Obesity in Later Childhood and Countermeasures

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Abstract: Major criteria for the diagnosis of obesity as a disease (obesity-disease) in children include being at least 20% overweight, an increased percentage of body fat, hypertension, sleep apnea, type 2 diabetes mellitus, and increased visceral fat closely related to metabolic syndrome. Although body mass index (BMI) is the key measure for diagnosing obesity in adults, percentile values are required to assess obesity in children because BMI varies with age in childhood. Thus, the percentage of overweight is often used for the continuous evaluation of obesity in childhood. Tracking of obesity from childhood to adulthood is commonly seen. BMI rebound (adiposity rebound) in early childhood is likely to be associated with the subsequent increase in body weight indicating a critical period in the development of obesity. There is a difference in serum leptin concentrations between males and females in adolescence. Eating disorders such as anorexia nervosa and bulimia nervosa are frequent among adolescent girls, and are usually accompanied by aversion to obesity. The basic principle of intervention for reducing obesity is to decrease caloric intake and increase energy expenditure. Attention also should be paid to the involvement of hereditary predisposition and prenatal factors. It is necessary to review the lifestyle habits of the entire family, and, in so doing, the role of the mother seems essential. School life is also important. Prophylaxis is of greater value in children than in adults.

Key words: Obesity; School children; Children; BMI

Introduction

Because obesity is an important lifestyle-related disease, it is of great clinical significance to understand it as a disease entity. Therefore, the concept of obesity as a disease (obesity-disease) has been proposed, indicating the need for a policy to deal more appropriately with obese patients who have health problems or are at high risk of impaired health. Obesity, viewed from the aspect of daily practice, as it is in this document, represents a critical area in modern health care.

Although obesity-disease generally manifests...
Guidelines for the Diagnosis of Obesity-Disease in Children

Diagnostic criteria for obesity-disease are needed in the clinical care of children as well as adults. Obese children represent a population at risk for developing various complications, and proper intervention and treatment are needed in the clinical care of children as well as adults. Obese children represent a population at risk for developing various complications, and proper intervention and treatment are

Table 1 Diagnostic Criteria for Obesity-Disease in Children

<table>
<thead>
<tr>
<th>Determination of obesity in children: Percentage of overweight of 20% or more in children aged less than 18 years and having a significantly increased body fat percentage.</th>
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<tbody>
<tr>
<td>• Reference values for body fat percentage are as follows (regardless of method of measurement)</td>
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<tr>
<td>Boys (entire childhood): 25%</td>
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<tr>
<td>Girls younger than 11 years: 30%, 11 years old or older: 35%</td>
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Definition of obesity-disease: Obesity-disease is a condition complicated by health impairment (medical abnormality) derived from or related to obesity and requiring treatment to medically reduce weight. This condition is dealt with as a disease entity.

Diagnosis of obesity-disease: Obese children at least 5 years (60 months) old who conform to any of the following requirements:

1. Having at least one item of section A.
2. Having the percentage of overweight of 50% or more and at least one item of section B.
3. Having the percentage of overweight of less than 50% and at least two items of section B.

A. Medical problems particularly requiring obesity treatment

1. Hypertension
2. Abnormal pulmonary ventilation including sleep apnea
3. Type 2 diabetes mellitus, impaired glucose tolerance (abnormal elevation of HbA1c)
4. Increased abdominal circumference or visceral fat accumulation as determined by CT at the umbilical level

B. Metabolic disorders and other abnormalities closely related to obesity

1. Liver dysfunction (abnormal ALT levels)
2. Hyperinsulinemia
3. Hypercholesterolemia
4. Hypertriglycerideremia
5. Hypo-HDL-cholesterolemia
6. Acanthosis nigricans
7. Hyperuricemia

(In cases of hepatopathy, fatty liver should be confirmed by ultrasonography. Blood samples for TG and IRI assays should be obtained in the early morning following overnight fasting.)

If no improvement is achieved even after the weight is reduced, these findings are presumed to be unrelated to obesity.

Reference items: Physical factors and issues in daily living (the presence of two or more items corresponds to one item of section B.)

