


Original Article: Obesity and its Association with Childhood Diabetes: A Systematic Review of the Latest Evidence

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ABSTRACT

Incidence of diabetes in children, causes and risk factors for this complication, types of diabetes in children, the need to follow the recommendations, management and control of type 1 diabetes and nutritional tips to control diabetes in children, we will report. Type 1 diabetes is more common in children and type 2 diabetes is more likely to occur in adults, especially after the age of 40. Although type 1 diabetes accounts for only five to 10 percent of all cases of diabetes, it is the most common type of diabetes in children. In fact, 85% of the most recently diagnosed types of diabetes are in children and young people under 18 And for this reason, it is also called juvenile diabetes. Obesity is a major cause of diabetes in children. In this study, based on the available scientific evidence, the relationship between obesity and diabetes in children and its mechanism and pathophysiology are accurately stated.

Introduction

Obesity is the most common eating disorder among children and adolescents in the United States and is rapidly increasing in other countries as well. Approximately 21 to 24 percent of American children and adolescents are overweight, and 16 to 18 percent are obese [1,2]. The prevalence of obesity is higher in some

racial groups. Obesity in children sets the stage for insulin resistance and type 2 diabetes, high blood pressure, high blood fats, liver and kidney disease, and pregnancy disorders. This condition also increases the risk of obesity in early adulthood and heart disease. Obesity in children is a complex disorder [3].

The prevalence of obesity has increased so much in recent years that it is the most

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important health concern. The US National Nutrition and Health Survey shows that the prevalence of obesity in children of both sexes is increasing. Many factors, including genetics, environment, metabolism, lifestyle and eating habits, play a role in obesity. However, more than 90% of obesity cases have no medical cause and less than 10% of them are hormonal or genetic [4]. Practical definition of obesity in adults is obtained from statistical data that analyze the relationship between body mass and the risk of disease and mortality in the long and short term [5]. Because acute medical complications of obesity are less common in children and adolescents than in adults, and because long-term data on the relationship between childhood weight and morbidity and adult mortality are difficult to interpret, there is no single universal definition of obesity in Kids cannot be offered. Some studies use the terms "overweight," "obesity," and "sick cheek obesity" for children and adolescents who weigh more than 20 to 50 percent and 80 to 100 percent more weight than expected, respectively. Body mass index (BMI) cannot be used in children under two years of age because their weight is constantly changing [6].

Body mass index or BMI, although not perfect, is a measure of body fat. Here is how it is calculated: Weight is divided in kilograms by height squared in meters. BMI is modified based on body size and can be easily used to assess the clinical condition of individuals. BMI is closely related to total body fat and in children who are overweight or obese, it corresponds to the amount estimated through the bone density test [7]. Normal BMI rates vary depending on age, gender, and puberty status. One study found that short sleep duration in young children was associated with increased BMI. This observation was independent of other variables such as physical activity and so on. In addition, data show that over a 5-year period, an increase in BMI in overweight children aged 6 to 11 years is associated with an increase in systolic and diastolic blood pressure, as well as a decrease in sleep duration. One study found that the birth of a sibling when the baby was 24 to 54 months old was associated with a healthier BMI [8].

Causes of obesity in children

Genetic syndromes associated with obesity in children include: Prader-Willi syndrome, pseudoparathyroidism, Bardet-Biddle syndrome, Cohen syndrome, Down syndrome, Turner syndrome [9].

Hormonal disorders causing obesity in children include: Growth hormone deficiency, Growth hormone resistance, Hypothyroidism, Leptin deficiency or leptin resistance, Glucocorticoids (Cushing's syndrome), Premature puberty, Polycystic ovary syndrome, Secretory tumors [10].

Drugs that can lead to overweight in children and adolescents include: cortisol and other glucocorticoids, megestrol, sulfonylureas, tricyclic antidepressants, monoamine oxidase inhibitors such as phenelzine, oral contraceptives, high-dose insulin, Thiazolidinediones, risperidone [11].

