Childhood Obesity: A Multifaceted Etiology

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Abstract

This paper presents a multifaceted etiology of childhood obesity regarding energy consumption, energy expenditure, behavioral factors, and psychosocial factors related to the disorder. Recommendations are presented for health educators to approach this problem from a holistic perspective involving assistance from parents and teachers and assisting children in making lifestyle changes. Also, challenges and future directions for research are given.

Introduction

Childhood obesity has been described as "one of the most complex and least understood clinical syndromes in pediatric medicine." Convention suggests obesity results from overeating and inadequate physical activity (Muecke, Simons-Morton, Huang, & Parcel, 1992). However, many studies contradict this widely accepted notion. A review of literature in the areas of energy consumption, energy expenditure, and psychosocial factors reveals a multifaceted etiology regarding childhood obesity.

Obesity is a disorder, when prevalent in childhood, increases the risk of obesity in adulthood and the risk of adult morbidity and mortality (Epstein, McKenzie, Valoski, Klein, & Wing, 1994). To define obesity, a distinction between overweight and obesity must be made. The term overweight is defined as exceeding population norm or average weight considering that person's gender, height, and frame. The term obesity is defined as an excessive amount of body fat. It is possible to be obese and within the normal weight range, and to be overweight and of normal body fat. More than 80% of obese adolescents become obese adults, suggesting current weight control efforts for obese children may be insufficient and/or ineffective (Uzark, Becker, Dielman, Rocchini, & Katch, 1988). Between 13% and 36% of 12 - 17 year old Americans are obese and depending on gender and race, an additional 4 -12% may be considered super-obese (having an overly excessive amount of body fat) (Strong, Deckeldaum, Gidding, Kavey, Washington, Wilmore, & Perry, 1992). This represents a 39% increase in the prevalence of obesity compared with data collected between 1966 and 1970. Equally alarming, is the 54% increase in the prevalence of obesity among children aged 6-11 years of age (Strong, et al., 1992).

In general, females are overweight more often than males, white males are overweight more often than African-American males, and African-American females are overweight more often than white females (Berenson, Sromovasan, Wattigney, & Harsha, 1993). Results from the recent National Growth Studies indicate 31% of African American girls were obese compared with 21% of white girls at similar ages. Additionally, the rate of increase in obesity was higher for African American girls than for white girls (Pratt, 1994). During the past fifteen to twenty years, obesity increased 39% among 12-17 year olds, 35% for whites, and 53% for African Americans (Desmond, Price, Hallinan, & Smith, 1989). Also, African American girls have an earlier onset (twelve years of age) and relatively higher risk of obesity than do their Caucasian cohorts (Pratt, 1994).

High Fat Foods/Energy Consumption

In light of children's documented preference for foods high in fat, evaluation of consumption patterns may reveal overconsumption of high fat foods by obese children independent of their high total caloric intake (Muecke, et al., 1992). Shah and Jeffery (1991) reviewed eleven studies of food intake among children and found three indicating a positive relationship between intake and obesity. Bellisle, Rolland-Cachera, Deheeger, and Guilloud-Bataille (1988) found obese children ate less at breakfast and more at dinner than their leaner peers. Energy value of breakfast and afternoon snack was inversely related to corpulence and no correlation existed between

adiposity and corpulence among 2440, 7-12 year old French children. These results suggest a possible contribution of disturbed metabolic and/or behavioral daily cycles in development of overweight (Bellisle et al., 1988) rather than the consumption of high fat food. The high energy dinners of overweight children might be explained by their consumption of relatively low energy afternoon snacks. It appears more interesting however, to view this potentially as a disturbed pattern of intake distribution over the waking hours: low morning intake plus high evening intake.

Waxman and Stunkard (1980) introduced the concept of an "obese eating style," consisting of rapid eating combined with larger bites. These researchers observed the duration of mealtime for obese boys was significantly shorter than their nonobese brothers at dinner and nonobese classmates. Obese boys consumed calories more than twice the rate of their nonobese siblings and peers. The study however, did not examine what obese children ate.