1. Skin findings including striae cutis and intertrigo
2. Bone fracture or arthropathy caused by obesity
3. Menstrual disorder (secondary amenorrhea lasting for 1.5 years or more)
4. Decreased ability to run and jump, which causes prominent difficulty in, e.g., taking a physical education class
5. School avoidance and being bullied because of obesity


(From Asayama, K. et al.: Diagnostic criteria for obesity in children, Himan Kenkyu 2002; 8: 204–211.)
necessary, particularly for those who require prompt care.\textsuperscript{1,3,5,10} However, the frequency of complications is lower in obese children than in adults, and therefore obesity in children also plays a greater role as a predictor of future risk.\textsuperscript{11,12}

Table 1 presents a summary of diagnostic criteria for obesity-disease in children.\textsuperscript{13} Basic requirements for the diagnosis in children 5 to 18 years of age include an percentage of overweight* (degree of obesity) of at least 20% and a high percentage of body fat. In addition, a diagnosis of obesity-disease is made in the presence of concomitant morbidities such as hypertension, sleep apnea, type 2 diabetes mellitus, or increased visceral fat, which is closely related to metabolic disorders. In addition, derangement in metabolism of carbohydrate and lipid and acanthosis nigricans have been cited as essential features.

In adults, body mass index (BMI)** is an important tool in diagnosing obesity.\textsuperscript{2,6} However, BMI varies according to age among children. In children above 5 years of age, BMI values continue to increase until the child reaches his or her adult height (Fig. 1). Therefore, the percentage of overweight is often used for the continuous evaluation of subjects in childhood. In Western countries, percentiles of BMI are used to determine obesity in children.\textsuperscript{6}

**Significance of the Diagnosis and Treatment of Obesity in Children**

According to calculations made in the US, costs related to take care of obesity in children between 6 and 17 years old have tripled during

\begin{equation}
\text{Percentage of overweight (\%)} = \frac{\text{Actual body weight} - \text{Standard body weight}}{\text{Standard body weight}} \times 100
\end{equation}

\begin{equation}
\text{BMI} = \frac{\text{Body weight (kg)}}{\text{Height (m)}^2}
\end{equation}
the past 20 years, generating alarm and drawing attention to the healthcare costs of obesity.\textsuperscript{14)\textsuperscript{14}}

The prevalence of impaired glucose tolerance concomitant with severe obesity is 25\% among 4- to 10-year-old children and 21\% among 11- to 18-year-olds.\textsuperscript{1)\textsuperscript{1)\textsuperscript{1}) When the metabolic disorders that constitute “metabolic syndrome” are examined in terms of the factors included—lipids, blood pressure, and insulin—such disorders are frequently found in obese children, with the most important causative factor being insulin resistance.\textsuperscript{10)\textsuperscript{10}}

The diagnosis and treatment of obesity in childhood and adolescence is critical not only because of their importance at this stage of life itself but also because they are closely related to metabolic syndrome and obesity in adulthood (Table 2). Tracking of obesity from childhood onwards is common, with a number of recent reports documenting tracking from childhood to adulthood.\textsuperscript{4,10,12)\textsuperscript{4,10,12}}

BMI varies with age, showing rather high values in early infancy and beginning to decline one year after birth, reaching its lowest point at the age of 5–7 years. Thereafter, BMI gradually increases with age, reaching an adult level when the child reaches his or her adult height.\textsuperscript{15)\textsuperscript{15}} This phenomenon of a rise in BMI as the child ages, is called adiposity rebound\textsuperscript{16)\textsuperscript{16}} or BMI rebound. Earlier adiposity rebound is reported to increase the possibility of adult obesity. Thus, adiposity rebound is considered a critical period for the development of obesity. Based on our clinical experience with pediatric obesity, children with simple obesity tend to be precocious. Adiposity rebound in younger age seems therefore almost synonymous with their precocity.\textsuperscript{3,4)\textsuperscript{3,4}}

### Issues in Adolescence

Adolescence is the period that ranges from the manifestation of secondary sex characteristics to the completion of sexual maturation.\textsuperscript{17)\textsuperscript{17}} The mean age at menarche among Japanese girls is 12.3 ± 0.03 years (mean ± standard deviation). Among boys, an increase in testicular volume is noted initially, with this increasing to 15–20 m\textsuperscript{3} with maturation.

