



Primary Care Approaches

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Childhood Obesity: Strategies for Prevention

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The prevalence of childhood obesity has been steadily increasing over the past several decades. Because obesity is not readily amenable to treatment, prevention is very important. Children's growth should be monitored using the body mass index (BMI) and risk factors assessed through a dietary and physical activity history. For children at risk, developmentally-based prevention strategies include establishing a positive feeding relationship, encouraging healthy eating habits, and maintaining physical activity.

Childhood obesity is the most common nutritional problem among children in the United States. It is now considered a disease of epidemic proportions. Presently, estimates of childhood obesity (defined by body mass index [BMI] exceeding the 85th percentile) range from 22 to 33% (Troiano, Flegal, Kuczmarski, Campbell, & Johnson, 1995), with 13.7% of children between the ages of 6 and 11 being above the 95th percentile (MMWR, 1997). During the past decade, the number of children above the 95th percentile has doubled and the number above the 85th percentile has increased by 40% (Troiano et al., 1995). The greatest increases have been among children 6 to 11 years of age (Moran, 1999). After the age of 3 years, the probability that obesity will persist into adulthood increases with advancing age. The more obese the child is, the greater the probability (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997).

This general rise in obesity is associated with long lasting physical and mental health consequences and a cost of approximately \$100 billion a year in the United States (Goran, Reynolds, & Lindquist, 1999). Complications related to and other conditions associated with obesity include hypertension, hyperlipidemia, increased incidence of non-insulin dependent diabetes, cholelithiasis, some types of adult onset cancer (e.g., colon, breast, pancreatic cancer),

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dermatologic disorders (e.g., acanthosis nigricans, intertrigo, monilial dermatitis), pulmonary and orthopedic conditions, menstrual abnormalities, and psychosocial morbidities.

Once a child has become obese, treatment is more difficult and the condition often becomes a lifelong problem. Rosenbaum, Leibel, and Hirsch (1997) point out that 90 to 95% of people who appropriately lose weight subsequently regain it. Therefore, prevention is the most effective treatment for obesity. Interventions with younger children may be more effective than with older children because they have had less time to develop poor eating and exercise habits, and parents have greater influence over their lifestyles. This article will discuss the use of the BMI to assess growth in childhood, risk factors associated with obesity, and interventions aimed at the prevention of childhood obesity using a developmental approach.

Body Mass Index

The International Task Force on Obesity (Dietz & Robinson, 1998); the Expert Committee on Pediatric Obesity, comprised of members from the Maternal and Child Health Bureau, the Health Resources and Services Administration, and the Department of Health and Human Services (Barlow & Dietz, 1998); and the Expert Committee on Clinical Guidelines for Overweight in Adolescent Preventive Services (Himes & Dietz, 1994) recommend the use of the BMI as an accurate and easily available method to screen for childhood obesity. The BMI is strongly associated with subcutaneous and total body fat as measured by dual energy x-ray absorptiometry and also with skinfold thickness (Pietrobelli et al., 1998). It is highly specific for those with the greatest amount of body fat. The BMI is significantly correlated with various adverse biochemical and physiologic effects of excessive adiposity such as serum insulin levels, systolic and diastolic blood pressure (Pietrobelli et al., 1998), and with blood lipids and lipoproteins (Himes & Dietz, 1994). The BMI is calculated by dividing a child's weight in kilograms by his height in meters squared.

Among children, the BMI normally varies considerably with age, decreasing in early years and increasing with age after about 6 years old. This upward trend after the low point or dip in BMI percentile curves reflects what is called the adiposity rebound. These changes with growth necessitate age specific criteria. Gender differences in body composition and the timing of growth patterns also make gender specific criteria desirable (Troiano & Flegal, 1999). The National Center for Health Statistics of the Centers for Disease Control and Prevention has recently released BMI percentile growth charts for children from 2 to 20 years of age along with revised height and weight growth charts (see: <http://www.cdc.gov/nchs>). Charts and a computerized program to calculate BMI are also available at this site.

