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PEDIATRIC HIGHLIGHT

New insights into the field of children and adolescents' obesity: the European perspective

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EDITOR'S NOTE: The problem of childhood obesity is accelerating throughout the world. The following is a position paper from The European Childhood Obesity Group (ECOG) that outlines the nature of the problem of childhood obesity along with treatment and prevention methods available today. The paucity of literature on prevention and treatment of obesity in children as documented in this paper points out the need for much additional research on obesity in children.
OBJECTIVES: The awareness of childhood obesity as a major health problem and an uncontrolled worldwide epidemic has to be increased in the society.
DESIGN: In order to improve the quality of the health care and to minimize the cost it is important to investigate and standardize pediatric obesity prevention and treatment and to adapt to social and cultural aspects.
RESULTS: Obesity is the result of excess body fat. The different norms and definitions in Europe and the US is described and clarified. However, the available methods for the direct measurement of body fat are not easily used in daily practice. For this reason, obesity is often assessed by means of indirect estimates of body fat, that is, anthropometrics. There are essentially six relevant levels, which could be involved in prevention of child and adolescent obesity: family (child, parents, siblings, etc), schools, health professionals, government, industry and media. Evidence-based health promotion programs has to be given a high priority. Government should encourage media increase information about healthy nutrition and to avoid the marketing of unhealthy foods including sweet drinks, for example, in TV. Many different approaches of treatments of obesity have been investigated, including diet, exercise, behavioral therapy, surgery, and medication. None have been found to be effective enough as sole tools in children. This has led to focus on multidisciplinary programs especially involving families. Behavioral cognitive therapy is effective in treating childhood obesity as is family therapy. Surgery and drug treatment cannot be recommended without additional research. Clinicians should consider the various factors that can influence body composition.
CONCLUSION: It is important to know and to follow nutritional factors, energy intake and composition of the diet, nutrition and hormonal status, food preferences and behavior, and the influence of non-nutritional factors. We recommend that obesity should be the major priority both in the health care system, on the scientific level and for future political actions.
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Introduction

Pediatric obesity is an important health problem and represents an uncontrolled worldwide epidemic. There is also an increasing prevalence of pediatric and adolescent obesity in Europe[1] as well as in USA[2] and even in less developed countries.[3]

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Age- and gender- specific body mass index (BMI, weight in kg divided by the square of height in m) has been widely used.[4,5] In a recent survey, the highest prevalence of overweight (85th centile BMI of the studied population) in Europe among 13-y old are equally divided between countries representing different regions such as Finland, Ireland, and Greece.[6] In the same study it is clear that the highest prevalence of overweight in Europe is getting closer to the US. However, obesity (the 95th centile BMI) in the US is still much higher.[6] In the Lissau *et al* paper[6] the 85th centiles is mentioned overweight in order to be in accordance with the American norms. But the European names

are overweight for the 85th centile and obesity for the 95th centile and we used these terms in Figure 1.

Long-term health complications in overweight children after 40 y follow-up include significantly increased rates of cardiovascular diseases and digestive diseases but also increased mortality.[7] Another follow-up study of overweight adolescents after 55 y showed an increased mortality of all causes and coronary heart disease in men.[8] Even in young children insulin resistance and other metabolic complications are frequently detected.[9] For the individual, the quality of life is often severely impaired not only for medical complications but also for psychological problems.[10]

For the society, the medical health costs are important. The discharges where obesity was the principal or secondary diagnosis has increased by 55% in youths ages 6–17 y from 1979–1981 to 1997–1999 in the US. This may reflect the medical consequences of the obesity epidemic.[11] Moreover, these costs have increased three times from 0.43 to 1.7% of the costs for overall hospital discharges ($127 million per year). In adults, the national health care costs in France and the Netherlands were 2 and 4%, respectively, in Australia the cost was above 2% and in the US 6.8%.[12] As an example of the predicted potential financial implication is a net benefit of $7317 for an intervention cost of $14 per student per year