Paralleling sexual maturation in adolescence are differences in physique and body composition between males and females. This is chiefly derived from the actions of sex hormones. In association with the amount of body fat, differences in serum leptin concentration are noted between males and females in adolescence.\textsuperscript{5,8,17)\textsuperscript{5,8,17}} Variations in body composition during adolescence, particularly physiological increases in body fat among girls, should be considered separately from the progression of obesity.

Another feature of adolescence is the presence of eating disorders that occur frequently among adolescent girls,\textsuperscript{4,17)\textsuperscript{4,17}} such as anorexia nervosa and bulimia nervosa usually accompanied by strong feelings of aversion to obesity. One view is that the treatment/intervention of obesity is the main causative factor. However, the main factors in the onset of eating disorders are considered to be mental predisposition and psychological status.

Girls who are not obese and fall within the range of standard body weight often regard a

### Table 2 Significance of the Diagnosis and Treatment of Obesity in Childhood and Adolescence

| 1. Tendency to increased incidence |
| 2. Tracking into adulthood obesity |
| 3. Predictive of abnormalities of body weight and metabolism in adulthood |
| 4. Adulthood obesity originates in childhood and adolescence (adiposity rebound) |
| 5. Relation with eating disorders and underweight in adolescent girls |
| 6. Manifestation of disorders of carbohydrate and lipid metabolism |
lower weight as desirable. This goal of a lower weight may lead to several health problems. According to the National Nutrition Survey conducted by the Japanese Ministry of Health, Labor and Welfare, about one in four (24.2%) Japanese women in their 20s have a BMI of less than 18.5, a frequency that is nearly double the corresponding percentage of 12.4% in the 1980s.

**Countermeasures to Obesity in Children**

The basic principle for reducing obesity is, obviously, to decrease caloric intake and increase energy expenditure. When this principle is employed in clinical practice, certain caveats apply, particularly in pediatric cases.

One point to consider is the involvement of hereditary predisposition and prenatal factors. These are important for the occurrence of obesity, including adult cases. Therefore, children with a history of obesity in the family should be considered at high risk. It can be presumed that differences between children with high and low hereditary risk will occur in the progression of obesity and development of complications, even if the children have similar lifestyles. Although high-risk family history is not included among the diagnostic criteria for obesity-disease, it is an important factor that requires serious attention, particularly in pediatric cases.

When obesity is found frequently within a family, acquired, or lifestyle, factors may be common to the patients, in addition to hereditary causes. More specifically, it is not uncommon for many of the family members in question to have the same tendencies toward certain habits of eating and exercise that precipitate obesity. It therefore is necessary to review the lifestyle habits of the entire family in considering the treatment and prevention of obesity in children.

In terms of the involvement of family members in lifestyle and obesity, it should be recognized that the mother plays a particularly important role. Although both parents are responsible for the upbringing of children, under current circumstances in Japan mothers play greater roles, particularly in regard to activities related to the life habits of children. A number of previous studies in Japan as well as other countries on the correlation between the obesity of parents and children have revealed a higher correlation with obesity in the mother. Therefore, approaches to the obese child are chiefly made via the mother.

Another major factor is school for the development of lifestyle of children. School is the center of a child’s social life, and the child spends a considerable amount of time in school. It is difficult to consider schools collectively because the situation varies widely from one school to another, but a proper understanding of obesity enables early detection and diagnosis as well as effective intervention and treatment.

In comparison with adults, greater importance should be attached to the prevention of obesity in children. Since some life habits are established during childhood, it is necessary to set good life habits as the goal of guidance. Corrective measures and actions taken during childhood, to lead to more appropriate eating habits and preferences, joy in exercise, skill in physical activities, and non-sedentary leisure, are of critical importance because lifestyle patterns formed in childhood may affect the lifestyle, health, and quality of life of individuals for the rest of their lives.

**Conclusion**

Many of the signs of obesity are already present in childhood, necessitating early care and guidance. Childhood is a period in which life habits are established and the effects of prenatal factors become apparent. Thus, it is an important period in the diagnosis and treatment of obesity.
REFERENCES