Energy Expenditure

A declining level of fitness among American children has brought the role of physical activity under great scrutiny. Studies, however, have been equivocal. Some demonstrated obese children have a clear deficiency of activity when compared to peers and are less aerobically fit then nonobese peers. In contrast, others found obese children not only experience comparable activity levels and fitness levels, but actually expend the same or more energy than thinner peers when controlling for work load of their excess weight (Muecke, et al., 1992). Some results show low energy expenditure can be an important factor contributing to excessive weight gain early in life (Roberts, 1993). However, cross-sectional data linking physical activity with obesity in children have been inconclusive (Kimm, 1995).

According to Epstein, Valoski, Vara, McCurley, Wisniewski, Kalarchian, Klein, & Shrager (1995), obese children are more sedentary than their nonobese peers and choose to be sedentary when given the option of being active or sedentary. These researchers have shown an inverse relationship between the amount of adult television watching and vigorous physical activity and fitness (Epstein et al., 1995). According to Pratt (1994), physical inactivity, frequent television viewing, and high energy and fat intakes may contribute to obesity.

The Framingham Children's Study, a longitudinal study examining 106 preschool children through first grade, found low levels of activity during preschool years had a moderately strong effect on a child's changing level of adiposity from preschool through entry into first grade (Moore, Nguyen, Rothman, Cupples, & Ellison, 1995). However, this study presented many confounding variables including misclassification of activity, limited number of subjects, and erroneous estimation of caloric intake.

Several studies did not find a consistent relationship between physical activity and weight when using self-reported questionnaire, motion sensors, or direct observations. McMurray, Harrell, Levine, and Gansky (1995) found no significant differences in the reported physical activity levels of 1092 obese and non-obese children. They offer three possible explanations for this finding: (1) obesity does not significantly modify physical activity levels in 8-10 year olds, (2) physical activity may not modify obesity except when the child routinely participates in activities at a fairly high level of exertion, or (3) factors other than physical activity may be more crucial to early development of obesity. Thus, the relationship between obesity and energy expenditure remains controversial.

Physical inactivity, frequent television viewing, and high energy and fat intakes may contribute to obesity (Pratt, 1994). Television watching has been identified as a strong risk factor for childhood and adolescent obesity (Gortmaker, Dietz & Chung, 1990). As a sedentary activity, watching television may become a conditioned stimulus for eating if persons repeatedly eat in front of the television (Epstein et al., 1995). Television viewing is associated with the onset of obesity, a decrease in the remission of obesity, a decrease in activity levels and may possibly influence diet (Gortmaker, Dietz & Chung 1990). Recent observations in children suggest increased television viewing and playing computer games

which may indicate less physical activity than in the past (Strong et al., 1992).

A study examined the relationship among observed television watching time, noted physical activity level and body composition among 3-or 4-year-old children. In this study, children from the Texas site of Studies of Child Activity and Nutrition program were observed from 6 to 12 hours per day up to 4 days over one year. The results indicate television watching was negatively correlated with physical activity levels. Physical activity was lower during television-watching than non-television-watching time in this sample of children (DuRant, Baranowiski, Johnson, & Thompson, 1994).

Energy Consumption and Expenditure

Waxman and Stunkard (1980) examined both energy intake and energy expenditure using a case-control study design, and found despite greater consumption and lower activity levels, obese children actually expended more energy in moving than did their peers. Thus they attribute obesity solely to excess calorie consumption (Waxman & Stunkard, 1980). However, only four obese children were studied in this case-control study.

Muecke, et al. (1992) performed a case control study using 309 students, ages 8-10, to ascertain the association of high fat foods and low physical activity. They did not find an increased risk of obesity when children were exposed to only high fat foods or low levels of physical activity. However, when both risk factors were assessed concurrently in the same child, a 38% increase in the risk of obesity was present (Muecke, et al., 1992). This finding underscores the complexity of obesity causation and is suggestive of a multifactorial etiology.