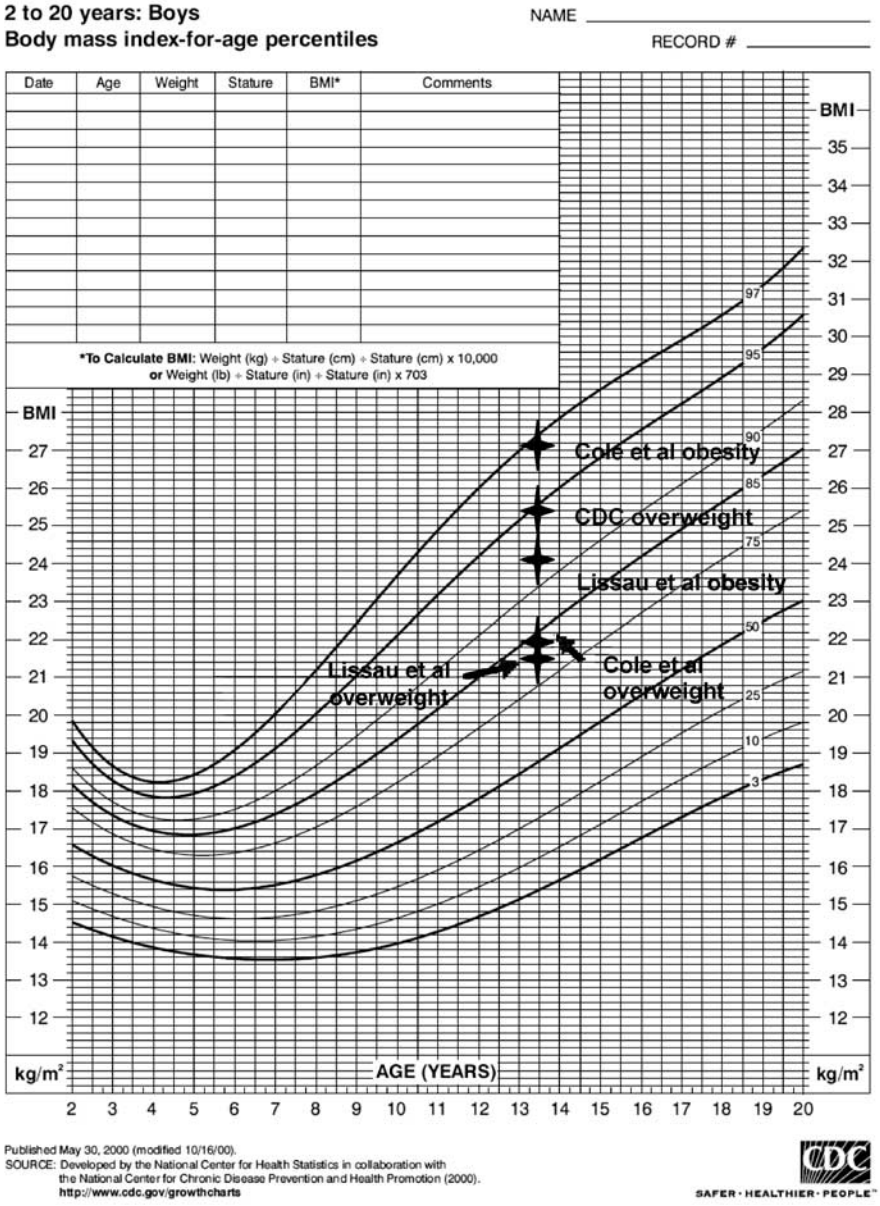

Figure 1 Using the CDC growth chart acomparison is made for a 13.5-y-old boy between different cutoff points widely used in childhood obesity. BMI values: Cole *et al* obesity, 27.3; CDC overweight 95th percentile; Lissau *et al* obesity, 24.8; Cole *et al* overweight, 22.3; Lissau *et al* overweight, 22.1.

