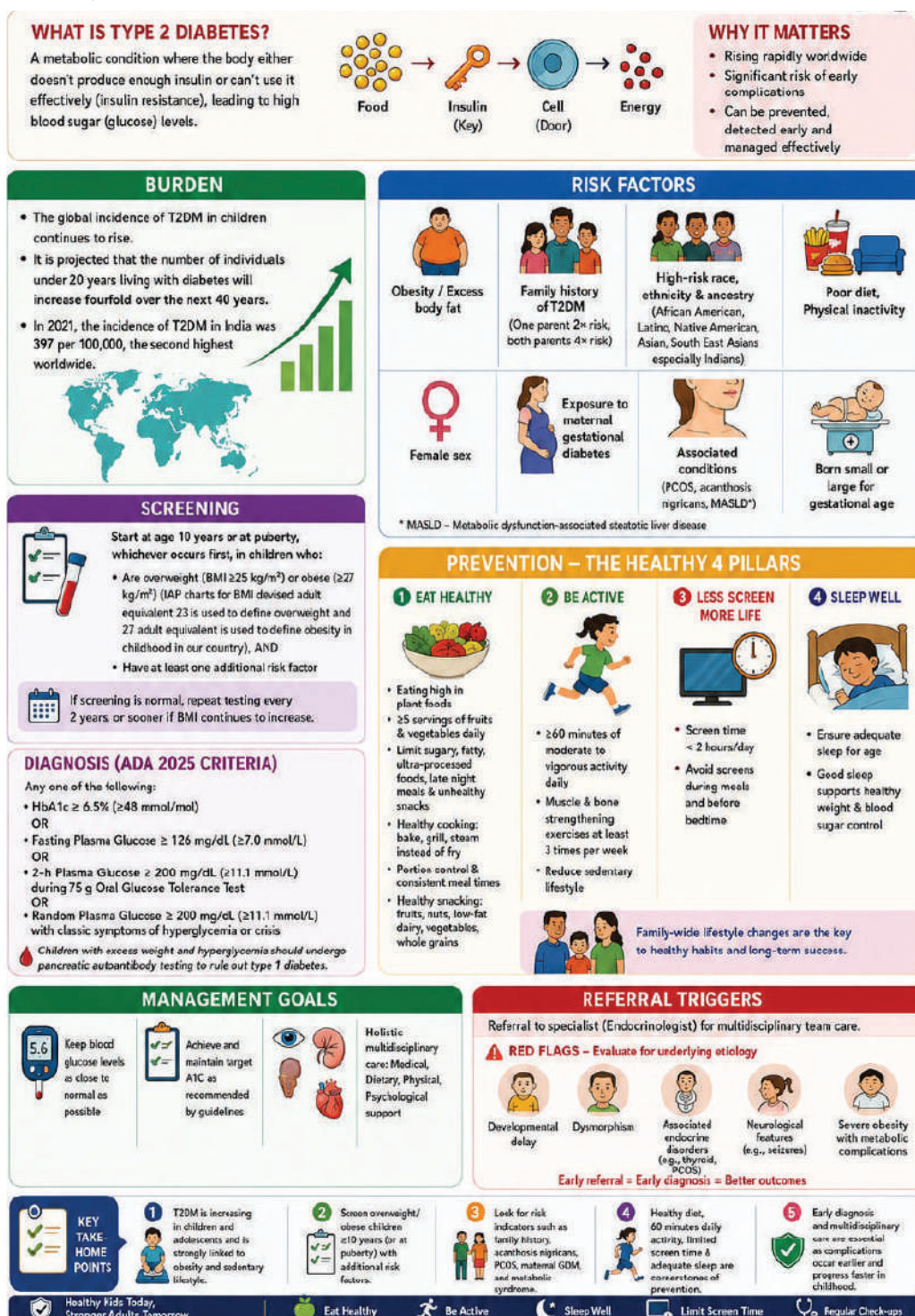
The aims of managing T2DM in children and adolescents are to:

- Maintain blood glucose levels as close to the normal range as possible
- Work toward maintaining an HbA1c level that is recommended as the target by all guidelines, since HbA1c shows how well your blood sugar has been managed over time
- Periodically screen for complications affecting the eyes, kidneys, nerves, and heart.

Referral is needed for:

- Prediabetes or diabetes to a specialist for multidisciplinary team care (endocrinologist, dietitian, counsellor)
- Children with RED FLAGS may need detailed workup for underlying aetiology like developmental delay, dysmorphism, associated endocrine disorders, or neurological features (seizures).

Algorithm 1. Type 2 diabetes in childhood: burden, risk factors, screening, prevention and referral



T2DM: Type 2 diabetes mellitus; BMI: Body mass index; MASLD: Metabolic dysfunction-associated steatotic liver disease; PCOS: Polycystic ovary syndrome; HbA1c: Haemoglobin A1c; ADA: American Diabetes Association; FPG: Fasting plasma glucose; OGTT: Oral glucose tolerance test.

Key Messages

- Type 2 diabetes is increasingly common in children and adolescents, largely driven by obesity, sedentary lifestyle, and unhealthy dietary habits.
- Overweight or obese children aged ≥ 10 years (or at puberty) with additional risk factors should be screened regularly for prediabetes and type 2 diabetes.
- Acanthosis nigricans, family history of diabetes, maternal gestational diabetes, polycystic ovary syndrome (PCOS), and metabolic syndrome are important risk indicators that should prompt evaluation.
- Healthy eating, daily physical activity (≥ 60 minutes), reduced screen time, and adequate sleep are the cornerstones of prevention.
- Early diagnosis and multidisciplinary management are essential, as childhood-onset type 2 diabetes progresses rapidly and is associated with earlier complications affecting the eyes, kidneys, nerves, and cardiovascular system.

Suggested Reading

- American Diabetes Association Professional Practice Committee for Diabetes* . 14. Children and Adolescents: Standards of Care in Diabetes-2026. *Diabetes Care*. 2026;49 (Supplement_1):S297-S320. doi:10.2337/dc26-S014
- Lawrence JM, Divers J, Isom S, et al. Trends in Prevalence of Type 1 and Type 2 Diabetes in Children and Adolescents in the US, 2001-2017. *JAMA*. 2021;326(8):717-727. doi:10.1001/jama.2021.11165
- Wu H, Patterson CC, Zhang X, et al. Worldwide estimates of incidence of type 2 diabetes in children and adolescents in 2021. *Diabetes Res Clin Pract*. 2022;185:109785. doi:10.1016/j.diabres.2022.109785
- American Diabetes Association. Preventing type 2 diabetes in children and teens. *Diabetes Spectr*. 2005;18(4):249-250. doi:10.2337/diaspect.18.4.2499