Psychosocial Factors

Psychosocial influences on childhood obesity include personality, coping styles, perceived barriers, interpersonal skills, parental psychological functioning and body image. Research suggests that between the ages of 4-5 and 8-9 years, greater gains in weight -for-height percentiles were correlated with several temperament characteristics, in particular with low predictability and low persistence or attention span (Carey, 1992). It also is suggested that the disorganized, nonpersistent child (one who is easily influenced) may have more trouble resisting unnecessary food and maintaining dietary efforts (Carey, 1992). Researchers suggest that increased stress might exist in families in which a member is overweight because of strong social pressure to remain thin (Hanson, Klesges, Eck, Cigrang, & Carle, 1990).This may suggest that overweight mothers use less than optimal coping strategies in dealing with stress. Data supports this hypothesis in the significant correlation between avoidance coping styles and high relative weight in mothers (Hanson, et al., 1990). Such high levels of conflict and stress interfere with normal family problem-solving and coping skills (Hanson, et. al., 1990). Relatedly, one study found self-esteem in obese children to be lower than in normal weight children (Desmond, Price, Hallinan, & Smith, 1989).

Uzark and colleagues (1988) have done extensive research in the area of psychosocial barriers influencing childhood obesity. In obese adolescents, weight loss was significantly associated with their beliefs regarding: (1) personal control over weight, (2) barriers or difficulty of losing weight, (3) medical problems as a cause of their obesity, (4) family problems as a cause of their obesity, and (5) perceived willingness of family members to diet.

Greater weight loss in children who perceive more barriers/difficulty and less family willingness to diet may reflect the importance of having realistic expectations related to behavioral compliance. This research examined the following psychosocial variables: perceived threat of obesity, perceived barriers or difficulty of losing weight, feelings of control over weight, obesity attributions, and family support network factors. Obesity attributions included: bad eating habits, poor resistance of certain fattening foods, foods available in home, boredom, lack of exercise, eating away from home, influence of family, family problems, nervous tension, school problems, and medical problems. Family support was measured in the dimensions of "instrumental support," as measured by the number of obese family members and willingness of family

members to diet as perceived by the child; "emotional support," and "normative or appraisal support," as measured by the parent 's attitude or expectation regarding the child's weight control (Uzark, et.al., 1988). Obesity and poor dietary habits also are related to social isolation and to family relationships and structure (Pratt, 1994).

A significant association exists between the child's beliefs regarding personal control over weight and beliefs regarding barriers or the difficulty of losing weight and weight loss outcome (Uzark et al., 1988). This study revealed significant correlations between the parents' and the child's beliefs regarding four of the eleven obesity attributions: lack of exercise, family problems, nervous tension, and medical problems. Disturbances in self-perceived weight contribute to inappropriate weight loss behavior and may lead to body image dissatisfaction, low self-esteem, and weight gain (Pratt, 1994).

A Multifaceted Etiology: Recommendations

Childhood obesity seems to have multiple causes centering around an imbalance of energy intake and expenditure. Childhood obesity most likely results from an interaction of nutritional, psychological, familial, and physiological factors (Summerfield, 1990). Research suggests childhood obesity is a multifaceted problem affected by genetic, physiologic, psychosocial, and economic variables and is often the result of maladaptive attitudes and behaviors which lead to over-consumption and/or underactivity (Uzark, et al., 1988). Parents and adult care providers may exert influence over children's eating behavior. Verbal influences such as prompting children to eat at mealtime and nonverbal influences, such as food purchases, the presentation of foods and the influence of adult eating behavior are often exerted by adults (Ray & Klesges, 1993).

Also, Ray and Kleges (1993) suggest watching television lowered resting metabolic rates in children, thereby offering an explanation for the effect of television viewing on obesity development. Also, food commercials are constantly presenting repeated prompts to eat. Obese children and adults respond to these repeated prompts with greater reactivity than nonobese adults (Epstein et al., 1995). Additionally, psychosocial influences on childhood obesity may include personality, coping styles, perceived barriers, interpersonal skills, parental psychological functioning and body image.

Considering the risk factors presented in childhood obesity, it is important to design an integrative, holistic, treatment program for childhood obesity. These programs should involve interventions for childhood obesity such as changing eating behaviors to lower caloric intake, changing exercise behaviors to increase caloric expenditure, and training parents to implement these behavior changes (Epstein, 1990). Research has shown that parent education in behavioral techniques training and parental involvement as a targeted participant in family-based treatment influences short- and long-term child weight control (Epstein, et al., 1994). The fact that obesity has multiple causes and that none of these causes has a highly effective cure means that multifactorial interventions must be considered and that prevention is the treatment of choice (Gortemaker, Dietz, & Chung, 1990). Addressing the problem of obesity prior to its onset may also help prevent engaging in compensatory behavior to lose weight once obesity is established (Fitzgibbon, Stolley, & Kirschenbaum, 1995).

