

# Lights and Shadows on Pediatric Obesity Prevention

## Abstract

In order to gain effectiveness against the worldwide spread of obesity it has been recommended by high health offices and scientific societies caring for adults to begin at the earliest possible time. This was also the pediatric point of view based on prevalence trends, clinical burden (comorbidities already in pediatric age), tracking and poor therapeutic results. Because of the population growth this problem will not be solved easily.

**Types of prevention:** The three levels of prevention primary (before the disease), secondary (latent disease) and tertiary (for disease consequences) plus the fourth holistic level, when carried out in practice fall on the classical questions: What, When and How, issued by WHO Population Health Promotion. What kind of prevention? The answer would be general and individual. The general approach is crowded by a great extent of plans and guidelines; therefore the evidence based policies are and will be applied to clear the overlapping and sometimes confusing panorama. Who is the recipient of prevention? This has been changed because of the notion of earliest prevention that should start preconceptionally, going on during pregnancy and newborn period. The negative consequences of high birth weight are clearly demonstrated. Even the classical age to start prevention (4-6 years) is receding in favor of the early rebound of BMI. How prevention is carried out? The present ways should be based on demonstrated plans, but a lot of very varied norms appear, although these seem unable to improve the problem. New interventions for pediatric population are analyzed and the common points of action are: Reduction of energy intake, Increase energy expenditure, Involvement of parents/ family, appropriate information to child or adolescent.

In this panorama of good prevention programs yet increased prevalence trends of obesity in the world it is clear that something new must be done but it has not been defined yet. In the meantime this succinct analysis of positive facts and done negative issues, will perhaps contribute step by step to improve the obesity prevention future.

**Keywords:** Pediatric obesity; Pediatric overweight; Early obesity prevention; General obesity prevention; Individual obesity prevention; Prevention obstacles

**Abbreviations:** BMI: Body Mass Index; HIC: High-Income Countries; LMIC: Low- and Middle-Income Countries; T2D: Type 2 Diabetes

## **Praestat Cautela Quam Medela (Prevention is better than cure) Edward Coke 1628**

Why obesity prevention should start in early life? There are four main reasons: prevalence, clinical burden (comorbidities already in pediatric age), tracking and poor therapeutic results once it has been established. In this human and preventive context the fundamental reason is that 30% of all obese adults begun to be so before adolescence [1]. When we consider that 2500 million individuals (older than 18 years) suffer from overweight and obesity [2,3] this percentage has a very practical preventive sense. In addition and in a global context among children and adolescents (5-17 years) 10% are overweight and 3% obese [4]. The proportion of under-fives is similar with an estimated amount of 42 million in 2013 [3]. Furthermore since 1980 up to the present decade the prevalence of pediatric obesity has tripled in

many parts of the world even in low- and middle-income countries (LMIC) [2]. These figures have a global representativeness which does not preclude that certain countries of Europe or America have greater prevalence. Lastly, obesity treatment implies a long, bitter, costly and frequent path to overweight and seldom to normal weight. A particular phenomenon related to the four pointed out reasons is the varied scientific response towards obesity prevention and treatment, to which the (e-) extended panorama of shamanistic or magical cures should be added. In order to obtain reliable information, the evidence methods applied to systematic reviews, randomized controlled trials and observational studies can assess the degree of evidence and subsequent recommendation. These research studies are qualified through a rating system going from the wide from the Centre for Evidence-Based Medicine, Oxford to GRADE, or the simpler SORT. Another general aspect to be considered in prevention is the homogenization of anthropometric measurements assessment. Body mass index ( $\text{kg}/\text{m}^2$ ) and waist circumference Z-scores are probably the most appropriate in clinical grounds but their evaluation is also highly desirable through a proved general

## Review Article

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standard, such as the one by Cole or CDC, WHO because of its design would be the third option. The relative Body mass index rBMI [5,6] is a very simple method easily understood by the family and older children. Recently and due to the overweight trend the 95 centile has moved upwards, so both children and youths not very obese would not be identified [7], hence the advantages of the Z scores. The primary aim of this article is to approach the block of programs well designed by international, national or scientific societies for obesity prevention before arriving to the target risk population. A secondary aim could be to sensitize of health authorities for effective integration of actions.

