GUIDELINES FOR INTERVENTION IN OVERWEIGHT AND OBESITY IN PEDIATRICS

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Abstract: The current high prevalence of overweight and obesity in children will have future consequences on the health and well-being of the adult population. The magnitude of the problem, recognized not only by health professionals but also, and increasingly, by the population, justifies a greater commitment to its resolution, both at individual, community and governmental levels.

This article aims to provide practical guidelines for intervention in overweight and obesity, particularly in primary health care, addressing aspects of diagnosis, identification of risk groups, prevention and treatment.

Keywords: Obesity, Pediatric, Overweight, Diagnosis, Prevention, Treatment

INTRODUCTION

Overweight (ExP) and obesity (OB) have a high prevalence in pediatric age, being recognized as a disease with repercussions not only in childhood but also in adult life. Although it is already a problem recognized by the population, it is still difficult to modify lifestyles that lead to its reduction.

In Portugal and Spain about 1 in 3 children are overweight or obese. According to the COSI study in Portugal in 2019 *(1)*, 29.6% of children between 6 and 8 years old were overweight or obese (12.0% of whom were obese). However, there has been a trend towards improvement, as in 2008 this figure was 37.9% (15.3% OB).

Although there is no universal definition for ExP and OB, in clinical practice the body mass index is mostly used, since it correlates well with adiposity. In pediatrics, the absolute value is not considered, as in adults, but its evaluation in percentile curves. **(Table 1**: **Definitions of overweight and obesity)**

***Table 1**. Definitions of overweight and obesity*

	0-2 years (Rel. P/E)[a]	2-5 years (BMI)[a][c]	5-19 years (BMI)[b] (percentile and z-score)
Overweight	P97-99 (+2 to +3DP)	P97-99 (+2 to +3DP)	P85-97 (+1 to +2DP)
Obesity	>P99 (> +3DP)	>P99 (> +3DP)	>P97 (> +2DP)

Source: WHO and Valerio G. et al (2018)(2)

Z-score and percentile equivalence: +1DP=84.1; +2DP=97.7; +3DP=99.9; ***P/E ratio:*** *weight/stature ratio;* ***BMI:*** *body mass index;* ***SD:*** *standard deviation;* ***WHO:*** *World Health Organization; [a]WHO reference curves 2016; [b]WHO reference curves 2017; [c]According to WHO the P/E Rel. should be used until 5 years with the following definitions: overweight >2DP and obesity >3DP (3), although in clinical practice BMI is used between 2-5 years; Consider severe obesity from 5 years if BMI >P99.*

For appropriate intervention, systematic assessment and interpretation of somatometry in child and adolescent health surveillance visits is primarily required. Closer monitoring and earlier action should be considered as soon as there is an upward crossing of weight or BMI percentiles, even before the problem is established.

Increased attention should also be paid to children with risk factors for the development of ExP and OB. The early years of life and the prenatal period are particularly sensitive to the influence of nutritional and environmental factors that may influence the expression or suppression of the activity of some genes associated with predisposition to obesity and future metabolic disease (epigenetic mechanisms). **(Table 2**. **Risk factors for obesity)**

However, regardless of nutritional status, investment in prevention is a key form of intervention in reducing prevalence.

As regards intervention, the first line should be implemented in Primary Health Care, since they have a privileged position close to the family and the community, which will often also be the target of intervention. Referral to more specialised care will be made in specific situations.

***Table 2**. Risk factors for obesity*

Prenatal
Parental obesity (higher risk if both parents obese)
Low socioeconomic status
Preconception BMI >30kg/m2
Excessive weight gain in pregnancy, gestational diabetes, smoking
Neonatal
Mild for gestational age (higher risk if rapid recovery growth)
Macrosomic
Childhood
Absence of breastfeeding
Infant formulae with high protein content
Early dietary diversification
Excessive weight gain in the first 2 years
Early adipocyte rebound [(a)]

Source: Adapted from Valerio et al. (2018)

(a) ***Adipocyte rebound:*** *increase in BMI that occurs at normal growth, after a decrease in its value between the ages of 2-6 years.*

PRIMARY AND SECONDARY OBESITY

It is well known that most cases of OB have a primary or nutritional cause, resulting from a genetic predisposition of polygenic characteristics associated with an obesogenic environment. This includes a sedentary lifestyle associated with a disproportionate caloric intake, often dependent on the family and community environment in which children are inserted.

Children with primary obesity usually show accelerated growth not only in weight but also in height, which is often above the familial target height during growth. They may even present with advanced bone age and earlier development of secondary sexual characters.