During childhood and adolescence, excess fat accumulates if the total energy intake is greater than the total energy expended. This energy imbalance may be the result of high energy intake or reduced energy consumption. Decreased energy consumption is usually due to sedentary lifestyle [12]. Excessive watching of TV, computer and digital games, and lack of adequate physical activity are the causes of this type of obesity. In infancy, excessive fat accumulation occurs when the baby is given too much energy, especially when the ratio of protein to energy changes. This often happens when nutrition is supplemented with supplements such as carbohydrates or fats while the same amount of protein is given. In addition, one study reported that the prevalence of obesity increased by age three in children who ate solid foods by age four months [13].

Leptin / ghrelin hormonal pathway dysfunction: In obese people, hypothalamic-brain-abdominal dysfunction through the leptin / ghrelin hormonal pathway is involved in controlling abnormal appetite and excessive energy expenditure. Research shows that dysfunction of this hormonal axis can cause obesity in ten percent of obese people, especially those who appear to have familial obesity.

Several reports indicate that these families have a significant weight loss response to hormone replacement therapy in leptin-deficient patients [14]. Decreased energy consumption in the body indicates other hormonal deficiency diseases such as hypothyroidism and growth hormone deficiency. Increased energy intake is seen in genetic syndromes such as Prader-Willi syndrome, Cushing's syndrome, and drug-induced obesity [15].

Weight gain factors

Despite the observed role of genetics and hormonal disorders in obesity, these factors alone can not cause weight gain in most obese patients who seek treatment. Although most overweight children have some form of familial obesity (one or two obese parents), being overweight in these obese children clearly depends on both environmental and genetic factors. The relationship between parent's and child's eating habits suggests that family obesity is related to the pattern of eating, exercising, and choosing entertainment activities such as watching television and digital games, and the cultural pattern of the type of food and how it is cooked. Evidence from twins, foster children and families shows that genetic factors also play a role in childhood obesity [16].

Genetics: The similarity rates of obesity and type 2 diabetes in monozygotic twins are higher than in identical twins, and the total body fat in identical twins is much closer together than in heterogeneous twins. However, genetic factors can not explain the increase in the prevalence of obesity in new generations compared to the past [17].

Insulin resistance, hyperlipidemia (dyslipidemia) and hypertension: Fat accumulation in the body, especially in the abdomen, reduces insulin sensitivity in skeletal muscle, liver tissue and adipose tissue. This insulin resistance sets the stage for glucose intolerance and hyperlipidemia. Low levels of high-density lipoprotein (good cholesterol, or HDL), both genetic and associated with sedentary lifestyles, may play a role in increasing the risk of premature coronary heart

disease in obese adults. Increased insulin circulation and insulin-like growth factor may increase blood pressure and stimulate the production of ovarian androgens and adrenocortical cells [18]. Too much androgen leads to irregular menstruation, amenorrhea (menopause) and oligomenorrhea (intermittent). Aromatization of adrenal androgens to estrone leads to breast enlargement in men. Insulin resistance, lipid dysfunction, and hypertension predispose to type 2 diabetes and cardiovascular disease and reduce life expectancy [19].

Obesity caused by disease

Short stature or slow linear growth in obese children suggests the possibility of growth hormone deficiency, hypothyroidism, high cortisol hormone, false parathyroid hypothyroidism, or a genetic syndrome such as Prader-Willi syndrome. A history of dry skin, constipation, cold intolerance or fatigue can be symptoms of hypothyroidism. Polyuria and high thirst in obese adolescents may be a warning sign of diabetes. A history of central nervous system damage (eg infection, injury, bleeding, radiation therapy, seizures) indicates hypothalamic obesity with or without pituitary growth hormone deficiency or pituitary hypothyroidism [15]. A history of morning headaches, vomiting, visual disturbances, and frequent urination or excessive fluid intake may also indicate that obesity is caused by a tumor or other mass in the hypothalamus. The accumulation of selective fat in the neck, trunk and purple lines indicates that the body has high cortisol, especially if the linear growth rate is reduced. The presence of signs of premature sexual development indicates that weight gain has occurred as a result of premature puberty. However, high facial hair growth, acne, and irregular menstruation in adolescent girls suggest that weight gain may be due to high levels of cortisol or polycystic ovary syndrome. Obesity itself may be associated with facial hair growth, irregular menstruation, and hypertension [20].