To address the behavioral factors of childhood obesity, several elements should be included in an intervention program: Parents should be provided with information regarding the relationship of parenting practices and childhood obesity. Methods to increase behavior, such as positive reinforcement, negative reinforcement, modeling, stimulus control, and contracting, and methods to decrease behavior, such as response cost and punishment, should be described in detail. Parents and children could write reciprocal contracts with activities (e.g., family outings) and privileges (e.g., staying up late) as stated reinforcers. Parents and children also might be instructed to model appropriate eating and activity behaviors. Families should be encouraged to try to arrange their environment to maximize behavior change. For example, food preparation and service and level of activity among family members should

reinforce appropriate obesity prevention behaviors.

All figures in a child's life (i.e. parents, teacher, coaches, etc.) should be involved in the prevention program. Reinforcing aspects of the child's life would include the use of praise, as well as looking at attitudes, beliefs, and the environment. The use of praise increases the probability that children will comply with the changes in eating and exercise accepting and stress behaviors that are targeted (Epstein et al., 1993). Parents might be instructed to accept the child to promote self-confidence and self-esteem in making changes and to be involved in helping the child learn to deal with their emotions and stress without turning to food for comfort (Viebrock & Berry, 1993). Parents and children should be instructed to engage in discussions regarding the child's personal control perceptions and views concerning barriers to weight control, as well as be given instruction on enhancing supportive interactions in the child's social environment (Uzark, 1988). Coaches and teachers also could then be included in the reinforcing treatment intervention aspects of the program.

A lifestyle-type exercise program should be used to incorporate varied activities. This type of program allows participants to choose aerobic activities that can be incorporated in their daily routine. Activities such as brisk walking to and from home, school, between classes should be encouraged. Obese youth are not only less fit than their normal weighted peers, but they are less skilled and consequently discriminated against in play and sport activities. The exercise program should include skills training for sports which is hoped to lead to increased participation in physical activities at home, at school, and in recreational settings.

Parents' participation at home with their children during exercise sessions has shown to improve compliance and overall success. Examples of this may be parents involving their children in household chores and assisting them in checking heart rates and perceived exertion in doing regular exercise activities. Parents may encourage their obese children to participate weekly in age-appropriate organized sports, lessons, clubs, or games. Research has shown that targeting both the parent and child during treatment resulted in lower relative weight for those children after 5-10 years than for children without their parents (Suskind, Sothern, Farris, von Almen, Schumacher, Carlisle, Vargas, Escobar, & Loftin, 1993).

Teachers should include obese children in physical activities at school. Suggestions include involving overweight children on the playground during recess, planning daily physical activities, doing calisthenics in the morning, and taking children through supervised obstacle courses (Javernick, 1988). Exercise adherence might be evaluated via self-monitoring in habit books. These books should include measures for frequency, duration, and type of exercise and should be kept and checked weekly.

An effort to reduce sedentary activities must take place in a childhood obesity intervention. Reduced television watching time should reduce fat and prevent the development of obesity. Parents should set limits on viewing television and video or computer games. Parents might require that any television viewing beyond the set limit needs be accompanied by an aerobic activity. Other recommendations would be to include family participation in reduction of inactivity, family participation in sports, and more parental supervision of inactivity.

Conclusion

The rising incidence rate of childhood obesity has contributed to the demand for obesity prevention programming and implementation efforts. Health educators working with today's youth need to keep in mind the holistic components particular to this group of youth. Challenges include sensitizing youth to care about the serious concerns of obesity particular to health. Making intervention programs available to youth already faced with many barriers such lack of parental involvement, having limited access to after-school activities, and low financial resources also represents a challenge. A culture which values consumption of high fat foods and acceptance of an obese body brings another difficulty.

Childhood obesity is a complex problem with a multifaceted etiology. It is not a simple problem of excess caloric intake and/or high fat

diet and low physical activity. To be effective prevention and intervention programs must understand the role of genetics; parental influences; psychosocial contributors; eating patterns; level, type, and frequency of physical activity and nutritional education. Future research must examine and equip parents and educators about how these factors interrelate.

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