When short stature or slowing of linear growth rate, early onset or rapidly progressive evolution, neurodevelopmental disorders or dysmorphisms are present in association with obesity, secondary causes must be considered which, although rare, must be excluded by a complete clinical history and objective examination. **(Table 3**. **Causes of secondary obesity)**

When endocrine causes are identified, specific treatment must be given, as well as in leptin deficit, an extremely rare situation. In most genetic situations, the

intervention in relation to weight is similar to that of primary obesity. In relation to drugs, their continuation will have to be equated by assessing the risk-benefit.

***Table 3**. Causes of secondary obesity*

	Features
Endocrine Hypothyroidism S. Cushing	short stature or slowing of statural growth speed
S. of Monogenic Obesity Mutation of melanocortin receptor 4 Propiomelanocortin deficiency Deficit in leptin or its receptor	Severe OB with onset in the early years of life
S. Genetics Prader-Willi, Cohen, Bardet-Biedl, Albright, Alstrom	typical dysmorphic features, delayed neurodevelopment and sometimes short stature
Hypothalamic lesions Trauma, tumor, inflammatory diseases	Severe rapidly progressive OB
Drugs Systemic corticoids Antiepileptic drugs (carbamazepine, sodium valproate) Risperidone Antidepressants (tricyclics, paroxetine) and Antihypertensives (propranolol, clonidine).	OB after initiation of therapy

PREVENTION

Even in families with knowledge about the benefits of healthy nutrition and the importance of physical activity, it is necessary to reinforce healthy behaviors at each surveillance visit or, if appropriate, motivate for change.

Below are some practical general aspects to be applied in surveillance consultations that may have a positive role in the prevention of ExP and OB (4):

- The diet of children and adolescents should be rich in low calorie density foods (vegetables, fruits, legumes, lean meats, fish, semi-skimmed or skimmed milk without added flavors), and the use of those energy-dense (fried, processed foods, fatty meats, sweets, cakes and biscuits) should be limited.

- It should be suggested to the family not to have at home foods associated with the development of obesity or be away from the immediate observation of the child, placing the healthiest ones on the most accessible shelves.

- The size of the portion placed on the plate should be controlled, for example by using smaller plates and platters.

- Sweet foods should not be used as a behavior reward.

- The importance of breakfast should be reinforced and long fasting times, which increase appetite at the next meal, should be avoided.

- At meals away from home *fast food* should be avoided, and the quality and portion size should be adjusted to the child's age.

- In infants, exclusive breastfeeding should be encouraged up to 6 months and continued during diversification up to 12 months or beyond. The first 2 years of life are a critical period in obesity programming and acquisition of eating habits. Although young children innately have a preference for sweet and salty foods, a diversity of flavours should be encouraged to avoid a monotonous and less healthy eating pattern in the future.

- Sugar-sweetened beverages (colas, ice teas, soft drinks) should not be part of the diet at pediatric age, and it should be remembered that natural juices also have high caloric value, and it is always preferable to offer the whole fruit. Zero-calorie or low-calorie drinks are also not recommended since they perpetuate the habit of liking sweetness. Water is the ideal drink for children and adolescents.

- Regarding physical activity, it is recommended that children older than 5 years accumulate at least 60 minutes of moderate or vigorous physical activity per day, in structured sports activities or free play, as well as in daily routines (climbing stairs instead of the elevator, walking or cycling to school). Activities should be adapted to age and individual preferences, and where possible also performed with the family.

- Health care providers should also be aware of community resources for recreational physical activity (parks, walking and cycling routes, sports clubs) and engage with school health to encourage development of accessibility to healthy foods and improved conditions for physical activity.

- Regarding electronic devices, as there is evidence of their relationship with the development of obesity, they should not be present in the bedroom or at mealtimes and their use should be limited. Meals should be at the table and with the family. **(Table 4. Recommendations for the use of electronic devices)**

- Recommendations on sleep duration should also be reinforced, due to its association with obesity.

***Table 4**. recommendations for the use of electronic devices*

AGE	
< 18 months	Discourage use of devices (except video calls)
18-24 months	If they wish to use: choose appropriate programs/applications, use in conjunction with the caregivers
2-5 years	Limit to 1 hr/day, appropriate programs/applications, use in conjunction with caregivers
>5 years	Limit to 2h/day

Source: American Academy of Pediatrics (2016)(7)(8)

THERAPEUTIC ORIENTATION

There is no universal model of intervention and it should be individually adapted taking into account the child or adolescent's age, BMI, motivation for intervention, and sociocultural aspects of the family. The goal of the treatment is to achieve an appropriate weight, but also to promote the acquisition of eating habits and physical activity in the pediatric age group that will be maintained in the future. The approach to the child/youth and their family should be empathetic, without blame or value judgments, positively reinforcing lifestyle modifications, even if the results in BMI reduction do not reach the expected goal. In each consultation, rather than suggesting a complete change of habits, it is necessary to obtain a commitment to change in some aspects.