Diagnosis of childhood obesity: Two clinically useful assessments in this area are linear growth

rate and puberty timing. Most patients with familial or eating-related obesity have normal growth rates or higher than normal and mature at the appropriate age. Many obese children in this group mature faster than normal-weight children of the same age, and their bone age is usually forward. But in children with growth hormone deficiency, hypothyroidism, high cortisol and genetic syndromes, growth and maturation slows or stops. Conversely, the rate of growth and maturation in some girls with polycystic ovary syndrome accelerates to precocious puberty [21].

Obese people are more at risk for various types of diabetes, especially type 2 diabetes, also known as insulin-resistant diabetes or adult-onset diabetes. Blood sugar levels in type 2 diabetes are very high. In obese people, adipose tissue cells are forced to receive more nutrients than they consume. Stress causes these cells to become inflamed, releasing a protein called cytokines. Cytokines block insulin receptor signals and eventually lead to insulin resistance. Insulin allows cells to consume glucose and gain energy. When you are insulin resistant, your body will not be able to convert glucose into energy and eventually your blood sugar levels will always be high. In addition, stress can cause fat cells to become inflamed, leading to obesity-related illnesses such as heart disease [22].

Obese children are four times more likely to develop type 2 diabetes after the age of 25. According to a UK study of children aged 2 to 15, children with a high BMI were four times more likely to develop juvenile diabetes than children with a normal BMI. In the past it was thought that type 2 diabetes was only for adults, while today type 2 diabetes has been identified and diagnosed in many children. Doctors attribute it to obesity, an unhealthy diet and sedentary lifestyle. Obesity can also cause type 1 diabetes in children. Although type 1 diabetes is an autoimmune disease, factors such as obesity and insulin resistance can complicate the disease [23]. A study of 100,000 one-year-olds found that infants who were overweight or obese were directly linked to type 2 diabetes. The heavier the child, the lower the diagnosis of type 2 diabetes. Although insulin resistance is not the only cause of type 1 diabetes, according to this

study, the role of childhood obesity in the development of both types of diabetes can be understood [24].

The effect of sleep on diabetes: The link between obesity and diabetes is not so direct, but other factors such as sleep can exacerbate this link. Sleep is essential for many basic bodily functions, such as regulating insulin. Left untreated, sleep problems and disorders, such as sleep apnea (which is more common in obese people), can lead to weight gain, resulting in insulin resistance and type 2 diabetes. Belly, flank and whole-body fats are the two leading causes of sleep apnea because excess fat in the throat can block the airways and cause sleep apnea. In fact, here a group of factors in diabetes go hand in hand and lead to this disease. Obese people are more prone to obstructive sleep apnea, which even mild sleep apnea can disrupt the body's metabolic processes and increase the risk of developing diabetes. Endocrinologists believe that insufficient sleep not only affects blood sugar levels but also disrupts other body processes such as cholesterol and blood pressure [25]. Obese people are several times more likely to have these problems. Unfortunately, many people with type 2 diabetes do not get enough sleep, and this includes both quality and quantity of sleep. People who sleep less (less than 6 hours) or sleep too much (more than 9 hours) are more likely to develop type 2 diabetes [26]. According to a study in the UK, about 4,500 children who did not get enough sleep were exposed to three factors associated with type 2 diabetes. These factors include higher BMI, increased insulin resistance, and increased blood glucose levels.

Conclusion

Dangerous signs of childhood diabetes: According to the British Diabetes Association, only 9% of parents were able to identify the four main symptoms of type 1 diabetes. In 2013, this amount increased to 14%. In some children, it is not detectable until their diabetes is severe. Type 2 diabetes is caused by poor nutrition, obesity, low activity, stress and sleep deprivation, smoking, high fat and in short everything that is harmful to a healthy life and is institutionalized in mechanical life, but in type 2

diabetes can not be many He attributed the above symptoms to children because children

generally do not smoke, are not stressed, and are generally not prone to many of the above factors. In type 1 diabetes, the patient is not involved in the development of the disease and has more of a genetic aspect that interacts with external factors and impairs the secretion of the hormone insulin. Of course, there are theories about the effects of toxins and viruses on type 2 diabetes.

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