preventing an estimated 1.9% of female students from becoming overweight adults.[13] In the long run, it is possible that these treatments will reduce the burden of obesity, but in the short run, the obesity attributable costs might increase until the prevention programs are effective.[14]

The research community has now put more focus on pediatric obesity. For this reason, the European Childhood Obesity Group (ECOG) was founded in 1990 to increase attention on childhood obesity. Since then, annual scientific meetings have been organized all over Europe. Members of the ECOG have taken an active part in the scientific community to promote the fight against childhood obesity.[15] The ECOG is officially recognized by the European Association for the Study of Obesity (EASO) and the International Association for the Study of Obesity (IASO). In 2002, the European Union (EU) called the ECOG to cover pediatric obesity aspects during the Conference on Obesity — a challenge for the EU.[16]

The awareness of childhood obesity as a major health problem has to be increased in the society. In order to improve the quality of the health care and to minimize the cost it is important to investigate and standardize pediatric obesity prevention and treatment and to adapt to social and cultural aspects. This will make it possible for health care personnel to help patients and families more easily.

Definition and classification

Obesity should be defined as excess body fat. The most widely used measurement to define obesity is the BMI. It is a predictor of body fat from a population perspective, but has limitations on an individual level and is only a proxy measurement of body fat. BMI shows significant variations during childhood; that is the reason why, age- and gender-specific reference standards must be used and in adolescents, the pubertal status should also be evaluated.

However, different cut-off points are used in the US and in Europe due to statistical comparisons of anthropometric population measurements as a proxy for the lack of accurate and precise body fat measurements. The US definition (at or above the sex- and age-specific 95th percentile BMI cut points from the 2000 CDC growth chart named overweight (www.cdc.gov)) gives higher cut-off points than the European age- and sex-specific definition for an overweight equivalent in children but lower for the obesity equivalent.[17] The overweight equivalent in children corresponds to the cut off in adults of BMI at or above 25.0 that has reached consensus as well as the obesity equivalent corresponds to at or above BMI 30.0. This is shown in Figure 1 and this became clear when different populations were studied in a comparative survey using identical data collection methods.[6]

Pediatric obesity might be defined by other anthropometric measurements (eg skin-folds and waist circumference) and cut-off points are suggested in the literature,[18] but more reference_data defining cut-off values for populations are needed.[19] Other body composition measurements such as bioimpedance analysis (BIA), dual energy X-ray absorptiometry (DXA), computer tomography (CT), magnetic resonance imaging (MRI) are usually used for research purposes in clinical settings.[20]

In the first clinical examination of an overweight/obese child, personal and family history of obesity and related problems like type 2 diabetes and cardiovascular diseases should be investigated due to the future health complications. Furthermore, in children the metabolic syndrome has been defined in a similar way as in adults (BMI above 97th percentile, hypertriglyceridemia, increased HDL cholesterol level, hypertension and insulin resistance). It was characterized in a sample of 490 children showing an increase in the prevalence with the degree of obesity.[21]

Children with primary obesity are often characterized by elevated height and accelerated bone maturation. Children with secondary (syndromic) obesity frequently have short stature (lower than the 5th percentile) and delayed bone maturation. Secondary obesity could be caused by endocrine problems (eg hypothyroidism, Cushing's syndrome, late-onset adrenogenital syndrome), genetic abnormalities like the Prader–Willi syndrome, Duchenne muscular dystrophy, Down's syndrome, Albright hereditary osteodystrophy, Bardet–Biedl syndrome, Fragile X syndrome, Cohen's syndrome, Carpenter's syndrome, central brain tumors and drug-related obesity.[15] Primary obesity is by definition not explained by known genetic or metabolic defects. However, in the future a larger proportion of primary obesity might be explained by new discoveries regarding single gene disorders such as melanocortin-4- receptor defects, ghrelin, etc.[22] For the moment this should be examined only in high-risk families. These syndromes are all rare which make prevention important to decrease the incidence of primary obesity of unknown origin.