It has been proposed that the 95th percentile of the BMI be used to define overweight (Barlow & Dietz, 1998, Himes & Dietz, 1994, Troiano & Flegal, 1998). Children with a BMI

above this cutoff are more likely to be obese, are at risk for remaining obese, and are more likely to have future adverse outcomes than those classified as overweight by lower percentile cutoffs. Children with a BMI between the 85th and 95th percentile should be considered at risk of overweight (Troiano et al., 1995). An early adiposity rebound has been associated with a higher BMI in adolescence and with adult obesity, independent of parental obesity (Whitaker, Pepe, Wright, Seidel, & Dietz, 1998). All children should have their height, weight, and BMI plotted on the growth charts at each well child visit. This will enable the practitioner to assess the child's pattern of growth, risk for obesity, and need for appropriate intervention.

Factors Associated with Risk of Obesity

Activity. In today's society, children are becoming less active and spending more time engaged in sedentary activities. Total energy expenditure in younger children is approximately 25% lower than current energy intake recommendations (Brown, 1997). Participation in physical education classes has declined dramatically, with less than 36% of elementary and secondary schools offering daily classes (Sothorn et al., 1999). Therefore, most of a child's physical activity takes place outside of school. However, children are playing outdoors less due to safety concerns, lack of supervised recreational programs, and scarcity of playgrounds. "Latch key" children who are in their homes alone after school are often forbidden by parents to engage in outside activities (Brown, 1997). Parental obesity and low levels of physical activity are correlated with decreased physical activity in their children (Strauss, 1999). The opposite is also true; children of active parents are six times more likely to be active than when neither parent is active.

Television. Increased television viewing is associated with higher rates of childhood obesity (Anderson, Crespo, Bartlett, Cheskin, & Pratt, 1998). Yet, youth view an average of 4.8 hours a day, with an estimated 33% watching more than 5 hours a day and only 11% watching 2 hours or less a day (Gortmaker et al., 1996). Gortmaker and colleagues (1996) reported a dose response relationship between the number of hours of television viewing and the incidence of obesity with the odds of becoming overweight 8.3 times greater for those watching more than 5 hours of television a day. This is well above the daily viewing time of 2 hours or less that is recommended by the American Academy of Pediatrics (Gortmaker et al., 1996). Watching television decreases the time available for exercise and activity while encouraging the snacking and consumption of energy dense foods. Moreover, more than 90% of foods advertised on television are high in fat, sugar, and salt (Strauss, 1999), and consuming them further contributes to obesity.

Diet. Nutritional surveys in children indicate that the prevalence and degree of obesity are related to the amount of fat consumed (Strauss, 1999). One third of meals are eaten outside of the home, often at fast food restaurants where foods typically have 45% to 55% of their calories from fat. Children consume one third of their total daily energy intake at school where most schools serve meals that average 38% of their calories from fat (Story, 1999). Children average significantly less intake of the daily recommended amounts of fruits and vegetables, with French-fried potatoes accounting for a large portion of the vegetables that are consumed (MMWR, 1996).

Childhood food preferences and eating patterns are formed by parental food beliefs and eating habits (Klesges, Stein, Eck, Isbell, & Klesges, 1991). There is no evidence that children have an innate, unlearned preference for high fat or calorie-dense foods. Parents tend to have foods that

they like and eat in their homes, and with repeated opportunities to eat these foods, young children will include many of them in their diet. If parents tend to enjoy and eat high fat foods, their children will develop similar eating patterns (Strauss, 1999).

Johnson and Birch (1994) showed that children whose parents had a tendency to eat uncontrollably even when not hungry also had a lower ability to regulate energy intake. Mothers who were controlling in their child feeding practices (encouraging their children to eat only at mealtime rather than in response to hunger or encouraging children to finish all of the food given to them) had children who were less responsive to caloric density cues and, therefore, showed less evidence of self-regulation of caloric intake (Johnson & Birch, 1994). Birch and Fisher (1998) found that children's food preferences were influenced by the foods that were used as rewards for performing non-food related tasks. Children learned to dislike foods (e.g., green vegetables) they were required to eat in order to obtain rewards.

Prevention Strategies

Infancy. Prevention of childhood obesity begins in infancy with the establishment of a positive feeding relationship between the parents and the baby. This requires that the caretakers learn the infant's "hungry" and "satiety" cues, provide foods that are developmentally and nutritionally appropriate, and make feedings pleasant for both them and the baby (Satter, 1987). Prenatally, women should be counseled regarding the benefits of breast feeding. Breast fed infants have more control and will stop feeding when satiated and, therefore, tend to be appropriately lighter. A longer duration of breast feeding is associated with decreased adiposity at age 2 years (Strauss, 1999). Caretakers have heightened control over the infant's intake when formula is given and often tend to keep feeding even when the baby has indicated that he is full.