Dietary care and physical activity are at the basis of the intervention, and it is not enough at this stage to convey only generic information of "you must eat less!" and "you must move more!

For a structured and more individualized therapeutic orientation, it is necessary to take a detailed clinical history that includes eating habits (number of meals, composition, preferences and dislikes, portion size, snacking between meals, beverages, meal location - with TV, with the family, restaurant) and physical activity (quantification of participation in structured school and out-of-school sports activities, commuting to school, free time, family activities, screen time). The questionnaire in younger age groups is usually addressed to parents and in older age groups to the patient him/herself, and should include meals and *snacks* away from home.

It is also important to evaluate previous interventions, lifestyle modifications achieved and difficulties encountered.

It is crucial to understand if the child and her/his caregivers understand the current and future consequences of the problem and the extent of the ExP or OB. Do not forget to analyse potential resources or barriers for the implementation of the guidelines, which can be dependent on the child or adolescent, family and home or school community.

Family-based interventions are more effective than those focused only on the child, knowing that the parental model is fundamental for the acquisition of healthy habits. When other adults are involved in caregiving, for example grandparents, they should also receive the message indirectly or directly in consultation.

The identification of comorbidities **(Table 5. Comorbidities)** may lead to a strengthening or necessary adjustment in therapeutic recommendations. These can be identified by looking for suggestive signs or symptoms or by performing analytical assessment. The latter is indicated from 2 years of age onwards (5) and may include fasting glucose and lipid sheet, AST and ALT. After 5 years, fasting insulin, 25-hydroxyvitamin D, uric acid or even abdominal ultrasound and polygraphic sleep study may also be considered.

***Table 5**. Comorbidities*

COMORBIDITIES	Signs / Symptoms / Laboratory Evaluation
Anxiety, Low self-esteem, Depression	School dropout, poor academic performance, isolation, bullying
Obstructive sleep apnea syndrome	Snoring, apnea, drowsiness or agitation daytime
Insulin resistance	Acanthosis nigricans, analytical evalu.
Diabetes mellitus type 2	Polyuria, polydipsia, fatigue, nicturia
Gastroesophageal reflux, constipation, lithiasis vesicular	Heartburn, abdominal pain, dyspepsia, nausea, vomiting
Polycystic ovary syndrome	Hirsutism, acne, irregular menstruation
Hypertension	Assessment of blood pressure
Dyslipidaemia	Analytical assessment
Non-alcoholic fatty liver	Analytical assessment, abdominal ultrasound
Epiphysiolysis of the femoral head	Hip or knee pain
Blount's disease	Deformity of the lower limbs, pain knees
Pseudotumor cerebri	Headache, vomiting, photophobia, diplopia, vision blurred

The first intervention phases should be developed in primary health care, and the initial recommendations overlap with those already mentioned in prevention. In the absence of improvement, more structured and individual support may be required, with a dietary and exercise plan, as well as more regular visits and monitoring. In certain situations, referral to reference centres with multidisciplinary teams including a paediatrician, nurse, nutritionist, psychologist and physical exercise specialist is indicated. **(Table 6: Referral to specialized care for pediatric obesity)**

***Table 6**. Referral to specialized care for pediatric obesity*

Excessive weight gain very early (especially before the age of 2)
Severe obesity (BMI >P99 in over 5 years)
Suspected secondary obesity
Presence of associated comorbidities (e.g. dyslipidemia, insulin resistance, obstructive sleep apnea syndrome, hypertension)
Treatment failure in primary health care

Dietary recommendations

In most growing children, a calorie-restricted diet is not indicated, due to the risk of nutritional imbalance. The dietary plan should be adapted based on knowledge of the needs for each age. Hypocaloric diets should be carefully monitored by specialists.

A good starting point at all ages is to begin by correcting individual eating errors, always negotiating those that can realistically be changed. Then, some general rules should be remembered, which apply to all ages (2): have three main meals and two snacks, have an adequate breakfast, respect age-appropriate portions, do not snack between meals, do not include energy-dense foods or sugary drinks in the diet, encourage family meals by removing electronic devices at mealtimes, train people to make healthy choices at meals away from home. The consumption of vegetables, cereals rich in fiber, fruit and water should be promoted.

Whenever possible a dietary plan should then be presented, negotiated and adapted individually, with suggestions for main meals and snacks.

Some particularities by age group are presented below:

- In the first months of life, exclusive breast milk should be encouraged, starting food diversification preferably at 6 months.

- In children up to 2 years of age who are overweight or obese, the importance of correct and complete dietary diversification should be reinforced. Advise on healthy eating, no sugary foods (desserts) or sugary drinks (including fruit juices and flavoured milk or chocolate), respect the number of meals and avoid snacking between meals. Hand feeding should be encouraged as soon as possible and feeding should not be forced when the child shows signs of satiety.