### Types of Prevention

In order to gain efficacy, prevention has been divided into three levels for application: Primary prevention (before disease), Secondary prevention (latent disease) and Tertiary prevention (for disease consequences). Furthermore there is a fourth level with a holistic approach to reduce risks for a general population. The normal flow goes from global and/or national organizations to community organizations, at which stage there is a diversion addressed to environment and at individual level: family/ child, individual clinicians, nurses, health workers... Usually this sequence should run smoothly but in fact it has some obstacles between levels. However, the preventive reduction is more drastic when considering the individual level which is in fact the other interface of prevention concept. This block was precisely described in the early 1970s [8] but after 50 years health professionals and allied personnel are not able to apply the appropriate knowledge emitted by the high policy-makers, in this case for obesity prevention.

To support this not very optimistic evolution I did a literature search through PubMed, Cochrane Database of Systematic Reviews and Scopus with a temporal limit of 10 years with the appropriate descriptors thus having revised 56 plans for obesity prevention issued from 2010 up to the present day: 11 came from global health agencies, 20 from national organizations and 25 from scientific societies or groups. The relevant information of this non-systematic review can be summarized as follows: Previous plans for adults are a good model for pediatric obesity prevention and furthermore they were predominantly the ones that have guidelines; the global health agencies have complete and practical contents even updated through this period [3]. Prevention results were almost always offered by scientific societies but in very few publications. The individual approach appeared in a minority of preventive issues. Perhaps it could be said that the main preventive lines are all similar and not varying greatly from those of 50 years ago.

Practically, vertical integration of delivering health services has proved useful in the last decades, which by no means signify opposition to horizontal integration that would coordinate different agencies [9]. The classical questions raised by the population Health Promotion What, Who and How [10] can be applied to pediatric obesity prevention but giving them a pragmatic profile.

To the first one WHAT kind of prevention, the response would be general and individual. The General approach is a competency

of health authorities, i.e. the recent WHO Commission on Ending Child Obesity, FAO HLPE Nutrition and Food System for malnutrition in its three forms, EU EATWELL project, but to take into consideration more veteran programs with a longer follow up, the EU Commission on Public health designed a general program for obesity prevention [11]. In this there are three stepping stones: Primary care (health professionals, barriers, and efficacy), Community and School Programs (education, diets, physical activity) and Administrative Programs (play and sport grounds, food energy regulations...) that clearly imply the state support. Unfortunately results are still to come. Due to obesity spreading, a series of national or community programs have been issued to which the local scientific societies or expert groups should be added. It is possible that they could bring success in the mid-term, but certainly they generate an undue competency for resources apart from possible confusion for health professionals and for patients. As signaled evidence policies would clear this overcrowded panorama. Cochrane revision on randomized studies [12], showed that only 10 studies had enough quality in terms of design, accuracy of measurements and duration, results out of them were not concordant about their main preventive action. Ten years later a new study Cochrane Review on the prevention of obesity in children [13] showed an improvement on the studies quality despite that from 93 reviews only 37 (279946 children) could be included in the meta-analysis. It was concluded that programs were effective to reduce adiposity, all individual interventions were not equally successful and the heterogeneity was largely unexplained. In a clinical setting WHO strategies are worth considering [14] in total and critically on the randomized studies of small size and local design due to the impossible assessment of energetic balance. These precautions should be even greater when considering studies related to individual prevention.

The following question is to WHOM prevention should be addressed. This has changed due to the earliest prevention concept. According to this obesity prevention should start even preconceptionally, and then diminishing gestational excessive weight gain, gestational diabetes and large for gestational age (>4.0 kg) newborns. These are linked to adult obesity and comorbidities [15,16]. Lifestyle, psychosocial or medical factors like maternal smoking, depression, T2D, lead to a fetal exposure to glucocorticoids that could act epigenetically as gene-specific DNA methylation levels found in umbilical cord tissue. Out of the varied factors (BMI, T2D, systolic blood pressure, lipid profile, vitamin D and adiponectin) studied in 30487 pairs, maternal BMI increase and high blood glucose levels were linked to higher offspring birth weight [17]. Obviously this important preventive chapter would require the mentioned and desirable integration of actions. After birth, prevention should focus on the weight gain in the first 3-6 months and to achieve breastfeeding longer than six months.