Mothers often believe that a heavy infant is a healthy infant and is a result of successful feeding and parenting (Baughcum, Burcklow, Deeks, Powers, & Whitaker, 1998). If they perceive that their infants are not getting enough to eat, solid foods may be added at an early age. Baughcum and colleagues (1998) found that mothers who do not understand that crying does not always indicate hunger often introduce cereal at 4 to 6 weeks of age, a period when crying increases in normally developing newborns. This pattern of using feeding to shape noneating behavior can increase the risk of childhood obesity. The nurses can help new parents identify their baby's cues, find other ways to manage crying instead of feeding, and provide reassurance that they are doing a good job of parenting. Since grandmothers are often involved in the decision making regarding introduction of solid foods, they should be included in discussions about nutrition.

It is important to assess whether the parent-infant feeding relationship is a positive one and to make appropriate interventions. As the older infant begins solid and finger foods, parents should be counseled that not all infants accept new foods with enthusiasm. Sullivan and Birch (1994) found that breast fed infants accepted new foods more readily than formula fed infants. They hypothesized that exposure to breast milk provides experience with a variety of flavors, unlike formula, which provides a consistent flavor across feedings. This can be a time when struggles over feeding begin. Children should be allowed to touch their food and explore it, to eat at their own pace, and be allowed to stop feeding when they indicate that they have had enough (Satter, 1987). Parents and caretakers should talk to their babies during feeding in a quiet and encourag-

ing manner, but should not entertain them or overwhelm them with attention.

Toddlerhood. Growth significantly slows down after 1 year of age, and children become more physically active with increasing independence. They struggle with separation, autonomy, and limits. As toddler's appetites decrease and their need for independence increase, their food intake often becomes erratic and unpredictable. Parents may be concerned and attribute the decrease in weight gain to their toddler's selective eating pattern. Parents of toddlers often use strategies such as bribery, punishment, or rewards to get children to eat; they fix whatever the child wants to eat because "at least he or she is eating something;" or the use of the bottle is prolonged (Stern, 1999). Food may be used to calm a toddler's temper tantrum or as a bribe to promote good behavior (Baughcum et al., 1998). These feeding techniques lead to children with poor ability to regulate caloric intake and may lead to a higher BMI (Johnson & Birch, 1994). This puts the child at risk for an earlier adiposity rebound.

Since toddlers are now joining the family at mealtime, this is an excellent opportunity for parents to select a healthy diet for the entire family. The focus at this age is on developing good eating habits and parents must model what they expect their child to eat. Parents should serve small amounts of nutritious foods and provide healthy snacks. It should be in a form the child can handle and include a selection of foods that the child generally likes. If the child refuses to eat what is served, the parents should not provide an alternative and not be coercive. Mealtimes should be pleasant, with the toddler participating in family meals. Many toddlers consume large amounts of calories from milk and juice. If not already accomplished, the bottle should be weaned, 2% milk offered at meals (after the age of 2 years), juice offered at snack, and water offered for thirst (Satter, 1987). Parents need to be reassured that "pickiness" and "food jags" are normal. When offering new foods, parents need to remember that it takes, on the average, five to ten tries before the new food is accepted (Sullivan & Birch, 1994). During the toddler period, dietary and activity histories should begin to be taken at each well child visit. Assessment questions appear in Table 1.

Preschool. The preschool years are marked by initiative, rebellion, and an eagerness to learn. Children are greatly influenced by the food habits of their parents. Therefore, parents need to continue to role model appropriate food choices. It is also not unusual for children to eat foods outside of the home environment that they usually dislike at home. When preschool children are given opportunities during meals to observe other children choosing and eating vegetables that the observing child did not like, preferences for and intake of the disliked vegetables are increased (Birch & Fisher, 1998). Parents should not use food as a reward nor should sweets or high energy foods be severely restricted. Children often enjoy helping to shop and prepare the foods, using their imagination to create new presentations of favorite foods. Parents have a responsibility to serve nutritious foods in a pleasant atmosphere; it is up to the child what and how much is consumed. Physical activity also needs to be encouraged with activities that the child enjoys. Television should be restricted to no more than 2 hours a day.