Prevention

Pediatric obesity leads to adult obesity. Four out five obese teenagers remain obese in adulthood.[23] Given the epidemic increase in pediatric obesity it is fundamental that all relevant groups understand their coresponsibilities. There are essentially six relevant levels, which could be involved in prevention of child and adolescent obesity: Family (child, parents, siblings etc), schools, health professionals, government, industry and media.[24] All six levels are to our knowledge not yet covered in one single study. However, the Kiel Obesity Prevention Study (KOPS) involve mainly family, schools and health professionals.[25] The Trim and Fit study involves family, schools, health professionals and government.[26] The North Karelia project included schools, health professionals, government and media.[27,28] Also the industry are involved in the Copenhagen City Bike program (http://www.bycyklen.dk/) where a free bike can be borrowed for a city tour.

Healthy eating patterns and reducing sedentary life-style should be a major concern in parents responsibility for their offspring. Prolonged exclusive breast feeding seems to reduce the risk of being obese or overweight among school age children. Preventing childhood obesity and its consequences may be an additional argument in the drive to encourage breast feeding in industrialized countries.[29,30] Adolescents should be encouraged to increase their own responsibility for a healthy lifestyle. To do so both parents and professionals need to give an age-adjusted information and intervention. Furthermore, the society has to give a more serious attention by supporting the parents and health professionals. Thus, evidence-based health promotion programs has to be given a high priority. Government should carry out information campaigns focusing on limiting daily intake of sweets and soft drinks among children and adolescents and restrict the marketing of unhealthy foods including sweet drinks, for example, in TV.[31]

School is an important environment for children. A targeted, school-based education program produced a modest reduction in the number of carbonated drinks consumed, which was associated with a reduction in the number of overweight and obese children.[32] For the future, novel thinking, public policy changes, and additional research funding are needed to develop strategies that will produce more effective methods of incorporating education on nutrition and physical activity into the school curriculum.[33]

In addition, communities could secure access to fresh drinking water in schools, educational institutions and other places frequently used by children and adolescents. Recently, actions have been taken by the health professionals regarding marketing of foods. In a new policy statement, 'Soft Drinks in Schools,' the American Academy of Pediatrics (AAP) recommends that school districts should consider restricting the sale of soft drinks to safeguard against health problems that result from overconsumption.[34]

Furthermore, fast food has been in focus. In a study by Ebbeling *et al*[35] adolescents overconsumed fast food regardless of body weight, although this phenomenon was especially pronounced in overweight subjects. Moreover, overweight adolescents were less likely to compensate for the energy in fast food, by adjusting energy intake throughout the day, than their lean counterparts. In another study, the effect of fast food has been measured to 187 kcal per day which might explain the rapid increase in the prevalence of obesity.[36]

Also TV-viewing has been discussed in causing the obesity epidemic.[37] Children are at risk of becoming obese as they spend a substantial portion of their lives watching television. Three mechanisms have been hypothesized: (displacement of physical activity, increased calorie consumption while watching or caused by the effects of advertising, and reduced resting metabolism). The reduced resting metabolism is supposed to be the major factor.[38] Promising targets for prevention are reduction in sedentary behavior.[39] However, relatively weak positive associations or mixed results have been found between television viewing and obesity.[40]

Unfortunately, several prevention studies do not show significant effects. Such studies are difficult to carry out or to publish. A Cochrane review found only 10 projects, which fulfilled the criteria of a high scientific level.[41] Only seven had a follow-up or more than 1 y which show the need for more long-term studies. The 1 y follow-up of the KOPS showed that actions inside school and at home could be successful in reducing the prevalence of obesity and improvement of dietary habits.[25] This type of study could be replicated in other countries and government support is needed.

Treatment

Many different approaches of treatments of obesity have been investigated, including diet, exercise, behavioral therapy, surgery, and medication. None have been found to be effective enough as sole tools in children. This has led to focus on multidisciplinary programs especially involving families.