Therefore the classical recommendation to start prevention between 4-6 years of age must be revised in the lights of the 'early rebound' of BMI at any prior age because of the implied risks [18]. At any age the target population is the child with overweight (BMI-Z score 1-1.9 SD or rBMI 110-119%), particularly if adolescent or other risk factors are present such as morbid obese mother or parent(s), excessive gestational weight gain or

high birth weight. Other circumstances to take into account are: ethnicity, non-Caucasian children in high-income countries (HIC) have greater risk for obesity [19], maternal diabetes [17,20] and stunted once the normal (or over) food intake is restored [21] and perhaps intrauterine growth restriction. The exemplary Finnish cohort study [22] throws light on the genetic predisposition to obesity after the GWA studies and long term follow up of mothers and offspring.

HOW prevention can be done at individual level. This stage represents the crucial point where the policymakers and targets meet, in practice primary care health professionals and child/families. The preliminary and perhaps most important action is the education of the pediatrician or primary health care professional on healthy habits, obesity risks and early recognition of overweight, and providing them with basic tools to transmit them to the family and the child [23]. The concise directions given by WHO [24] could be sufficient. The pediatrician or the primary care health provider can have a decisive role by establishing directions on behavior, diets and physical activity/ sedentary habits [25]. After several years in determined communities this attitude has proved beneficial [26]. In this context of acquired-transmission knowledge, the first principle of thermodynamic balance according to which if the energy intake exceeds the expenditure, the difference will be stored as body fat should be given. A simple diagram that could be understood by parents and older children has proved to be useful. This type of information should also be passed to teachers and tutors whenever true integration exists. The instruction of health care providers must be complemented with the accuracy about the anthropometric measurements and obtaining the familial food and physical activity patterns.

The 'how' prevention is carried out is a large chapter beyond the present scope and can be seen elsewhere for children [27-29] and adults [30]. The individual preventive actions are based on four points:

1. Reduction of food intake by means of an adapted diet to the family and school standards.
2. Simultaneous increase of physical activity and decrease of inactivity.
3. Involve parents and familial entourage in this task.
4. The child and specially the youth should be aware themselves of the physical and emotional consequences that will lead to a social isolation. These four points are not complicated nor require complementary exams or specialists (psychiatrics) cooperation, but they require time (not less than 30'/visit) and a fixed follow up schedule, unfortunately not many primary care points/ settings have these possibilities. Another thing to keep in mind is that the prevention activities at small-scale only produce small-scale results, but until the moment of general prevention it is functioning globally (as in many infectious diseases), this method if well designed, is the only one to cope with the spreading problem.

As a final reflection it could be said if there are good preventive programs why obesity has been increasing until now and probably

will continue up to 2030 or even to the more realistic date of 2060. On the positive side there have been important advances such as curving prevalence trends in determined communities, greater ad hoc education and social dimension of the problem beyond the classical medical approach. Yet that has allowed the early detection of the risk situation and to act consequently and even to treat the hidden comorbidities. The ambitious projects such as energy food content laws in vending machines or restaurants (US Affordable Care Act), agriculture changes and food chains, will need more time to show their efficacy.

On the dark side, apart from minor slips (Fat letters; more than 50 food pyramids) the following facts can be included: It is difficult to apply the evidence criteria for assessing prevention affectivity, this is not a health characteristic also occurs in another field i.e. in conflicts prevention. There are too many plans/ guidelines not all with the desirable quality and wide covering. The flow from global directions to individual preventive level is slow moving even in HIC with integrative approaches. The continuous evaluation of the applied procedures is far from generalized. Important actions such as labeling (Flabel in EU), fast food advertising, taxes for sugary drinks, school-lunch programs and so many others, still have an unknown impact on obesity reduction. In high-income countries the specific budget for prevention is considerably lower than that of acute care. In LMIC nothing is done apart from punctual and tiny actions consequently in a few decades obesity will be a problem there added to the treatment lag of these regions.

In conclusion it can be said that despite the slow transmission of preventive knowledge to the primary health care level it should be taken into account that small-scale studies lead to small-scale results but in fact results, therefore prevention should be initiated even at individual level.

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