Pediatric nurses can use the new Food Guide Pyramid for Young Children, developed by the United States Department of Agriculture, to enhance discussion about appropriate food choices and recommended number of servings. The pyramid is targeted to children ages 2 to 6 years and also emphasizes the importance of physical activity for good health (see <http://www.usda.gov/cnpp>). Children ages 2

Table 1. Assessment Questions

Family Nutritional Assessment

- Which meals does the family eat together?
- Who usually does the grocery shopping and prepares the food?
- Is there unregulated snacking?
- Are dessert foods, candy, and high-fat snack foods readily available?
- How often does the family eat out or at fast food restaurants?
- Are there limited financial resources to buy food?

Nutritional Assessment of the Child

- What does the child eat at each meal?
- What are his usual snacks?
- How often are snacks eaten?
- Does the child consume more calories as snacks than as meals?
- How many fruits and vegetables are eaten each day?
- Are the child's portions adult sized?
- Does the child go back for seconds?
- How much milk, juice, and sugared drinks does the child drink?
- How much time is spent watching television, playing video games, using the computer, reading, talking on the telephone, and engaging in other sedentary activities?

years and older should consume an amount of fiber equivalent to their age plus 5 to 10 grams a day (Williams, Bollella, & Wynder, 1995). It is important to include fiber in the diet, as children who consume the highest amounts of dietary fiber consume the lowest amounts of dietary fat and are less likely to become obese (Williams, Campanaro, Squillace, & Bollella, 1997).

School age. School age children have a growing sense of independence and take pride in their accomplishments. They are influenced by the media, have more access to "junk" foods, and no longer eat all of their meals at home. The easy availability of high calorie foods and an increasing tendency towards sedentary activities increase the risk of obesity. Parents need to limit high calorie foods in the home and provide plenty of fruits and vegetables. High fat convenience foods should be avoided, families should try to eat as many meals together as they can at home, and mealtimes should be pleasant. Meals and snacks should not be eaten in front of the television. Children should be taught other ways to handle stress besides eating. This is a good time to begin to teach other stress reduction techniques.

Physical activity declines throughout the school years with females reducing their activity levels more than males (Sallis, 1993). Parents need to provide opportunities for the child to be active. The child should not be allowed to have a television in his room, and television, video games, and computer time should be limited to a total of not more than 2 hours a day. Most school age children enjoy socializing; therefore, activities with friends should be made available, such as playing basketball or roller skating. Neighborhood, school, and community opportunities for activity should be

explored. Socializing around physical activity rather than food and sedentary behaviors increases the probability of being active. The best form of exercise is one that is sustainable. Since childhood is a time for free play, children should be encouraged to participate in spontaneous physical activity that is well-integrated into daily life, rather than being enrolled in regimented exercise programs. Physical activity should be encouraged that increases the interaction between parents and children, such as bicycle riding or taking walks. Children are more likely to exercise in situations in which they have a choice of the type of exercise. Forcing children into exercise programs of their parents' choosing is unlikely to be successful (Strauss, 1999).

If children do not readily identify exercise or physical activities in which they wish to participate, they should be encouraged to decrease their sedentary activities. This has been shown to increase energy expenditure and can be just as effective as a program to increase physical fitness (Epstein, Paluch, Gordy, & Dorn, 2000). Robinson (1999) tested the role that television, videotapes, and video games play in the development of body fatness as well as their effects on dietary intake and physical activity. In this randomized, controlled study, children who participated in a 10-day television turnoff followed by a 7-hour a week television budget had statistically significant decreases in all measures of body fatness. The intervention significantly reduced the frequency of children eating meals in a room with the television on, although reduction in the consumption of high fat foods was not significant.

Conclusion

Childhood obesity is increasing in prevalence, is associated with numerous morbidities, and is often not amenable to treatment. Therefore, prevention is a high priority. Pediatric nurses can assess children and families for factors associated with obesity, can teach parenting skills and educate families about establishing good eating habits early on, and can encourage physical activity. However, it may take a public health effort to place physical education back in the schools; reduce the amount of food commercials on television; support breast feeding; allow families to spend more time enjoying activities together, including meals; and provide community activities for our youth. Nurses can advocate for children by supporting these endeavors in order to promote the health of children.

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