It is now also clear that treatment needs to be supporting and long lasting.[42–44] In multidisciplinary treatments, the accompanying psychological factors are important, and brief treatments fail to take into account the life-long genetic influence. It is also fundamental to adjust treatment to different age groups due to physiological and psychological maturation of the growing child and adolescent. Parental neglect increases the risk of obesity in young adults 7–10 times[45] but family therapy could be used as improving the support for the child by the family.[46]

A need for a continuous life-long support is now more widely recognized due to the increasing knowledge in genetics where many obese have an inherited susceptibility of developing obesity. Furthermore, the Set-Point Theory of the regulation of body weight gets more support and has been modified to a 'Settling Zone' Theory. Biology may determine a range of body weights (adiposity) that are maintained fairly constant for long periods of time, within this 'zone', the behaviors responsible for controlling energy intake and energy expenditure are influenced primarily by environmental and cognitive stimuli.[47] Thus, it is difficult to deviate from a set point zone for body fat and body weight.

Treatment based on psychotherapy techniques

Behavioral therapy has been used in obesity management since first described based on the belief that obesity is a 'learned disease', possible to cure by 'relearning'.

Behavioral. cognitive therapy is effective in treating childhood obesity[48] as is family therapy.[42] These treatments emphasizes a nonblaming position showing the clinical usefulness of the Set-Point Theory. It seems that cognitive

behavioral therapy is effective in young children and that family therapy is effective in teenagers.

Furthermore, the long-term results using psychotherapy shows effects after 10 y with behavioral therapy aimed at child and mother.[43] Cognitive behavioral therapy, where also family talks were given, shows good results after 5 y.[44] However, successful long-term results have not been achieved in adults. This leads to the conclusion that treatment of children should be of priority for both clinical practice and future research.

Moreover, the early findings of eating disorders being connected to obesity has not been confirmed.[49] Today, there is a general understanding that obesity treatment based on psychological treatment techniques does not increase the risk of developing eating disorders also in children.[50]

Drug treatment. Treatment in adults using sibutramine or orlistat has shown a significant weight reduction although it is required to be combined with other approaches.[51] These approaches are not well-defined, instead the medical product agencies usually give a weight goal for the patient to achieve a weight reduction before the treatment starts followed by a further weight reduction in the beginning of the drug treatment.

In children, sibutramine has been given as an additive to behavioral therapy.[52] This induced significantly more weight loss than did behavioral therapy and placebo. In the US, the Food and Drug Administration (FDA) has approved orlistat for children aged 12–18 y in 2003 using a limited documentation with a maximum of 20 subjects in each study indicating the same side-effect profile as in adults.[53–55]

However, until more extensive safety and efficacy data are available, medications for weight loss should be used only on an experimental basis in adolescents and children.

Surgery. In obese children and adolescents who are totally resistant against any kind of conventional therapeutic regimen, surgical procedures, such as gastroplasty and the administration of an adjustable gastric band has been performed. These procedures should only be done in adolescents who underwent intensive multidisciplinary programs including psychological support where the obesity is genetically determined until randomized clinical trials have been performed for ethical reasons.

Previously, gastric bypass has been described as effective and safe in case reports in several studies but no randomized controlled trials have been performed and little long-term research with a view of quality of life issues surround gastric bypass have been performed.[56,57]

A report on 11 adolescents (11–17 y) with a mean BMI of 46.6 (38.0–56.6) who underwent adjustable gastric banding surgery showed in a follow-up of 23 months that BMI fell from 46.6 to 32.1 with marked improvement in all medical conditions.[58] More studies give additional support to this new technique with a longer follow-up.[59–61]

There is no doubt that controlled studies in particular on a long-term-follow-up basis have to be carried out, before surgical procedures can be recommended.