- At preschool age *fast food* and sugary drinks should also be avoided and experimentation with new flavours should be encouraged to avoid a monotonous diet. At this age and at school age, parental role model eating is fundamental and family table meals should be encouraged. Behavioural rewards with sugary foods should also be avoided.

- At school age, besides what has already been mentioned in the previous group, the involvement of the whole family in the diet plan is highly recommended, avoiding having inappropriate foods accessible at home. The consumption of sweets should be reserved for special situations. Particular attention should be paid to the composition of the snacks sent to school, which should always be healthy.

- In adolescence, skipping breakfast and skipping meals are frequent mistakes, contributing to a higher volume consumed at main meals and at the end of the day. The importance of frequent meals (snacks between main meals) should be explained. Greater independence with access to food outside the family environment and peer influence may also favour the consumption of inappropriate foods. Should be taught to make healthy choices. The use of mobile devices can be encouraged to monitor food intake and exercise, as well as weight evolution.

Physical activity

Physical activity, besides improving body composition, also improves self-esteem and promotes social integration. Although there is little evidence about the ideal exercise, a combination of aerobic and resistance exercise should be suggested (2).

In addition to promoting participation in structured sports, free play, family activities, and increasing exercise in daily routines should also be scheduled. As with the diet plan, the exercise plan should be negotiated and recorded.

At this point, we can identify some obstacles such as lack of safety in the environment around the address, expensive sports activities or those distant from the place of residence, time conflict with academic activities, parents' unavailability of time to accompany the exercise or promote the transportation of children. Health professionals should try to suggest alternatives to the listed setbacks.

In very inactive children and adolescents, exercise should be initiated gradually, to avoid injuries and especially discouragement due to the difficulties encountered.

Physical activity should be promoted in younger children through interaction with caregivers, outdoor activities, and frequent use of playgrounds or playing fields. From school age children should participate in organized sports activities (2-3 times per week), and should increase active playtime. In adolescence, sedentary activities often increase, and it is important to implement regular, preferably structured and intense physical activity (at least 60 minutes twice a week)(2) that is enjoyable to adolescents to avoid early dropout.

Reducing sedentary lifestyles also involves controlling the use of electronic devices (TV, mobile phones, *tablets*, video games), as several studies have shown that excessive use is associated with a higher risk of obesity. General recommendations are to avoid them at mealtimes and in the bedroom, as well as to limit their use at bedtime. **(Table 4: Recommendations for the use of electronic devices)**

Drugs and bariatric surgery

The indication for use of drugs is very limited, since most are not approved for pediatric age, their effects are modest and side effects are not negligible. With orlistat, approved by the FDA for those over 12 years of age, weight loss is small and because it causes fatty bowel movements, it is not well tolerated. Metformin is only approved above 10 years in children with Diabetes Mellitus type 2, and may be useful if the insulin levels were elevated. However, the weight loss achieved is also generally low and causes gastrointestinal side effects.

Bariatric surgery in pediatric age is only indicated in severe obesity, in adolescents who have already reached sexual and skeletal maturity. Recommendations include BMI >35 Kg/m2 associated with moderate to severe comorbidities or BMI >40 Kg/m2.(5)

The use of drugs and bariatric surgery should always be performed by experienced teams in a program involving a multidisciplinary team.

Goals in weight control

Weight loss goals depend on age, initial BMI, and are based on clinical recommendations and common sense, as clinical evidence is scarce. **(Table 7. Goals of intervention in overweight and obesity)**

In most growing children, weight maintenance or a decrease in weight gain may be sufficient to improve their nutritional status and well-being. In older children and the adolescent, weight loss is required and should be slow and stable. Rapid losses should be carefully analyzed and other causes excluded.

***Table 7**. Objectives of the intervention in overweight and obesity*

<table>
<tr><th>2-5 years</th><th>6-11 years old</th><th>12-18 years old</th></tr>
<tr><td colspan="3">BMI P85-94:</td></tr>
<tr><td colspan="3">weight maintenance or decrease in weight gain</td></tr>
<tr><td>BMI >P95:</td><td colspan="2">BMI P95-98:</td></tr>
<tr><td>weight management</td><td>weight maintenance or weight loss up to 0.5kg/month</td><td>weight loss up to 0.5kg/month</td></tr>
<tr><td>BMI >21kg/m2:</td><td colspan="2">BMI ≥P99:</td></tr>
<tr><td>weight loss up to 0.5kg/month</td><td colspan="2">weight loss up to 1kg/week</td></tr>
</table>

Source: Barlow S.E. American Academy of Pediatrics (2007)

CONCLUSION

Intervention in overweight and obesity is complex and with often unsatisfactory results. It is important to remind the child and family that it is a long-term process and it is important to value positive lifestyle changes. These will certainly have an impact on their current and future health and quality of life.

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