Follow-up

Studies on follow-up have tried to include all six relevant levels for prevention.[24] In adolescents, we need also to take into account pubertal and psychological changes that interfere with treatment strategies. Overweight and obesity is a chronic disease and its treatment needs long-term follow-up. Early childhood obesity is the dominant predictor of persistent obesity in adolescence and even in adulthood.[23] These results suggest that strategies to prevent childhood obesity must be initiated at an early stage. In this view, comprehensive behavioral interventions promote long-term weight loss in obese subjects. These findings come from L Epstein's research program, which includes diet modification and lifestyle exercise promotion and resulted in sustained weight loss even in 10-y follow-up.[43,62]

The treatment programs has to take into account the psychological changes during puberty transitions.[63] With preschool children, group teaching is more important than individual treatment, and the whole family should be involved. By the time children pass puberty they are creating their own groups and social networks, and individual treatment may be more appropriate.[46] This also affects the possibilities to perform a follow-up with a good attrition rate. Taken together these findings underline the importance of follow-up in order to control the subjects' progress. Clinicians should consider the various factors that can influence body composition. It is important to know and to follow nutritional factors, energy intake and composition of the diet, nutrition and hormonal status, food preferences and behavior, and the influence of non-nutritional factors. When these are taken together with an accurate and precise body composition assessment, it may be possible to control growth process and to predict adult status to reduce the risk factors of various diseases.

Conclusion and recommendations

Today our present knowledge gives us the possibility to take the following positions regarding key issues in pediatric obesity.

- Childhood obesity needs to be regarded as a separate disease different from adult obesity.
- Definition should be based on international consensus.
- Prevention and treatment should involve several levels of the society.
- Treatment and follow-up has to be adjusted according to age and gender.
- Psychotherapy-based techniques in a multidisciplinary setting could be recommended to support lifestyle changes regarding diet habits and physical activity.

- Drug treatment and surgery need further scientific evaluation in children.

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Appendix

Below we give two tables that might guide you in targeted actions in the future:

Table A1 reports some suggestions as a start of action against childhood obesity. The first step is intended as the basic level. It could be used in a primary referral level preferably with a pediatrician but also in a specialized center.

Table A1 Some suggestions within (secondary/tertiary) health care

Arena	*First step*	*Next step*
Health care	Clinical practice should use a multidisciplinary team and psychological treatment (family therapy or cognitive behavioral therapy) introducing a health care structure supporting this process	After additional research:
		Drug treatment
		Surgery
	Support to the family is essential also focusing on responsibilities of the family and locus of control[64]	Support by health care workers or social workers given at home or in specialized day care centers
	Assessment of intake and energy expenditure	Measurement of intake and energy expenditure
	Intervention early in life (no later than aged 10 y)	Intervention in adolescence still better than adult life
	1500 kcal is a safe in a varied diet after the age of 6 y[65]	After additional research: Low calorie diets
	The encouragement of physical activity is efficient[42,62]	After additional research: Increased physical activity by supervision (gyms, camps)
	Low drop out rate during treatment	Long-term follow-up
	National definition of overweight and obesity using BMI (if possible international at first step)	International definition using BMI[17]
	Establishment of better body composition measurements	Confirming test leading to a better international definition of obesity both on a individual and a population level
	Exclusion procedures of monogenic obesity for clinical practice	Screening for certain forms of genetic obesity

Table A2 Present and future political focus

	First political action	*Second political action*
Government	Recommendations for a healthy life style such as 'Soft drinks at school'[34] or and campaigns focusing on limiting daily intake of sweets and soft drinks The Danish Action Plan[31]	Law enforcements[31]
	Changes in tax policies for food products in separate countries after evidence-based studies	Changes in tax policies for food products in the European Union after evidence-based studies
	Changes in agricultural policies supporting healthy products after evidence-based studies	Changes in agricultural policies supporting healthy products in the European Union after evidence-based studies

The next step is only intended in a specialized center. Table A2 suggests that political actions are necessary. However, these actions need political decisions and power.

We recommend that obesity should be the major priority both in the health care system, on the scientific level and for future political actions.